National Port Study

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ABP	An Bord Pleanála
AIB	Allied Irish Banks
Air Draft	Distance between the water level and the highest point on vessel
Beam	The maximum width of a vessel or the other body that enters the port
BHC	Belfast Harbour Commissioners
CAP21	Climate Action Plan 2021
CEF	Connecting Europe Funding Facility
CSV	Construction Support Vessel
DAFM	Department of Agriculture, Food and the Marine
DECC	Department of Environment, Climate Action and Communications
DPC	Drogheda Port Company
DSG	Doyle Shipping Group
EIB	European Investment Bank
FID	Final Investment Decision
FLOMIS	Floating Offshore Wind Manufacturing Investment Scheme
GBS	Gravity Base Structure (Foundation Structure)
GCA	Grid Connection Assessment
HLV	Heavy Lift Vessel
H&W	Harland & Wolff
IMDO	Irish Maritime Development Office
IPORES	Irish Ports Offshore Renewable Energy Services
ISFS	Ireland Strategic Investment Fund
ISPS	International Ship and Port Facility Security Code
LAT	Lowest Astronomical Tide
LEP	Local Enterprise Partnerships
LEZ	Local Enterprise Zones
LCOE	Levelised Cost of Energy
LOA	Length overall (Vessel Length)
MAC	Maritime Area Consent
MAP	Maritime Area Planning Act
MP	Monopile (Foundation Structure)
O&M	Operation and Maintenance
ORE	Offshore Renewable Energy
OREDP	Offshore Renewable Energy Development Plan II
O-RESS	Offshore Renewable Electricity Support Scheme
NMFP	National Marine Planning Framework
PfG	Programme for Government
POC	Port of Cork
Ro-Ro	Roll-on/roll-off (Platform Ramp)
SEAI	Sustainable Energy Authority of Ireland
SFPC	Shannon Foynes Port Company
SPMT	Self-Propelled Modular Transport
SONI	System Operator for Northern Ireland
STEM	Science Technology Engineering & Mathematics
TEN-T	Trans-European Transport Network
WEI	Wind Energy Ireland
WTG	Wind Turbine Generator

Executive Summary

There is vast potential for the development of offshore wind in Ireland, with the sea area equivalent to seven times the land mass [1]. Despite this, the offshore wind sector has been slow to materialise with only one wind farm, the Arklow Bank Wind Park Phase 1, currently operational. Offshore Wind development was previously impeded by significant legislative and consenting hurdles, in addition to constraints with the existing grid infrastructure. The Climate Action Plan 2021, published by the Irish Government, stated a target for 80% of electricity to be generated by renewables by 2030, with 5 GW attributable to offshore wind. The target was recently increased to 7 GW as part of the agreement on Sectoral Emissions Ceilings, with the CAP to be updated later in 2022 to reflect the changes [2]. These recent green energy targets will act as a stimulus for the development of the offshore wind industry in Ireland. The positive changes to the legislative system for consenting introduced by the signing into law of the MAP Act (Maritime Area Planning) and likely improvements to the grid infrastructure in Ireland will support the aspirations of the Climate Action Plan. The targets have been recognised across the energy sector with a significant number of offshore wind projects planned in Irish waters.

With the offshore wind industry in Ireland gaining momentum, consideration is needed for the practical aspects of how these large-scale offshore installations will be delivered. Port infrastructure is widely recognised as an area requiring attention. Ports and suitable port infrastructure are key to the successful delivery of offshore wind projects, with all turbine components and foundations transported through these gateways. Port locations serve as a link between marine and landside activities and often become a hub for supply chain activity. Whilst it is well recognised that ports perform several critical functions within the offshore wind industry, there is a significant lack of suitable port infrastructure across Europe and particularly within Ireland at present.

The purpose of this document is to provide a synthesis of Irish port infrastructure, with a focus on those ports that are suitable, or have the potential to be made suitable, to support the marshalling of offshore renewable energy projects. Ports across the entire island of Ireland were considered (Republic of Ireland and Northern Ireland). The study considered the existing infrastructure and the gaps which need to be addressed to ensure Ireland can deliver the projects required under the Climate Action Plan and the Programme for Government.

The port study has been completed by Gavin & Doherty Geosolutions (GDG) on behalf of Wind Energy Ireland (WEI). The study has been funded by an advisory group made up of the following organisations: Belfast Harbour, DP Energy, ESB, Inis Offshore Wind, Ocean Winds, Ørsted, RWE Renewables and Source Energie. The involvement of the wider group has allowed for engagement and collaboration between GDG as consultants undertaking the study, several established offshore developers and an active port operator with experience of hosting staging and marshalling activities.

The scope of the work addresses infrastructure requirements for the facilitation of port staging and marshalling facilities and assesses suitability for both fixed and floating wind.

Locations Considered

The following locations were considered within the study and have been assessed on the basis of the existing and proposed infrastructure.

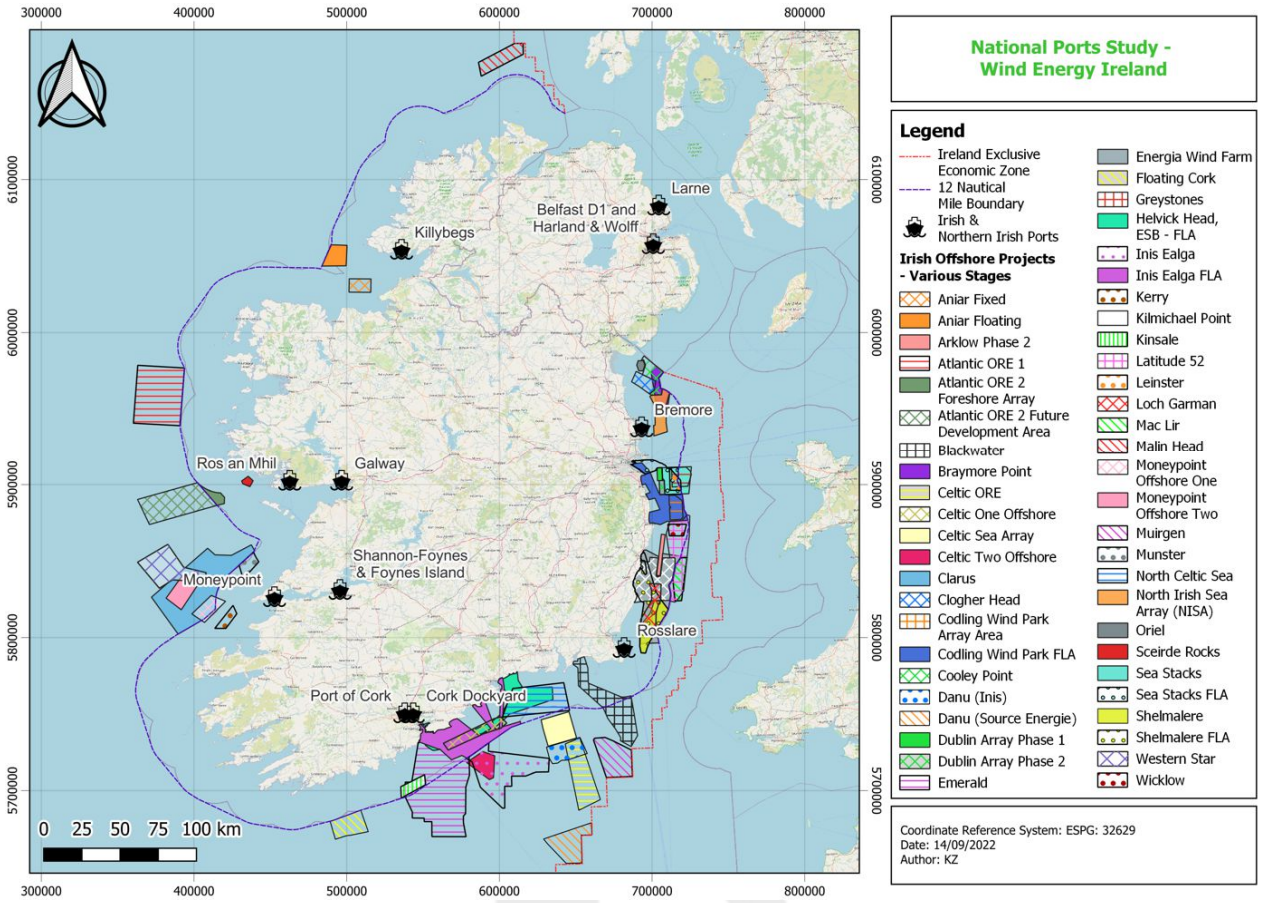


Figure 0-1: Ports Considered Relative to Proposed Irish Projects

Conclusions

The following conclusions were deduced on completion of the assessment:

1. Belfast Harbour's D1 facility is the only existing facility which can accommodate staging and marshalling of fixed-bottom projects of the scale anticipated.
2. Port of Cork's Ringaskiddy has potential to serve as a staging port for either foundations or turbines (but not both) but is restricted by loading capacities. Port of Cork have indicated that infrastructure plans targeting the ORE industry will be detailed within the 2022 Masterplan due for release later this year. Additional infrastructure would improve the already considerable facilities at Ringaskiddy and reduce the potential competition for use of the terminal.
3. Harland & Wolff and Larne appear to have some suitability to serve as staging ports, however this is largely dependent upon vessel selection due to limitations on draft and quay length respectively.
4. There are no existing facilities suitable to allow for manufacture and staging of floating wind projects in Ireland. D1 and Harland & Wolff at present could potentially offer assembly of modular

floating units but are restricted for turbine staging due to air draft constraints and limited wet storage potential. The reduced draft within the Harland & Wolff Building Dock and approach would also limit the suitability of the facility to be used for turbine mating.

5. Several new facilities will be required to meet the demand on staging ports (in addition to the suitable facilities at D1) given that several projects may be under construction simultaneously. This considers the near future 2030 target and the 2050 Net Zero ambitions. Without investment in Irish port infrastructure, offshore projects in Ireland will likely be serviced from UK or European ports.
6. Several ports have indicated development plans suitable to accommodate the deployment of fixed-bottom installations. Locations which have plans suitable for fixed-bottom installation are: Bremore, Cork Dockyard, Moneypoint, Rosslare and SFPC Foynes Island.
7. Several ports have indicated development plans suitable to accommodate the manufacture, assembly and staging of floating installations. Moneypoint and SFPC Foynes Island have the potential to accommodate manufacture (depending upon final footprint), assembly and staging. With Cork Dockyard's plans suitable for staging of most types of substructure, wet storage may be an issue if proposed at Bantry Bay given the significant tow distance. The wet storage areas proposed by Cork Dockyard would likely be suitable for steel substructures only given the water depths. The locations most suitable for floating wind are located on the west and south coast.
8. The indicative timescales indicated for port infrastructure development are in some cases quite ambitious. Consenting and planning phases of the marine infrastructure proposals will be of critical importance to the timely delivery of operational port facilities.
9. The local supply chain will require development if the several new port facilities materialise, particularly when considering floating wind. The identification of several suitable port infrastructure proposals around the coast could provide a significant level of regional development if the plans are realised.
10. Significant investment is required for ports to realise the development plans proposed, with all the large-scale redevelopment plans indicating cost estimates north of €100 million. With several locations relying on CEF funding to support the developments and considering the responses to the first round of applications, funding will likely be critical to the successful delivery of the development plans considered.

Key Recommendations

Considering the conclusions of the assessment, the following points are made as recommendations for the successful delivery of the required port infrastructure. Where recommendations require action from a certain body or organisation, the relevant organisation has been identified:

Table 0-1: Summary of National Port Study Recommendations

Item	Recommendation	Reasoning & Details of Proposed Action	Government Body or Organisation
1.	Irish Government support for port locations pursuing development plans to serve the Irish ORE market, potentially including State funding.	Active support from the Irish Government would serve to help de-risk the level of upfront investment for port authorities and plug any funding gaps which may exist. Government led support could be in the form of direct funding from the exchequer, a low interest loan scheme or access to funding vehicles such as the ISIF (Ireland Strategic Investment Fund) and EIB (European Investment Bank).	**Department of Transport, Department for Public Expenditure and Reform.**
2.	Clarity on timescales and processes for key milestone events and decisions (O-RESS, GCA, etc) from Government level.	Clarity on timescales and processes would provide assurance to both developers and port authorities that timescales being pursued are sensible. This would provide clarity and add confidence to the commercial viability of port infrastructure plans.	**Department of the Environment, Climate and Communications.**
3.	Accelerated publication of key Government strategy documents outlining the roadmap beyond 2030 and toward the Net Zero goal of 2050.	At present there is significant emphasis on the near future 2030 goals and the fixed-bottom opportunity. It is less clear how the 2050 Net Zero goal will be reached and what this may mean in terms of volumes of offshore wind and other related activities. Additional clarity on the route beyond 2030 will facilitate planning for the required level of infrastructure and strengthen the case for port development.	**Department of the Environment, Climate and Communications.**
4.	Continued engagement between developers, statutory authorities, port authorities and other relevant stakeholders.	Facilitation of continued dialogue between developers, statutory authorities, port authorities and other relevant stakeholders will ensure all parties are aware of the current state of play. To facilitate this, it would be proposed that the port co-ordination group is expanded to include industry personnel and port authorities seeking to serve the offshore wind market.	**Department of Transport.**
5.	Encouragement for collaboration between ports to ensure successful delivery of Irish Projects.	Given the likelihood that multiple Phase 1 and Phase 2 projects might be under construction at the same time, smaller ports should be encouraged to co-operate and work together to compete for the opportunity to provide construction services. To aid in encouraging collaboration, it would be proposed that an Irish port platform is established for ports seeking to serve the ORE sector in Ireland. Such a grouping would allow for knowledge transfer between port locations and provide a platform for discussion of challenges and opportunities.	**Wind Energy Ireland.**

6.	Properly resource the planning system and prioritise applications from ports for ORE related infrastructure.	Government commitment to a streamlined consenting and planning system will ensure delays to decision making periods do not detrimentally impact project programmes and completion dates for port facilities. It is proposed that the Department for Housing, Local Government and Heritage prioritise foreshore licence applications from ports targeting the ORE sector (in addition to applications from developers). This would aid in the timely delivery of operational facilities. Additionally, increased levels of resourcing for the Department for Housing, Local Government and Heritage and ABP would help to alleviate the delays which have been seen previously, largely attributed to staffing issues. Given the national importance of the climate targets, it would be further suggested that the Minister for Housing, Local Government and Heritage instruct ABP to prioritise planning applications from port locations seeking to accommodate the ORE industry.	**Department for Housing, Local Government and Heritage, An Bord Pleanála.**
7.	Supply chain support to ensure Ireland can service as much of the industry as possible.	Significant work has already been done by Enterprise Ireland with the formation of offshore specific clusters. It is recommended that this is continued with engagement between clusters and working groups encouraged to allow for identification of opportunities and synergies. Government support is recommended to allow new players to enter the market (through grants supporting new technologies or training, or creation of ORE local enterprise zones). Government promotion and incentivisation of STEM careers is also suggested to help address the skills gap.	**Enterprise Ireland and the Department of Enterprise, Trade and Employment, Department of Further and Higher Education.**
8.	Support for research & development, particularly within the floating wind sector.	Government support for research & development is recommended to aid the development of an Irish supply chain. Particularly for the emerging floating wind sector which will be critical for reaching the 2050 Net Zero ambitions and could make a significant contribution to our 2030 targets. Continued research and development will ensure commercial scale deployment is viable and provide certainty for ports pursuing floating wind specific infrastructure. Funding and support for the research and development phase will help to refine much of the fledging technology required for floating wind.	**Enterprise Ireland and the Department of Enterprise, Trade and Employment.**

1 Introduction

The offshore wind sector in Ireland is starting to gain increased momentum with the Maritime Area Planning (MAP) Act signed into law on 23 December 2021 and the Department of Environment, Climate and Communications (DECC) publishing the timeline for the first Offshore RESS (O-RESS) auction with a revised date of April 2023. These major milestones provide a consenting framework and route-to-market for the first round of offshore wind projects. With consultation recently concluded for defining the Phase 2 project strategy, the wider industry can see a pathway to achieving the updated offshore wind target of at least 7 GW of offshore wind energy by 2030.

Attention is urgently needed on the practical aspects of how these projects will be delivered. Port infrastructure remains an area of concern. To achieve Ireland's ambitious offshore wind targets it will be necessary to build multiple projects simultaneously and there is simply insufficient port infrastructure currently available to facilitate this.

Ports can serve as a hub for suppliers to congregate and can act as a catalyst for upskilling and upscaling of maritime businesses to become key suppliers to the offshore wind sector. The positive impact of dedicated ORE Ports on growing the supply-chain has been seen in many mature offshore wind markets (eg. Esjberg in Denmark and the Port of Nigg in Scotland). To facilitate port upgrades around the country, the status of the existing infrastructure needs to be established and the potential for this infrastructure to service the offshore wind sector understood.

The purpose of this document is to provide an assessment of Irish ports suitable, or with the potential to be made suitable, to support the construction of offshore wind projects. The study will consider the existing infrastructure as it stands and the gaps which need to be addressed to ensure Ireland can deliver the projects required under the Climate Action Plan and the Programme for Government. The study and reporting considers the infrastructure requirements for the facilitation of port staging and marshalling facilities and assesses suitability for both fixed and floating wind.

The port study has been completed by Gavin & Doherty Geosolutions on behalf of Wind Energy Ireland (WEI). The study has been funded by an advisory group made up of the following organisations: Belfast Harbour, DP Energy, ESB, Inis Offshore Wind, Ocean Winds, Ørsted, RWE Renewables and Source Energie. The involvement of the wider group has allowed for engagement and collaboration between GDG as consultants undertaking the study, several established offshore developers and an active port operator with experience of hosting staging and marshalling activities. For the purposes of this report, the wider funding group will be considered as the Port Study Advisory Group.

1.1 Context of the Assessment

Several studies have been completed over the past number of years focusing on the adequacy of Irish port infrastructure to support the marine renewable energy sector. These include the IPORES reports completed in 2012 and 2018 by the IMDO, three studies commissioned by the SEAI and the 2020 Carbon Trust Report. The most recent study, completed by the Carbon Trust [3], focused on the supply chain and potential opportunities presented by the offshore industry in Ireland [4]. Whilst the study predominantly focused on the economic potential of offshore wind in Ireland, the report included a substantial section focusing on the existing port infrastructure in Ireland to support the industry. The

context of this report was against a Programme for Government commitment at that time to deliver 3.5 GW of fixed offshore wind by 2030. As a result, the Carbon Trust study focused on the near-term opportunity for fixed-bottom wind on the east coast and did not consider Phase 2 projects. The reporting did not focus on the potential for floating and fixed-bottom projects off the south and west coasts.

The ambitions of Ireland as a nation have evolved considerably since the previous studies were completed. The 2021 Climate Action Plan committed to at least 5 GW of offshore wind generation by 2030 [5]. In July of 2022, the target 5 GW was revised to 7 GW as part of the setting of sectoral emission targets, with the Climate Action Plan set to be updated to reflect the changes in late 2022 [2]. The Programme for Government contains a much more ambitious target set for long-term development of the floating wind opportunity in the Atlantic (> 30 GW). Consequently, it is necessary to provide an up-to-date assessment to address the larger opportunity and associated challenges. The overarching goal of both the Climate Action Plan and Programme for Government is to reach net-zero carbon emissions by 2050.

The need for port infrastructure upgrades is becoming acutely recognised across all sectors. This is reflected in a revised policy statement released on 20 December 2021 by the Department of Transport setting out the strategy for commercial ports to facilitate offshore renewable energy activity in the seas around Ireland [6].

The key conclusion from this policy statement was a recognition that significant upgrades at multiple ports will be required to meet the long-term demands of the emerging offshore wind industry in Ireland. The policy indicated that the Irish Government will wholly support this by endorsing applications for European funding (eg. Connecting Europe Facility (CEF) funding) [6]. A recognition that separate facilities with differing infrastructure requirements are likely needed to service the fixed and floating market is a welcome addition to the policy statement. An understanding of the differing challenges posed by floating wind indicates a long-term commitment from the Department of Transport to look beyond the immediate fixed-bottom opportunity.

As part of the revised policy statement, the Department of Transport has established a ports Co-ordination Group to maintain policy alignment. Members of the group include representatives of the ports and terminal operators, officials from the departments of Transport, of Environment, Climate and Communications, of Housing, Local Government and Heritage, and of the IMDO. The terms of reference also provide that the group, where appropriate, can invite other agencies, departments or stakeholder to attend meetings and present to the Group [7]. At present, the ports co-ordination group does not include industry members.

The impact of port upgrades on maximising “the economic benefits at both regional and national level in terms of job creation and new SME enterprises in areas such as engineering, fabrication, transport and logistics, and other technologies” [7] is also welcome.

Given the shift in port policy and the commitment from the Government to support port facilities in meeting the needs of the ORE industry, it is essential that the industry is clear on what infrastructure currently exists. This study will benchmark the existing infrastructure facilities and assess the capabilities to support fixed and floating wind construction activities. The report will also consider

development plans where proposed and review the suitability of such plans to accommodate ORE requirements.

1.2 Objectives

The objectives of the National Port Study (2022) and reporting are outlined below:

- Establish the requirements from industry, at each stage of project development, for port infrastructure to enable fixed-bottom and floating wind projects to be developed from Irish ports;
- Develop a comprehensive overview of the current infrastructure available at each of the ports around the country identified as capable of providing marshalling/installation/staging services (fixed-bottom) and manufacture/assembly/staging (floating) to the offshore wind sector;
- Provide an overview of any development plans for infrastructure upgrades to accommodate the emerging Irish ORE market including a realistic assessment of deliverability considering the timelines for the Irish planning system, and anticipated Phase 1 and 2 Project timescales;
- Complete an assessment of the available and proposed infrastructure in relation to the benchmark requirements for both fixed and floating offshore wind as per the research completed and consultations with the ORE industry;
- Deliver a set of conclusions and recommendations based on the study findings.

1.3 Report Scope

This report provides an overview of the existing port infrastructure facilities in Ireland (Northern Ireland and the Republic of Ireland) and assesses the 'readiness' of the present facilities to support construction of offshore wind construction (both fixed and floating). The study will also seek to understand any proposed redevelopment plans which may be targeting the offshore wind sector in relation to staging and marshalling (and manufacture/assembly for floating wind).

The report focuses on the provision of staging and marshalling facilities for both fixed and floating offshore wind, this study does not consider port infrastructure facilities in the context of accommodating survey vessels, operations & maintenance activities, or decommissioning. Whilst it is entirely feasible that Irish and Celtic Sea projects may be marshalled from the UK or Europe, this study will only consider port locations and infrastructure across the island of Ireland.

The study is effectively a snapshot in time, current as of September 2022, and has sought to capture and assess the available and potential infrastructure currently understood. It is anticipated that further port development plans will emerge in the coming months and years as the offshore wind sector continues to gain momentum.

2 Overview of Industry

Offshore wind in Europe has steadily grown over the past 20 years with 3.3 GW installed across 8 wind farms in 2021, with the UK providing 70% of the total [8]. A further 5 wind farms will be operational by the close of 2023 across Italy, Germany, France, the UK and the Netherlands with a total of 312 turbines proposed to be installed. The annual and cumulative installed capacity from offshore wind since 2011 up to 2021 can be seen illustrated in Figure 2-1. The total installed turbine capacity across Europe as of 2021 is 28.3 GW across 12 countries. This is predominantly fixed-bottom installations with some small-scale demonstration floating wind projects contributing to the overall total. The contribution from Irish offshore wind is virtually negligible with only the 25 MW Arklow Bank Phase 1 operational at present.

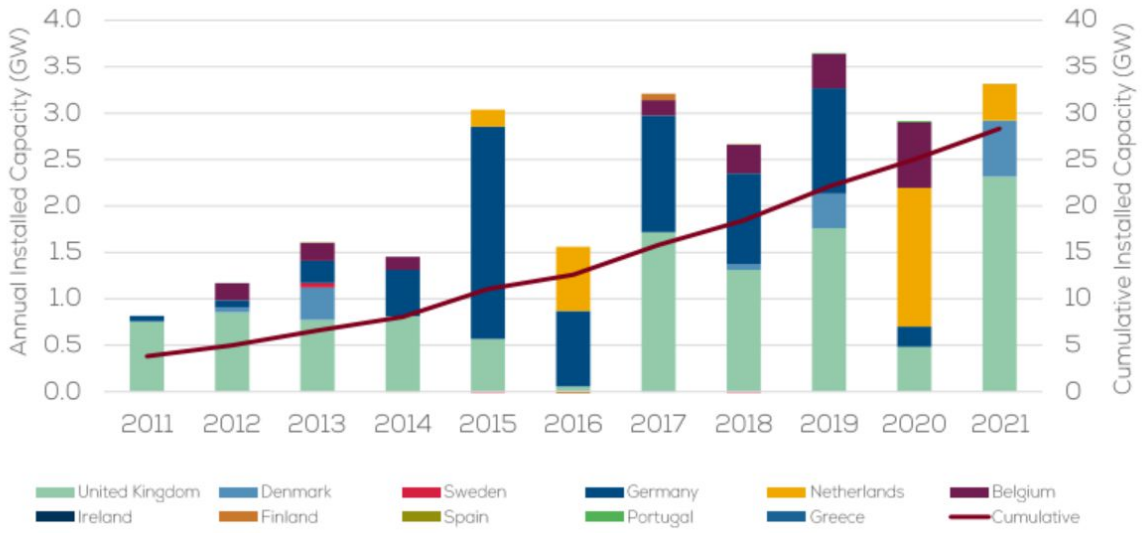


Figure 2-1: Installed Capacity Across Europe 2011-2021 [8]

The deployment of offshore wind in Europe is set to increase significantly, the 2020 European Commission's Green Deal initially set a 40% target for renewable energy sources to be delivered by 2030. With the war in Ukraine highlighting the dependence of Europe on Russian gas imports, the REPowerEU (2022) document upped the renewable energy target from 40% to 45% with the intention of reducing the reliance on external energy resources [9]. In tandem with the wider ambitions of Europe, the 2022 Esbjerg Declaration provided a commitment from Germany, Denmark, the Netherlands, and Belgium to provide 65 GW of wind power by 2030, and at least 150 GW by 2050 [10]. Large scale offshore wind deployment is anticipated across Europe in working toward these goals. The Irish Programme for Government recognises a commitment to the targets of the European Union and has set-out major renewable energy milestones aligning with the ambitions of the EU. However, with so little offshore wind development in Ireland to date, significant action is required to establish the offshore wind sector in Ireland in the timescales required.

In addition to the fixed-bottom opportunity, the Climate Action Plan highlights the extensive natural resource in Irish waters for floating wind. Ireland has an opportunity to become an industry leader in this technology with potential for 30 GW in the deeper waters of the Atlantic [5].

Europe has 113 MW of floating wind capacity with several key floating projects including TetraSpar, WindFloat, Kindcardine and PivotBuoy. The industry is very much in its infancy and will continue to develop and evolve from lessons learned during these initial ventures. Significant investment in research and development is anticipated to understand the viability of floating wind in Irish waters, and to determine the most suitable foundation types for various conditions. This also represents an opportunity for Irish research and testing facilities to become involved and contribute, with port locations in proximity to research institutions at a potentially advantageous position. The manufacture and assembly of floating substructures also offers a significant supply chain opportunity in Ireland with potentially far-reaching benefit to the local economy.

2.1 Fixed-Bottom Foundation Variation

The fixed-bottom industry is particularly well established with three typical foundation types common. The variation in the footprint of the various types of structures will impact the degree of laydown area required for staging purposes, in addition to the requirements for craneage, load bearing capacity at the quayside and laydown area.

The typical fixed-bottom foundations will fall into three categories with design variations to suit site conditions, these are outlined below:

1. Monopile (or tripod monopile) – Turbines are supported on a single steel tubular pile, these are often only suitable where water depths are relatively shallow (≤ 25m). With the introduction of a tripod frame, the foundation can be suitable for water depths up to 35m. An example of monopile storage in port is illustrated in Figure 2-2.

Figure 2-2: Monopile Foundations for West of Duddon Sands Offshore Wind Farm at Belfast, D1

2. Gravity Base Structure (GBS) – These foundation type will often be of concrete construction, either mass concrete, or precast and ballasted with sand, gravel, or water. Gravity bases are suitable typically in water 30m depth and less. These require some preparation of the seabed prior to installation to ensure a stable surface for the structure. Port of Blyth has handled gravity foundations for the Blyth offshore wind farm project, as shown in Figure 2-3.

Figure 2-3: Gravity Foundations for Blyth Offshore Wind Farm [11]

3. Jacket – Turbines are supported on steel frame type structures, like what has been employed in fixed oil and gas installations in the past. An example of jacket foundations for the Wikinger Offshore Wind Farm is shown in Figure 2-4. These are typically employed in water depths greater than 35m. [12]

Figure 2-4: Jacket Structures for the Wikinger Offshore Wind Farm [12]

In addition to water depth, the choice of foundation and final design will be dictated by further constraints such as ground conditions, metocean conditions, seabed topography, transport considerations and available quayside craneages.

2.2 Floating Wind Foundation Variation

As per the fixed-bottom foundations, the nature of the floating substructure will impact the portside requirements in relation to manufacture, assembly and staging (fit-out) for floating structures.

Floating substructures could mainly be categorised as ballast stabilisation, buoyancy stabilisation, and mooring stabilisation, with four main types falling into these categories. The typical substructure foundations are shown in Figure 2-5 [13], with most floating wind types based on well-established oil and gas technologies.

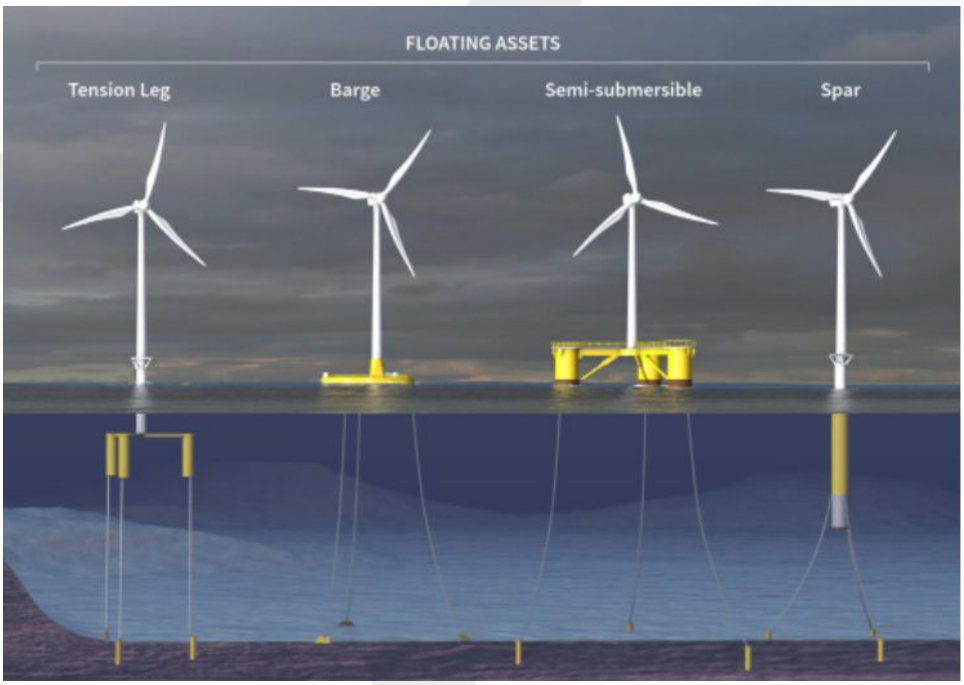


Figure 2-5: Typical Floating Substructure Types [14]

1. Spar – Spar type substructures have a long cylindrical framework (high draft) containing ballast to stabilise the structure. The cylindrical framework is fabricated from steel or concrete. Spar substructures typically have draft greater than 80m depending on the turbine rating power. The floater is usually connected to the sea bottom through catenary mooring lines [15]. The final assembly of these floaters is usually completed offshore (near-shore or at the installation site) due to the deep-water requirements.
2. Semi-submersible – These substructures are typically constructed through fabrication of three triangulated columns braced to form the foundation. These can be fabricated with either steel or concrete. Heave plates are common with this type of design to reduce motions [13]. Due to the relatively low draft of the substructures, turbine assembly operation is usually completed at the quayside. The assembled device is subsequently towed to the installation site by tugboats.
3. Barge – Barge type foundations are similar to semi-submersible in technology and design but with typically lower draft requirements. The barge substructures comprise either a steel or concrete

hull with the turbine typically installed on one corner of the structure. As per the semi-submersible types, and given the shallower draft, topside mating is suitable to be undertaken at the fit-out/staging quayside. Barge type substructures typically have the greatest motions under environmental loading of the four foundation types [16].

4. TLP – Tension Leg Platform type floaters are the least developed of all the floating wind substructure types, with significant research and development currently ongoing to advance the technology. TLPs are stabilised by a combination of mooring setup and buoyancy forces. The principle of the TLP is that it has higher buoyancy than mass, causing an upwards force that pins the structure upward. This force is balanced by mooring lines that are always in tension, stabilizing the structure. This mooring system comprises high axial strength tendons which serve to reduce motions making the floater more akin to a fixed structure [17].

Figure 2-6: WindFloat Atlantic in Portugal with Semi-Submersible unit at Quayside in Ferrol, Spain [18]

Figure 2-7: Floatgen Demonstrator with Barge unit at Quayside in Saint-Nazaire [19]

Table 2-1: Typical Draft Requirements at Staging Quay for Various Substructures [16]

Floating Offshore Wind Turbines (FOWT) Type	Staging quay Draft range	Substructure construction material
Barge	6m -8m	Steel
Barge	10m -12m	Concrete
Semi Sub.	10m -12m	Steel
Semi Sub.	12m – 15m	Concrete
Spar	70m	Steel
Spar	80m	Concrete
Tension leg platform (TLP)	10m -12m	Steel
Multi turbine	10m -12m	Steel

Whilst there are four main foundation types, the semi-submersible is the most advanced in terms of deployment to date and maturity of technology. It is considered most likely that semi-submersible foundations will be deployed in Ireland first given the advancement of the technology and the technical capabilities in relation to the anticipated conditions. Whilst typical quayside draft requirements are outlined in Table 2-1, degrees of variation are present for the types of substructures currently available to the market.

2.3 Turbine Evolution

Since the first offshore wind farms became operational in the early 2000s, turbine sizes have steadily increased with several manufacturers now providing turbines in the 14-16 MW capacity range. The drive to provide even larger and more efficient turbines seems likely to continue. There have been significant developments in both turbine and foundation technology in the past 15 years, with orders placed in 2021 for WTG units of rotor diameter up to 222m [8]. With increased turbine size, foundations are required to resist increased loading, with larger monopiles and more robust jacket structures needed for modern installations. The turbines anticipated for deployment in the Irish Phase 1 & 2 projects are anticipated to be 15 MW as a minimum.

The increase in turbines size and efficiency has led to significant reduction in the Levilised Cost of Energy (LCOE), with the cost £44/megawatt-hour (MWh) for fixed projects in 2023 reducing from £167/ megawatt-hour (MWh) in 2017 [20]. Whilst the upscaling of turbines has proven economically beneficial, this presents a challenge for the port infrastructure which will support offshore wind construction. The ever-growing turbine and foundation components will require significant landside areas to allow for marshalling, in addition to heavy-duty quayside and landside bearing capacities. Heavy lift crane availability at the port locations will also be required. The ever-growing turbines and foundations also pose a challenge for the vessel supply chain, with very few vessels available on the market to cater for the increasing size and weight of turbine elements. In 2022, WindEurope outlined that by 2024-25 the demand for installation and cable laying vessels will outstrip the supply for offshore wind construction. This limitation has the potential to negatively impact the pace and scale of offshore wind deployment worldwide [21].

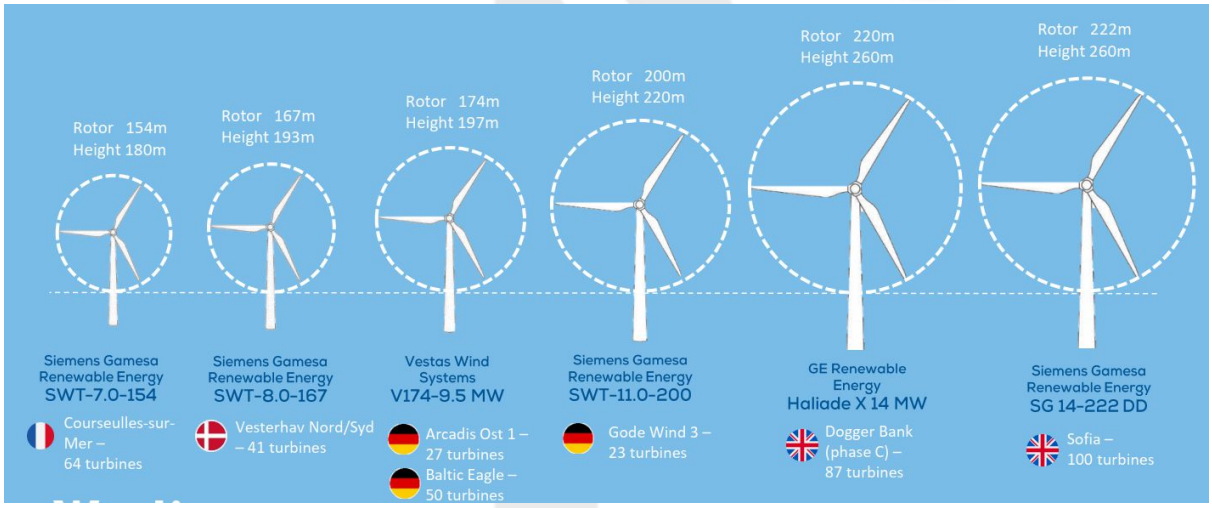


Figure 2-8: Turbine Sizes ordered in 2021 outlined by WindEurope [8]

In the context of port requirements, it is useful to consider the typical dimensions of the major wind turbine components anticipated for deployment in Irish projects. The following tables outline typical dimensions for turbines and foundations for the scale of installations anticipated. Whilst foundations for both fixed-bottom and floating vary, dimensions have been included for a typical monopile foundation for a fixed-bottom turbine, and for a typical semi-submersible floating substructure. Mooring chain details have also been included for reference.

Table 2-2: Typical Turbine Component Dimensions (15 MW)

Parameter	Value
Rotor diameter [m]	240
Blade length [m]	115
Blade mass [t]	65
Blade root diameter [m]	6
Nacelle height [m]	10
Nacelle width [m]	10
Nacelle length [m]	20
Nacelle mass [t]	650
Tower height [m]	120
Tower diameter at the base [m]	8
Tower mass [t]	1,000

Table 2-3: Typical Monopile Foundation Dimensions (supporting 15 MW turbine)

Parameter	Value
Monopile total length [m]	100
Monopile diameter [m]	10
Monopile mass [t]	1,400

Table 2-4: Typical Semi-submersible Substructures Dimension (supporting 15 MW turbine)

Parameter	Value (steel)	Value (concrete)
Substructure beam/width [m]	100	100
Substructure height [m]	25	25
Substructure port draft [m]	9	15
Substructure operating draft [m]	13	22
Substructure mass [t]	4,500	13,000

Table 2-5: Typical Mooring Chain Dimension (for substructure supporting 15 MW turbine)

Parameter	Value
Mooring lines per FOWT	4-6
Mooring line length/water depth [m/m]	6
Mooring chain weight [t/m]	0.5

2.4 Vessels for Component Transfer and Construction

In addition to providing an overview of the scale of major components, it is useful to consider the vessels anticipated to support deployment and construction of offshore wind farms. The vessels required to support the construction and installation phase of the projects will have a direct impact on the port infrastructure required for a staging location.

2.5 Fixed-Bottom

The key vessels used for the construction of fixed-bottom offshore wind can be divided into the following categories, with examples given to demonstrate the typical vessel dimensions staging ports will be required to accommodate:

Table 2-6: Key Vessels for Fixed-Bottom Installation [22]

Vessel Category	Activities	Vessel Type	Typical Vessel Particulars
Component Transfer Vessel	Transport of turbine and foundation elements to staging port from manufacturing location, also often used to transport components from manufacturing or staging facility to installation site.	Barges, coasters or heavy lift vessels	Beam = 20.00m Length Overall = 118.00m Draft = 7.25m *MV Palessa*
Turbine and Foundation Installation Vessel (WTIV & FIV)	Transport of turbines from staging port to installation site and used to complete turbine foundation and turbine installation.	Self-propelled jack-up barge, heavy lift vessel	Beam = 49.00m Length Overall = 231.00m Draft = 10.00m *Boskalis Bokalift 2*
Construction Support Vessels (CSV)	CSV vessels typically have heavy lift crane capacity and support surface and subsea (underwater) installations and inspection, repair, and maintenance.	Multi-purpose offshore vessel	Beam = 27.00m Length Overall = 140.00m Draft = 6.85m *Boskalis Boka Ocean*
Cable Installation Vessels (CIV)	Cable Installation Vessels are often loaded at cable manufacturing ports and directly transferred to the offshore site. Consequently, there is no requirement for the staging port to accommodate these types of vessels. Modern cable installation vessels undertake multiple activities including trenching, cable laying and burial, and rock dumping.	Specialist cable installation vessels	Beam = 32.00m Length Overall = 138.00m Draft = 7.30m *Jan de Nul Isaac Newton*

For Irish projects it is anticipated the turbines elements will be manufactured in the UK or Europe prior to be transported to the staging and marshalling facilities. The foundations will also likely be fabricated in Europe or further afield and transported to the marshalling site. Component transfer vessels are responsible for transfer of components from manufacturing facilities to staging ports where components are stockpiled for final deployment.

2.6 Floating

The floating wind vessels anticipated for commercial scale deployment differ from those required for fixed-bottom, with the exact nature of the requirements depending upon the substructure manufacture location. The typical categories of vessel used for the installation of floating turbines are as follows:

Table 2-7: Key Vessels for Floating Installation [23]

Vessel Category	Activities	Vessel Type	Typical Vessel Particulars
Component Transfer Vessel	Transport of turbine components to the staging port from manufacturing location, transport of mooring equipment to installation site from manufacturing location or to an intermediate staging port.	Barges, coasters or heavy lift vessels	Beam = 20.00m Length Overall = 118.00m Draft = 7.25m *MV Palessa*
Heavy Lift	Transport of modular substructure elements or fully assembled substructures to either assembly or staging ports. Given significant submerged draft, fully assembled substructures may need to be floated-off in deep water and towed either into the staging port or to wet storage facilities.	Heavy transport semi-submersible vessel	Beam = 78.75m Length Overall = 275.00m Draft (summer) = 10.94m Draft (submerged) = 31.00m *Boskalis Boka Vanguard*
Anchor Handling Tug Supply Vessel (AHTS)	Used for towing fully assembled units from deeper water into staging ports, and for towing fully assembled units from the staging port to the installation site. Vessels also used for the installation of mooring equipment for floaters.	Specialist anchor handling tug	Beam = 18.50m Length Overall = 77.0m Draft = 7.00m *AHTS Bourbon Orca*
Tug vessels	Used alongside AHTS in towing of fully assembled units to ensure motions are limited during transit.	Tug vessel	Beam = 12.03m Length Overall = 22.8m Draft = 5.50m *DAMEN AD Tug 2312*
Construction Support Vessels (CSV)	CSV vessels typically have heavy lift crane capacity and support surface and subsea (underwater) installations and inspection, repair, and maintenance.	Multi-purpose offshore vessel	Beam = 27.00m Length Overall = 140.00m Draft = 6.85m *Boskalis Boka Ocean*
Cable Installation Vessels (CIV)	Floating wind turbines will require dynamic cables to support export as opposed to the typical buried cables associated with fixed-bottom installations. It is anticipated that cables will be transferred directly to the installation site, and as such there is no requirement for the staging port to accommodate these types of vessels.	Specialist cable installation vessels	Beam = 32.00m Length Overall = 138.00m Draft = 7.30m *Jan de Nul Isaac Newton*

Table 2-7 relates to the installation of semi-submersible substructure types given these are the most likely to be deployed in Irish waters.

3 Offshore Wind in Ireland

A large degree of fixed offshore wind development has occurred over the past 20 years. The UK has established itself as an industry leader having deployed over 2,000 turbines along the UK continental shelf. Whilst the UK has successfully forged on, Ireland has severely lagged with only one operational wind farm, Arklow Bank Wind Park Phase 1, currently completed. Development in Ireland has been hindered by legislative and consenting difficulties, in addition to limitations of the current grid to support significant new connections. However, with recent green energy targets outlined by the Irish Government, the development of offshore wind in Ireland has become a priority. Additionally, positive changes to the legislative system for consenting and likely improvements to the electrical infrastructure in Ireland will remove the previous barriers to development.

In addition to the positive changes to the consenting process in Ireland, recent developments across the EU have recognised the critical nature of planning approvals for successful delivery of offshore wind across Europe. In June 2022, EU ministers agreed on a revision of the Renewable Energy Directive (RED) and Energy Efficiency Directive (EED). The revised directive takes cognisance of the vulnerability of Europe's current energy supply to external events, with the war in Ukraine bringing this into sharp focus. The growth of the offshore and renewables sector has been deemed a matter of "overarching public interest" and "public safety". Commitment has been made to ensure all new wind farms will be permitted in a maximum of two years [24]. The streamlining of the permitting process will serve to accelerate the deployment of home-grown renewable energy across the EU providing energy security for the future.

It is anticipated that given the proximity of the 2030 date, the majority of the 7 GW target will be provided through the well-established technologies of fixed-bottom turbines. With the construction stages of Phase 1 projects anticipated to begin around 2027, several projects will be required to be under construction simultaneously if the 2030 target is to be met. Given the west coast and southwest coast sites are proposed in relatively (>60m) deep waters, floating wind solutions are generally required to harness the offshore potential in these locations. Further research and development of floating wind technologies will be required in the coming years to allow for deployment of this technology. Floating wind comes with additional challenges, in particular relating to port facilities. Floating substructures will typically demand deeper water (draft) at port quaysides. In addition to quayside draft, wet storage areas will be needed at turbine staging ports to allow for units to be safely stored pre and post turbine mating.

Beyond the 2030 targets, the contribution of floating offshore wind required to reach Net Zero by 2050 is estimated by ESB at circa 20 GW [25]. As per fixed-bottom deployment, if Irish port infrastructure isn't available to support floating wind construction, UK or European ports will facilitate staging of these projects. Beyond the loss of economic benefit, there is already significant demand for UK ports with offshore wind capabilities. Having to rely on congested UK port facilities could delay Irish deployment or jeopardise projects entirely. Additionally, the provision of regional port facilities will reduce the spend associated with floating wind deployment as transit times and vessel costs will be reduced, allowing for a more commercially viable levelised cost of Energy (LCOE). The facilitation of suitable regional port infrastructure to serve the floating market is critical to the successful deployment of commercial scale projects in Ireland.

Allowing for an increase in turbine size over the next number of years, 20 GW of floating wind by 2050 would equate to approximately 1,000 turbines in total. Assuming Irish floating deployment begins in 2028, this equates to approximately 50 turbines deployed per year. Taking cognisance of the suitable weather windows anticipated for deployment in the Atlantic, this deployment rate would be beyond what a single location could accommodate. Several facilities with the capabilities to serve the Irish floating market will be required to ensure the 2050 Net Zero targets can be realised. It is noted that this represents the Net Zero target for the domestic market and does not consider electricity for hydrogen export.

3.1 Planned Irish Projects

There are a significant number of projects being developed off the coast of Ireland, these are shown in Figure 3-1. It is noted that this includes the Republic of Ireland sites only.

The Phase 1 projects which will be constructed first (previously known as 'Relevant Projects') are predominantly located on the east coast, with one project located on the west coast. The Phase 1 projects were invited in Q1 of 2022 to submit MAC applications which will be assessed to meet the definition of "relevant maritime usage" under the MAP Act [26]. The Phase 1 projects have been earmarked based on a lease being applied for or granted under the Foreshore Act 1933, or those projects which were eligible to receive a valid grid connection offer in December 2019 [27].

The Phase 1 projects with the proposed capacity of each are outlined in Table 3-1. It is noted that all Phase 1 projects are fixed-bottom, with Phase 2 projects likely to encompass some level of floating deployment.

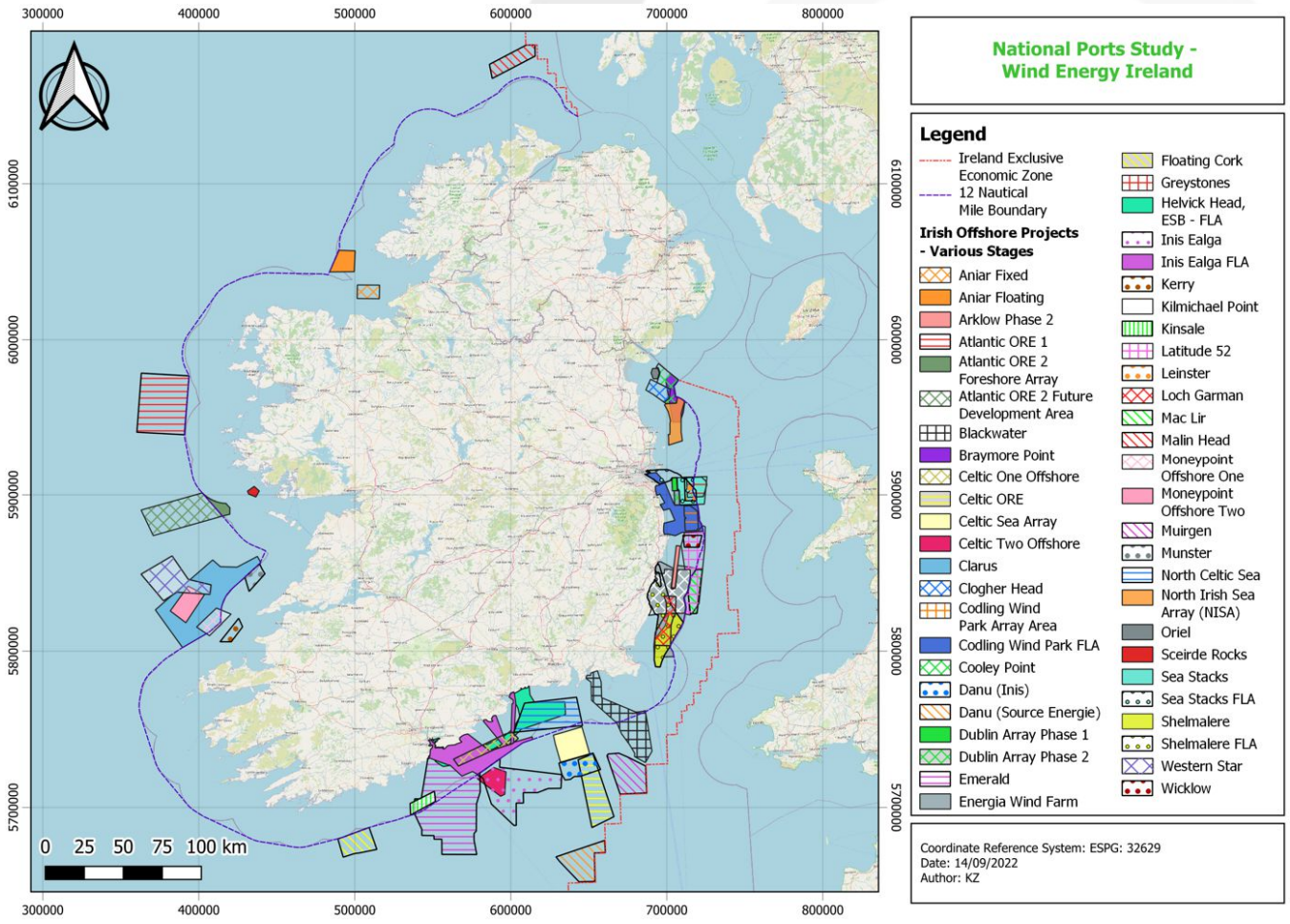


Figure 3-1: Proposed Projects in Irish Waters

Table 3-1: Phase 1 Irish Projects

Project	Capacity	Location
Oriel Windfarm	370 MW	East Coast
North Irish Sea Array (NISA)	500 MW	East Coast
Dublin Array - (Bray and Kish)	600 - 900 MW	East Coast
Codling Wind Park 1 and 2	900 - 1,500 MW	East Coast
Arklow Bank Wind Park Phase 2	800 MW	East Coast
Sceirde Rocks Wind Farm	400 MW	West Coast

3.2 Anticipated Timescales

The following high-level estimation of timelines has been completed for the proposed Phase 1 and 2 offshore wind projects. This will provide the benchmark from which development plans can be assessed for suitability to service the Phase 1 & 2 construction periods. It is noted that this is a relatively aggressive timeline and allowances have been made for potential delays during the construction period noted as +1/+2 indicating delays of 1-2 years may be possible.

The port assessment will consider the Phase 1 and 2 projects in the context of the anticipated timescales for port developments.

Table 3-2: High-Level Estimation of Timescales for Phase 1 & 2 Projects

Year No.	Year	Phase 1	Phase 2
1	2022	MAC / PA / prelim GCA	
2	2023	O-RESS 1 / PA / GCA	MAC / PA
3	2024	PP	PA / prelim GCA /O-RESS 2
4	2025	PP	O-RESS 2 / GCA / PP
5	2026	FID	PP
6	2027	CC	FID
7	2028	CC+1 / COD	CC
8	2029	CC+2 / COD +1	CC+1 / COD
9	2030	COD +2	CC+2 / COD +1
10	2031		COD +2
MAC	*Maritime Area Consent*		
PA	*Planning Application*		
O-RESS	*Offshore Renewable Electricity Support Scheme*		
GCA	*Grid Connection Assessment*		
PP	*Planning Permission (including for Judicial Review)*		
FID	*Final Investment Decision*		
CC	*Construction Commencement*		
COD	*Commercial Operation Date*		

It is anticipated that for the Phase 1 projects a preliminary Grid Connection Assessment (GCA) will be issued to projects by EirGrid prior to O-RESS 1. The preliminary GCA will set out the connection method and costs for the project, with the full connection offer completed post O-RESS 1. This is deemed the most likely scenario given the limitations on the grid connections and the relative number of O-RESS applications. The guidance document published in February of 2022 indicated that a GCA in addition to MACs are required for a project to be eligible for the O-RESS auction, however, given the grid connection constraints this seems unlikely to mean a fully approved GCA relating to a specific project [28].

4 Opportunities for Ireland

4.1 Lessons from the UK

The deployment of fixed offshore wind has been highly successful in the UK, with generation of electricity coming from offshore wind reaching 13% in 2020 [20]. Support from the UK government has been key to this achievement. During the fledgling stages of UK deployment there was focus on research and development in addition to demonstration projects. Further phases focused on commercialisation and capitalising on technological developments. The UK government ran several support schemes which served to support the development of the industry at various stages as it evolved and grew. These include the Contracts for Difference (CfD), which is still in operation today.

There has been significant partnership between the UK Government and the offshore wind sector, with the 2019 Offshore Sector Deal setting out the long-term strategy for offshore wind to become the mainstay of the UK's power generation [29]. The certainty that the Sector Deal has provided has allowed for significant investment in UK offshore wind and has championed local content to ensure as much revenue as possible stays within the UK.

The Irish market could learn from the successes of the UK sector. Similar support schemes could prove crucial to the feasibility of market development in Ireland. It is widely recognised that Irish businesses currently outside of the offshore sector will need support to become established in new markets. The introduction of supply chain support schemes could boost this potential and enhance the existing supply chain to serve the sector in Ireland. As of 2019 it was anticipated that the Irish market could support only 22% of the lifetime spend associated with 3.5 GW of offshore energy generation in Ireland [4]. With the target now increased to 7 GW, investment and Government support for the Irish supply chain is more critical than initially anticipated.

4.2 Supply Chain & Workforce

The potential benefits to Ireland from the emerging offshore industry are far reaching, with economic growth, job creation and significant community benefits all possible through development of the sector. Whilst the focus of this report is ORE staging ports, the supply chain and economic benefits extend beyond the construction phase through the life of the installation, as O&M hubs will be serviced through port infrastructure. Ports can serve as a hub for suppliers to congregate and can act as a catalyst for upskilling and upscaling of maritime businesses to become key suppliers to the offshore wind sector. The positive impact of dedicated ORE Ports on growing the supply-chain has been seen in many mature offshore wind markets in the UK and Europe. Government policies to support the supply chain can ensure a greater percentage of the required investment remains in Ireland [4]. Enterprise Ireland has understood the requirement to support the local supply chain having created a specific grouping of SMEs focusing on the offshore wind industry. To date the SME cluster has focused on the market opportunities in the UK, with a view to becoming ready for the development of offshore wind in Ireland [6]. In June 2022, Enterprise Ireland launched the Gael Offshore Network, focusing on bringing together and growing expertise in offshore wind in Ireland. The network hopes to help Irish companies capitalise on the economic opportunities offshore wind in Ireland presents [30].

In addition to the aforementioned clusters, several taskforces and working groups have emerged in recognition of the challenges the port sector and wider supply chain face. The Shannon Estuary Economic Taskforce held its first meeting in May of 2022, with the Taskforce hoping to understand and exploit the strategic strengths and advantages of the Shannon Estuary. The Taskforce has been appointed by the Irish Government and will specify the actions required to create jobs and stimulate investment in the estuary [31]. Similarly, Wind Energy Ireland have formed several working groups, including the Supply Chain Working Group developed specifically to support an Irish supply chain for the offshore wind industry.

At present it is recognised that there is a skills shortage in Ireland to provide a workforce for many of the key roles which support the offshore industry. However, there is also an opportunity to leverage the existing maritime experience in coastal towns and utilise the skills base to the benefit of the local community. Examples of this have already been seen, with Arklow being selected by SSE as their proposed O&M base. It is anticipated that 70 long term jobs will be created as a consequence of the Arklow Bank Project [32]. Codling Wind Park has identified Wicklow as the preferred O&M location with potential benefits to the local area including training, retraining and apprenticeship opportunities. Codling Wind Park anticipate that the O&M phase will create 75 local jobs over the lifetime of the installation. Another fishing location, Killybegs has a skilled local workforce, and there is potential for locations such as this to harness the existing skillset for the offshore wind sector.

Local enterprise zones (LEZ) and Local Enterprise Partnerships (LEP) have proven successful in the UK as tools enabling the growth of the local economy and diversification and development of the workforce [4]. Such schemes could be utilised in Ireland to support the growth of the supply chain with staging/marshalling port locations providing an idea hub from which to base this activity.

With the west and southwestern Irish offshore sites anticipated to harness floating wind, additional supply chains will need to be established to support the provision of floating wind specific components. Much of the technology required for floating wind to be realised on a commercial scale is yet to be fully understood with key areas such as dynamic cables and mooring systems requiring further research and development [3]. Continued support and investment in floating wind technologies will be critical to the successful delivery of these type of installations.

There are academic institutions in proximity to most of the port locations considered with the study. It would be advantageous to establish and grow existing links between the port authorities/developers and the institutions to provide vital research and development facilities. An example of where this may be possible is Ringaskiddy, where the MaREI (Marine Renewable Energy Ireland) is in proximity to the port. The MaREI is a world leading research centre focusing on energy, climate and the marine environment. Similarly, Galway has several academic institutes in relative proximity to the port, including the NUI Galway (National University of Ireland, Galway) and ATU (Atlantic Technological University). This will be particularly relevant for the development of floating wind on the west and southwest coast. A Government backed scheme or incentive to promote STEM careers, particularly in the marine and offshore sector would aid in attracting more people into the industry, with a major skills gap anticipated should no action be taken.

4.3 Government Support & Current Policy

The 2021 Port Policy Statement published by the Department of Transport highlights the need for a multi-port approach to both staging/marshalling and O&M. The policy document discusses funding potential for the required port upgrades, citing funding from the European Union's Trans-European Transport Network (TEN-T) as a key vehicle for financing the required port infrastructure development. The Connecting Europe Facility (CEF) funding falls within the TEN-T and would allow for funding toward port infrastructure projects supporting the development of ORE in Ireland. The CEF criteria have been extended to allow for feasibility studies and for the development of port infrastructure to support ORE for the funding window between 2021-2023. The widening of the criteria signals an understanding from the EU as to the importance of the ports sector for the delivery of offshore wind and carbon reduction [6].

In addition to the CEF, the 2021 Policy document indicated that further funding opportunities may be available in the future from sources such as the European Investment Bank, the Ireland Strategic Investment Fund and Green Funds. There is a clear understanding at Government level that port infrastructure will need support in funding the required upgrades to support the ORE industry. Whilst this is encouraging, ports with significant redevelopment plans will likely need to understand the availability and timelines for additional support.

As of March 2022, the Department of Transport offered several key recommendations to support the Irish Government's offshore renewables ambitions. These were delivered to the Irish Government's Advisory Group for the Offshore Renewable Energy Development Plan II (OREDP II). The key recommendations are outlined below:

1. A multi-port approach for deployment and O&M.
2. Ports with a clear business case should be supported.
3. Clarity should be provided with timelines re planning/consenting regimes, RESS auctions, grid access, etc. for business planning.
4. Clear policies should be set out now for 30 GW / Floating opportunity.
5. A ports coordination group should be established within Department of Transport.
6. Assist in maximising supply chain opportunities.
7. Develop Hydrogen strategy inclusive of port opportunities.
8. Ensure Ports avail of relevant EU Funding for ORE roll out [33].

The Department of Transport has committed to engage with the relevant Government departments to ensure Irish supply chain opportunities can be exploited. There is an understanding that port locations need surety of the opportunities to support business cases for development. Additionally, and specifically relating to port redevelopments, the presentation to the OREDP II Advisory Group acknowledged that timescales for planning and consents need to be improved if the ORE ambitions are to be met within the required timescales [33].

5 Role of Ports

5.1 Overview

Ports and suitable port infrastructure are key to the successful delivery of offshore wind projects with all components transported through these gateways. Port locations serve as a link between marine and landside activities and often become a hub for activity. The supply chain typically prefer to be in proximity to both marshalling ports and operation and maintenance (O&M) facilities. Ports also have a critical role in facilitating survey vessels prior to installation and will be required at the end of the project to support decommissioning of the assets. Whilst it is observed that ports perform several critical functions within the offshore industry, there is a significant lack of suitable infrastructure across Europe and particularly Ireland at present. It is estimated that €6.5 billion of investment in port infrastructure is required across Europe to achieve the energy targets set for the 2030 deadline [34]. Whilst this appears like a huge degree of investment, WindEurope highlight that this investment could be paid back in five years by revenue generated from the use of facilities for offshore deployment [35]. This presents both a challenge and opportunity to the Irish ports sector, this has been identified by port/harbour authorities with several major development plans announced in 2022.

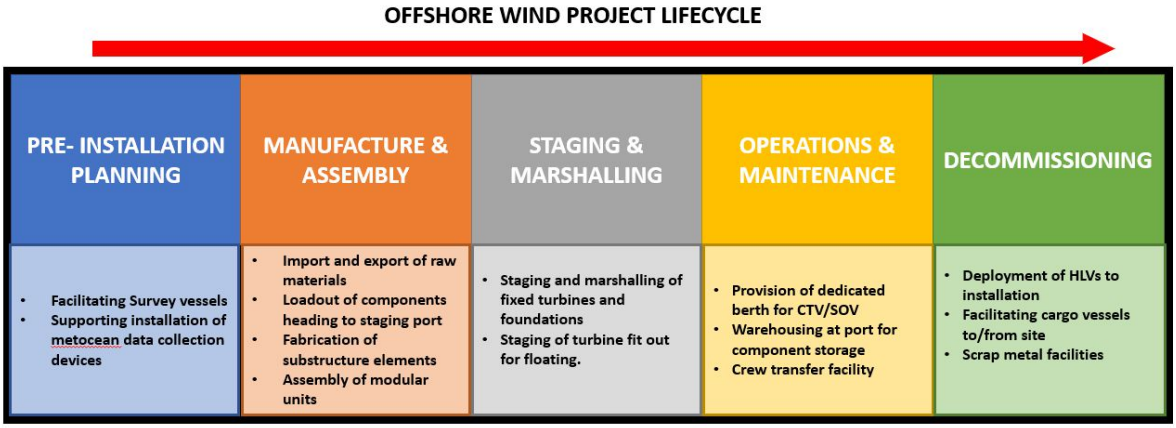


Figure 5-1: Role of Ports Throughout Offshore Wind Project Lifecyle [23]

With the growing scale of turbine components, the challenge for ports to support construction staging becomes even greater. It is largely recognised that there is insufficient existing port infrastructure to service the construction of the Phase 1 and 2 projects, particularly given that several projects may be under construction simultaneously. There is a need for investment and development of facilities to support offshore wind construction. Whilst O&M typically offers a steady stream of revenue for ports over the duration of the wind farm's lifespan, staging and marshalling ports will only serve the construction phase. Consequently, staging and marshalling ports will require a steady pipeline of projects to continue to be revenue producing [34]. It may be difficult for ports to gain funding for future development plans without surety of upcoming projects. We are aware from developers that their concerns over the lack of sufficient port infrastructure in Ireland has led them to engage with potential port suppliers in Britain and even on mainland Europe. While their preference would undoubtedly be to use Irish ports, there is a risk that these planned offshore wind farms could be built from the British west coast, in locations such as Mostyn or Liverpool, or from other EU member states.

Such an outcome would significantly reduce the potential benefit to the supply chain and the Irish economy.

There is an understanding at Government level as to the critical importance of port infrastructure for the delivery of offshore projects and for Ireland to capitalise on the significant economic opportunity which exists. The Minister for Transport's Policy Statement on the facilitation of Offshore Renewable Energy by Commercial Ports in Ireland, published in December 2021, seeks to establish a multi-port strategy for supporting the offshore wind industry. Providing more than one port facility would reduce the risk profile and would also provide an economic boost across Ireland. There is a significant focus on Dublin as the main economic hub in Ireland, the emerging offshore wind market offers an opportunity to allow for the development of regional economic hubs across Ireland. The Policy document also suggests that a minimum of two large-scale facilities would be required by 2025 to support storage and marshalling, with several smaller port locations facilitating O&M activities [1].

5.2 Other Uses of ORE Specific Infrastructure

Whilst port infrastructure improvements will require significant investment to meet the demanding specifications, the infrastructure will have the capability to serve other markets should there be delays to offshore wind construction or should the market decline in the future. The port specifications for staging and marshalling typically include heavy-duty quaysides and large landside areas far beyond what would be required for traditional port business streams such as RoRo, containers, or bulk cargo handling. Consequently, port infrastructure developed specifically for the ORE sector will have broad suitability across a number of sectors, with suitability to market themselves as multi-modal facilities. This has been observed in Belfast at the D1 terminal where the site has not been used for staging and marshalling since 2018 but has accommodated cruise vessels over the past number of years.

In addition to the example at Belfast Harbour's D1, across Europe a number of ORE facilities have been used to cater for other sectors. For example, Cuxhaven Port in the Netherlands has two main quays which accommodate offshore staging. Whilst this is the primary usage, both quays frequently accommodate fishing vessels when not in use for ORE staging. Similarly, Great Yarmouth in the UK offers itself as a multi-modal port. The facility hosted marshalling for the Galloper Wind Farm in 2017 and more recently the East Anglia One project (2019). Whilst the facility has demonstrable ORE capabilities, several alternative business streams have made use of the infrastructure in the time between staging projects, including handling timber cargoes, bulk, agri-bulk, aggregates, and steel. The suitability of ORE infrastructure to serve additional sectors should serve to reduce investment risk and cost and allow for increased utilisation of the facilities.

Where port locations are proposing to develop new facilities which include the manufacture of floating substructures, there a several other sectors which could make use of infrastructure when not manufacturing/assembling floaters. In the case where steel fabrication is proposed, the facilities could support the manufacture of monopiles, jackets, transition pieces and other ancillary steelwork for fixed-bottom installations. Where concrete floaters are proposed, manufacturing plant could also produce large reinforced concrete elements for heavy civils applications, such as port and harbour infrastructure, bridge elements, and other renewables concrete applications (perhaps tidal).

Port locations making consenting applications should be cognisant of the potential multi-modal port facilities and reflect this in applications to avoid future issues or non-compliances.

5.3 Marshalling Ports

It is useful to consider the stages involved in offshore wind farm construction and the role of the staging ports to understand the port requirements. Whilst a large degree of the components are the same, floating wind assembly and staging ports will have differing processes and considerations by comparison to fixed-bottom installations.

Regardless of the nature of the turbine base, the choice of marshalling port for a project will be dictated by several key considerations in relation to the logistical risk profile of the project. Marshalling sites will be in relative proximity to the wind farm allowing for more flexibility, maximising programme and reducing vessel costs, this is often the key driver for port selection [15]. Access is critical with unrestricted tidal access highly desirable alongside minimum restrictions on air draft. Beyond the logistical considerations, large landside areas are desirable to facilitate a degree of flexibility in operations. These overarching requirements apply for both fixed and floating wind installations.

Whilst the distance between the marshalling port and installation site is often a decisive factor for port selection, where suitable facilities are not within the preferred 150 nautical mile radius, developers will look to facilities further afield. As several Irish projects are anticipated to be under construction simultaneously, there is a very real possibility that without investment in Irish port infrastructure, a number of Irish projects will be serviced from UK or European ports. It is noted that from engagement with several Irish developers involved within the Port Study Working Group, there is a preference to utilise the Irish supply chain as far as possible. This includes using Irish port facilities as staging and marshalling hubs provided suitable infrastructure is available. This will not be possible without improvement to the existing facilities.

5.4 Fixed-Bottom Wind

The logistics and processes involved with fixed-bottom installations are well understood with significant numbers of operational fixed-bottom wind farms across the UK and Europe. Consequently, the staging and marshalling requirements are well defined and subject to less variation and uncertainty than those of floating wind installations.

During the construction phase of an offshore wind farm the marshalling port is used as an intermediate facility. The marshalling ports are in relative proximity to the proposed site and will usually be closer to the wind farm location than manufacturing port. The major components such as foundations, blades, nacelles, and towers are typically manufactured at another location and then transported (often by vessel) to the marshalling port where they are offloaded and stored temporarily before assembly and then final collection to be installed on site [15]. Assembly for fixed structures encompasses the preassembly of certain tower elements, transition piece elements or other specific welding activities as required. These activities will be completed at the staging and marshalling port. The construction and mating of the turbine with the transition piece occurs at the wind farm site with elements transported by installation vessel.

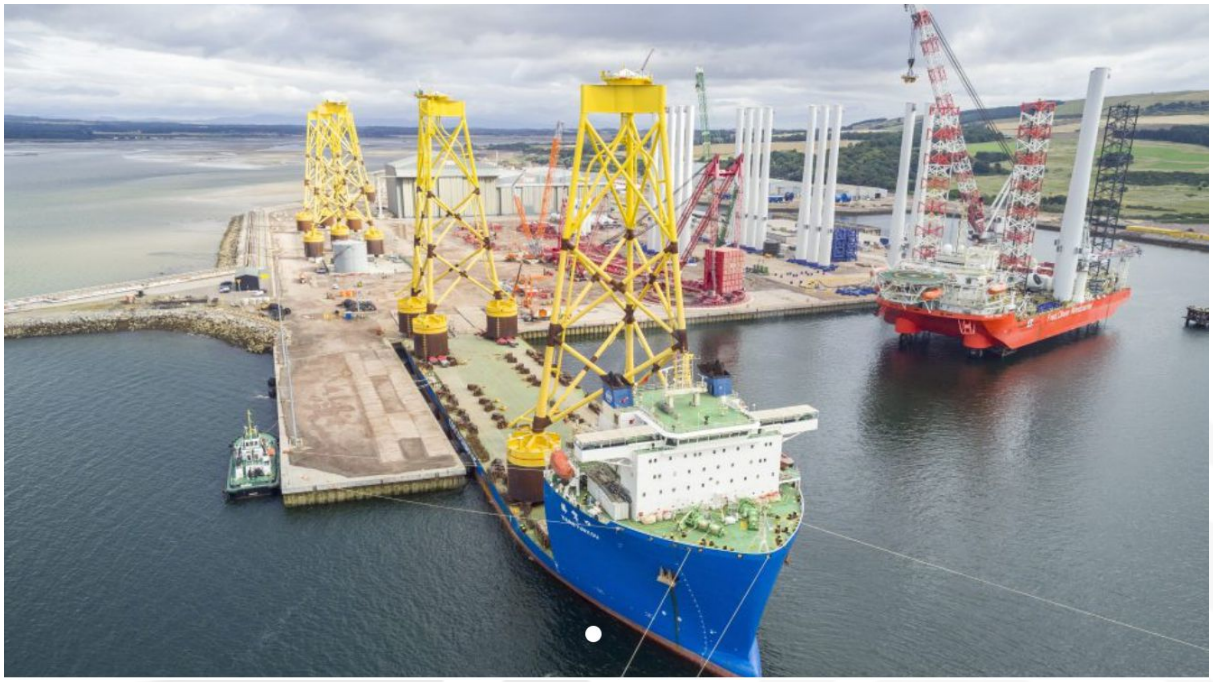


Figure 5-2: Staging of Foundations and Turbines at Nigg, Scotland [36]

5.5 Floating Wind

To date only relatively small-scale demonstration arrays have been completed globally and it is difficult to say with certainty what the industry may look like for the deployment of commercial scale projects in Ireland. It is likely that there will be significant innovation to meet the demands of the floating wind locations with port capabilities likely feeding into the substructure design process.

The exact port requirements for floating wind will be dictated by the nature of the substructure proposed in addition to project logistics. The choice of substructure for a proposed project will be influenced by a significant number of factors including (but not limited to) metocean conditions, water depth, ground conditions, proximity and functionality of port facilities, consenting constraints, mooring & anchoring options, and supply chain considerations. As the turbines will be mated to the substructure at the quayside there is an added degree of complexity as the installation will have to contend with motions of the substructure. Consequently, the degree of shelter within the harbour will have some impact.

5.6 Substructure Fabrication and Assembly

The substructure is typically fabricated and assembled at a construction hub and transported to the staging port for mating of the turbine elements with the foundation. Depending on the distance between the construction hub and staging port, the substructures are typically transported by semi-submersible heavy lift vessel. Where the distance between ports is relatively minimal, and depending on the weather window, substructure units may be towed to the staging port. It is also possible, if space and supply chain are available, to complete construction and assembly of the substructure in addition to turbine fit out at one port location.

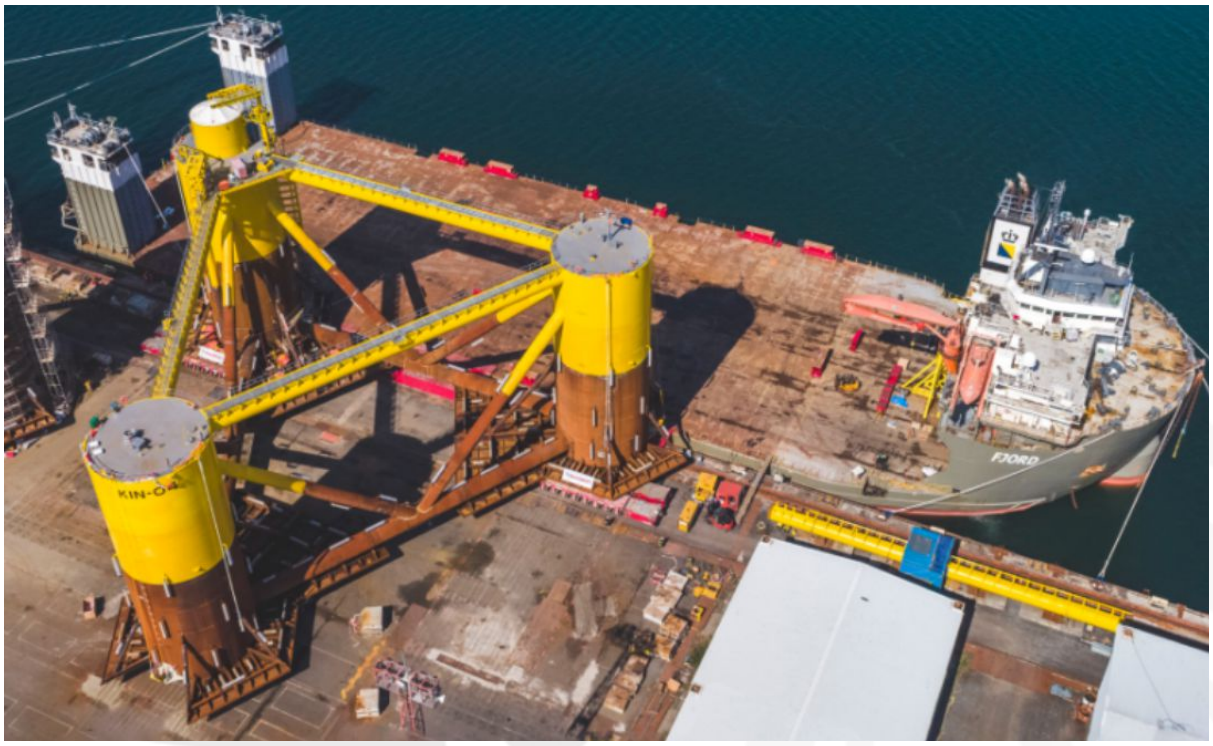


Figure 5-3: Kincardine Semi-submersible transferred by SPMT onto Heavy Lift Vessel [37]

If available, dry docks are useful for completing construction/pre-assembly works in the dry and then subsequently floating out without the need for additional craneage or for semi-submersible barges to float the substructure. The first two steel substructures for the WindFloat Atlantic demonstration project were constructed in the dry dock at the Port of Lisnave, Portugal prior to the units being towed to Ferrol in Spain for integration of the turbine topsides (Figure 5-4). Dry docks are useful for this type of process, however there are very few operational in Ireland as of 2022. Harland & Wolff, located in Belfast, have two dry dock facilities; the Main Building Dock which is 556m in length x 93m width (between fenders), and the Ship Repair Dock which is 335m in length x 50m width. Cork Dockyard also have an operational dry dock 165m in length x 25m wide. Given the dimensions of the existing Irish dockyard infrastructure, it is likely that only the Main Building Dock at Harland & Wolff would be suitable for the fabrication of certain substructures.

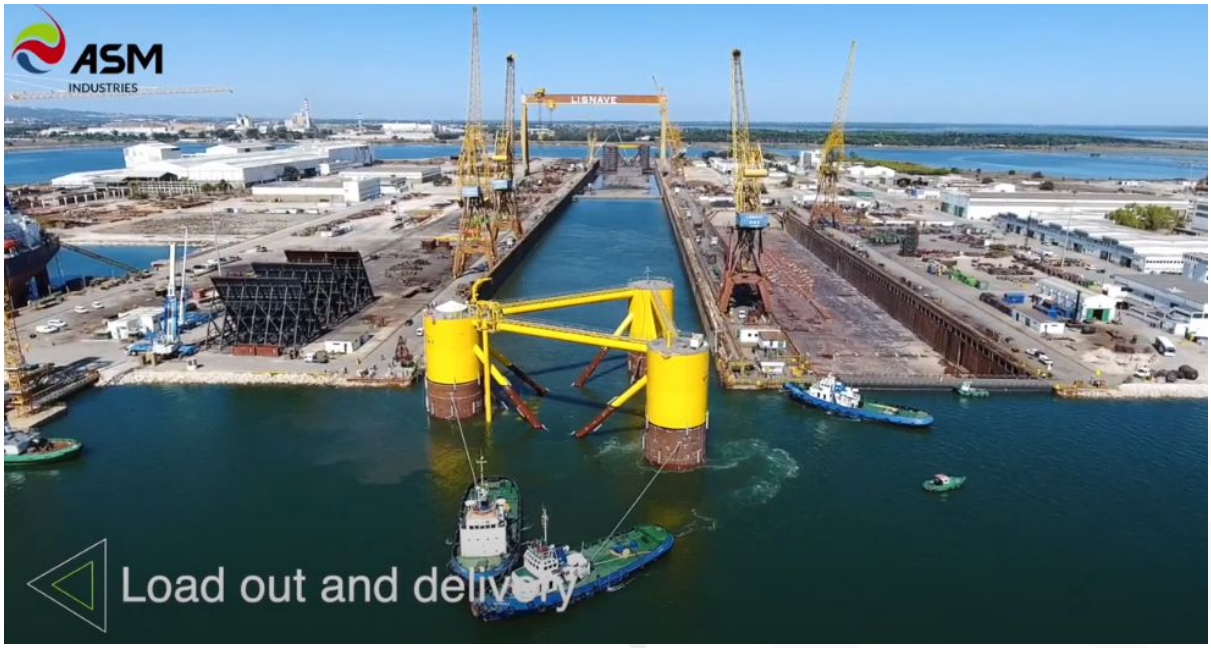


Figure 5-4: WindFloat Atlantic Substructure being Towed out of Dry Dock in Lisnave, Portugal (ASM Industries, now CS Wind)

Whilst the substructures are expected to be manufactured and assembled at one location, it is possible that modular substructure units may be transported to port locations for assembly prior to turbine mating. This would offer more opportunities for the local supply chain; however, it would introduce more risk into project logistics. Craneage capabilities may also preclude the possibility of pre-assembly for several locations.

There is some debate across the industry and within academic sphere as to whether substructures will be manufactured in Ireland or manufactured in a facility across the globe and transported to local staging ports. Some Irish port locations with development plans are targeting manufacture/assembly and staging, whilst others are intending to offer turbine staging only. It is anticipated that the readiness of the supply chain and availability of skilled workforce will impact whether manufacture at Irish ports is a realistic proposition. The availability of raw materials also has the potential to hinder fabrication in Ireland, with shortages and long lead in times for steel possible. The requirement for key components such as magnesium to be shipped from China and other locations (including Ukraine) has the potential to detrimentally impact the availability of steel [38].

5.7 Turbine Staging

Whilst the turbine elements remain the same regardless of the foundation type, there will be variation in the role of ports when considering floating installations. Unlike fixed-bottom structures where most of the construction and turbine mating is undertaken at the wind farm location, floating turbines are typically mated at the quayside and then towed to the final location fully assembled (barge and semi-submersible types). The differing construction methodology leads to significant draft requirements at the quayside and in the approach channel. Whilst the draft of substructure varies depending on type, this can be up to 14m for concrete semi-submersible foundations. Beyond draft, certain substructure

types are significant in width with semi-submersibles anticipated in the region of 80-100m. Approach channels will need both adequate draft and width to allow for transport of these units.

Floating staging ports will also require a degree of wet storage for commercial scale projects. Wet storage is necessary to allow assembled substructures to be stored in the water prior to the turbine topside being fitted and for fully assembled units to be stored prior to tow out (as this will be weather dependent). As per the channel and quayside depth, suitable draft will be required at these locations. The typical areas required are significant when considering the widths of the substructures and the mooring radius around each. The space requirements become even more considerable when considering fully assembled units as the clearance between each will need to respect the rotor diameter of the turbines. It is essential that proposed areas avoid encroaching on existing navigational channels. Given the height of fully assembled turbines are expected to be greater than 300m, no air gap restrictions can be tolerated. Significant degrees of landside storage area may also be required given the large footprints associated with elements of the floating substructures if these are being manufactured and fitted out at the same location.

5.8 Mooring Equipment

Unlike the fixed-bottom structure, floating wind requires chains and moorings to fix the structures to the seabed in addition to inter array cables, these additional components will likely be accommodated at a different port location and transported directly to the site at the time of installation. This additional process offers the opportunity for smaller ports not suitable for manufacture/assembly or staging to become involved in the floating wind installation process. It is noted that the load capacity of some smaller quayside facilities may not be suitable for the handling and storage of chains.

5.9 Floating Wind Maintenance

It is anticipated that the floating wind maintenance requirements will vary in comparison to fixed-bottom projects. For significant maintenance or repair work it is expected that floating units will be towed back to a maintenance port to have work completed. For routine maintenance the requirements will likely be similar to fixed structures, however there is an added degree of complexity in that the floating units will not be static. Technicians maintaining floating structures will be faced with a more challenging prospect and how this will play out in practice is yet unknown. Maintenance ports, where significant servicing or repairs take place will need to have suitable draft to accommodate the tow-in of the units, in addition to having the craneage and quayside space to allow for repair activities.

5.10 Overview of Floating Wind Processes

As a summary of the above, an overview of the processes involved in floating wind is outlined below in relation to port activities;

- Manufacture and assembly of substructures – Substructure foundations are manufactured either as complete substructure units, or in modular fashion for assembly at another location. Units are then transported via heavy transport vessel to the assembly or staging/fit-out port.

- Assembly – Modular substructures are assembled at a port location prior to turbine staging. The assembled units are then transported to the staging port for turbine staging.
- Turbine Staging (Fit Out) – Turbine topsides are mated to the substructure, with this typically taking place at the quayside. Wet storage is required at the staging location for safe storage pre and post mating.
- Staging of moorings/chains and cables – The moorings may be stored at the turbine staging port depending on space constraints, or at a separate staging port for moorings & chains.

It is possible that all four activities may be undertaken from one location depending on the nature of the facility. Given the availability of port infrastructure and readiness of the supply chain, it is anticipated that ports will handle one or possibly two of the proposed processes, with other ports offering support. This mirrors the 2021 Port Policy which champions a multi-port approach for servicing the industry.

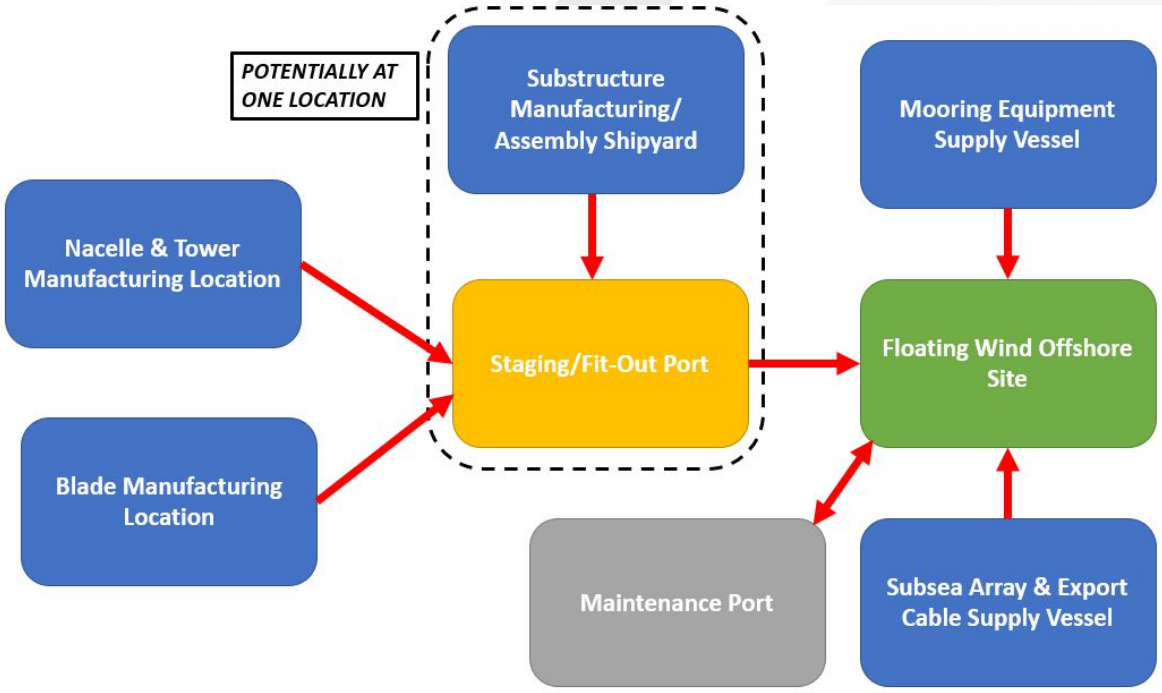


Figure 5-5: Schematic of Role of Staging Port in Floating Wind Construction

The subsequent port assessment will consider the suitability of existing and potential future infrastructure to accommodate the following:

1 Manufacture/fabrication of substructures
2 Assembly of modular substructures
3 Turbine Staging (Fit Out).

Whilst the suitability to accommodate staging of moorings and cables will not be explicitly considered, a general indication will be made where locations appear suitable for this type of activity.

6 Port Infrastructure Requirements

The following section will seek to define a set of port criteria which is representative of the industry as it is anticipated to look during the deployment of the Phase 1 and 2 projects.

6.1 Key Considerations & Constraints

The following presents an overview of the key considerations and constraints for ports supporting staging and marshalling.

Table 6-1: Overview of Key Port Constraints

Vessel Beam	There is a relatively large range of vessels associated with offshore wind staging and marshalling, vessels can range in beam significantly depending on the nature and purpose of the vessel (e.g. vessels carrying jacket foundation structures).
Lateral Clearance	In addition to the beam of the vessel (width), a suitable degree of lateral clearance is required to ensure safe port operations where items of cargo are stowed perpendicular to the orientation of the vessel (e.g. blade elements).
Quayside Water Depth (Draft)	Offshore installation vessels (jack-up vessels) and other supply vessels have relatively significant draft requirements at the quayside. It is desirable for this to be tidally unrestricted. Draft is more significant when considering the staging of floating wind units which may have drafts up to 14mLAT.
Approach Water Depth (Draft)	In a reasonably similar fashion to quayside water depth, the approach channel into the port must also have sufficient water depth. These limits are generally similar to or slightly relaxed (only by a metre or so) when compared to quayside water depths.
Jack-up Suitability	The conditions at the quayside seabed must be suitable to provide safe operations and avoid damage to the seabed and quay walls.
Quayside Length	This will depend upon operations, minimum values given by developers often consider a total length which will accommodate marshalling of both turbines and foundations. When considering floating operations quay length is more significant depending upon the proposed operations. For example, at a staging port, there will likely be a desire to have a length of quay dedicated for turbine mating (circa 200m-300m), with an additional length of quayside for handling of turbines transported in via component transfer vessels to the staging port (circa 200m).
Laydown Area	Required laydown area depends on the project size (number and size of turbines) but landside area requirements are often significant where a port is supporting staging of turbines and foundations (fixed). It is not uncommon for turbines to be marshalled at a different location from foundations if a port cannot provide enough landside area to support both activities. Where a landside area is specified for the benchmark requirements this will consider the total area for assembly and storage.
Wet Storage *(floating only)*	Relevant for floating wind foundations only, an area for wet storage is typically required to allow assembled substructures to be stored in the water prior to the turbine topside being fitted and for fully assembled units to be stored prior to tow out (as this will be weather dependent). The wet storage will need to have suitable draft and adequate to space including for temporary moorings. It is essential this avoids encroachment on existing navigational channels. Whilst this reporting will not consider aspects beyond physical suitability, it is likely that visual impact of wet storage areas will be a key consideration when considering consenting and approvals for such.
Load Capacity at Quayside	Significant load capacity is required at the quayside to allow for large crawler cranes to load/unload heavy items onto the quayside and hinterland areas and for the significant loading associated with SPMTs.
Load Capacity at Laydown Area	A significant landside load (bearing) capacity is also required to allow for storage of large components and foundation elements of significant weights.

Air Gap Restrictions	It is essential that there are limited air gap restrictions impeding vessels entering the port which may be carrying tall cargo (fixed-bottom). Floating wind staging of turbines will require no constraints on the air gap given the significant height of fully assembled units (anticipated >300m height).
Proximity to Wind Farm Location	Proximity to the installation site is one of the most critical considerations in port selection for staging and marshalling activities. Ports in relative proximity to the proposed site are deemed more favourable as this allows for the reduction of transit times during construction in addition to lower vessel costs. Often a 150 nautical mile distance from the installation site is deemed the limiting threshold. Where suitable facilities are not available within the typical 150 nautical mile range, developers will look to port locations further afield. As this study is not being completed for one site, rather the gamut of potential projects, a more general overview of distances will be considered.

In addition to the key considerations, the following are highlighted as further considerations for port locations supporting staging and marshalling of offshore wind projects.

Table 6-2: Overview of Additional Port Considerations

Ro-Ro Capability	Linkspan ramps capable of supporting Ro-Ro operations are desirable and it may be important in terms of future projects as ramps can be used in order to help speed up the loading process.
Drydock Availability	Historically drydocks were used in terms of vessel manufacture and also maintenance. They have also been used for specific tasks in renewables just as the production and staging of gravity bases and other activities including wet work and operation and maintenance. Drydocks can be extremely useful for the assembly of floating wind units. Only a very small number of drydocks remain operational in Ireland.
Craneage Capability	Availability of cranes and also their versatility can place an important role on the types and shapes of cargoes that can be lifted. The use of high-capacity mobile and crawler cranes can often suit a wide range of loads provided range is not compromised. Although uncommon, the availability of overhead gantry cranes can also provide options for component transportation across a site.
Proximity of Supply Chain	Whilst it is anticipated that there will be significant supply chain development to support the offshore wind industry in Ireland, proximity to existing supply chain with experience of the offshore industry will be advantageous. Additionally, proximity to the supply chain will improve project logistics reducing overall installation costs.
Connectivity and Location	Road, rail and airport connections are relatively important when considering the supply chain, and potential work crews travelling to the staging port.
Previous Experience with ORE	It is desirable that the port is already familiar with the offshore project logistics and operation. This is necessary to avoid the learning curve, speed up the process and execute the project safely.

6.2 Quantitative Criteria

As the needs of both fixed and floating wind vary, two distinct sets of port criteria have been set out to characterise each.

The information in relation to the port infrastructure requirements have been informed by a number of means which are outlined below;

- Market engagement in the form of recent consultations with the ORE industry (questionnaires distributed to developers, contractors, and supply chain – March 2022, and specific engagement with floating developers – May 2022).
- Research into current and proposed practice for floating and fixed-bottom deployment. In addition, engagement with researchers/academics focusing specifically on floating wind deployment (April 2022).
- Engagement with the Port Study Advisory Group to gain feedback on proposed criteria (April-June 2022).

The quantitative criteria set minimum and preferred requirements as indicated by industry engagement. The minimum criteria reflect the base level of infrastructure requirements which allow for the required activities to be performed. The preferred criteria represent the infrastructure requirements which allow for flexibility in operations, including for greater levels of storage at the site and flexibility around vessel movements and selection.

6.3 Fixed Requirements

In keeping with the key considerations outlined in Section 6.1, the following minimum and preferred criteria have been adopted to benchmark against for the port assessment. This information has been largely based on previous consultations completed with the ORE Industry (current as of March 2022).

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.

Table 6-3: Fixed-Bottom Port Benchmark Quantitative Requirements

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

6.4 Floating Requirements

The benchmark criteria for floating wind have considered requirements for what may be a typical commercial project providing 750 MW-1,000 MW capacity. Whilst larger floating installations are proposed within Irish waters (>1 GW), the anticipated phased nature of floating deployment will mean that the port requirements remain much the same, with the construction phase longer in duration.

The likely substructure type for floating projects is unknown at this stage but for the purposes of determining port requirements, semi-submersible foundations are assumed. The semi-submersible substructures have the most significant footprint and as such would prove the most critical in terms of storage requirements. The technology involved for semi-submersible type substructures is also the most developed to date and considered the most likely to be deployed in Ireland. The area requirements have assumed semi-submersible units of approximately 80-100m beam for a substructure supporting 15 MW turbines. The criteria consider suitability for both concrete and steel.

The landside area requirements exclude storage of cable storages and mooring equipment.

Table 6-4: Floating Wind Port Benchmark Quantitative Requirements

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

The criteria set out in Table 6-4 has sought to provide a benchmark for the anticipated needs of the floating industry. However, it is recognised that the industry is in its infancy and the requirements will be evolving and most probably innovating to suit what can be physically achieved at ports in proximity to the wind farm sites.

The above parameters for wet storage and approach draft assume that if the substructures are manufactured at another location and transported via heavy transport vessel, the float off occurs in deeper water in relative proximity prior to being towed to the wet storage area or quayside.

The wet storage draft requirements have been influenced by operational drafts of the semi-submersibles known to the industry. As the temporary storage of these units will be required to withstand various sea states, the draft requirements will need to allow for rolling, pitching and heaving of the substructures without grounding. Consequently, the requirements for wet storage draft are anticipated to be similar to the operational drafts. This will be influenced in practice by the degree of shelter afforded to the wet storage area and the nature of the substructures proposed, with concrete operational drafts significantly greater than steel.

The area requirements suggested for wet storage represent the range of values anticipated, the wet storage required for a specific project will be dictated by the following:

- Substructure footprint
- Water depth at wet storage area
- Temporary moorings proposed (mooring pile system or catenary moorings)
- Orientation of the substructure units in the wet storage area
- Deployment strategy as to the number of units anticipated in wet storage at a given time.

7 Port Questionnaire Study

7.1 Methodology for Study

To gain a comprehensive and accurate record of the existing infrastructure at each of the port locations considered, the following methodology was proposed for the study.

1. High level desk review of existing information and experience in-house relating to specific port locations to allow for screening of suitable ports.
2. Creation of a shortlist of port locations to be considered within the report.
3. Discussion of proposed shortlist with the Port Study Working Group, and refinement of considered locations.
4. Based on port requirements outlined previously, creation of an infrastructure and general capabilities questionnaire to be distributed to shortlisted ports. Questionnaire to allow for detailing of any development plans, in addition to progress of plans to date, anticipated timescales and cost estimates.
5. Distribution of questionnaires to shortlisted port personnel.
6. Collation of returned questionnaire data and assessment of existing infrastructure and development plans.
7. Creation of port profiles for each location considered. Profiles to be distributed to each port for comment prior to finalising, allowing for verification of data and agreement on information included.
8. Reporting on outcomes of study, to include key conclusions and recommendations from the port assessment.

7.2 Pre-screening of Ports

A desktop exercise was completed to reduce the number of ports considered in the study and focus on those with the physical characteristics to host staging and marshalling activities. Ports with known development plans have warranted inclusion as several of these have the capabilities to service the offshore market. Beyond the exclusions on the grounds of physical capabilities and consideration of development plans, the study has focused on port locations which have expressed a specific desire to accommodate staging & marshalling activities. This approach has been taken to provide a concise list of ports with a realistic view on likelihood and suitability.

The multi-port strategy proposed to deliver offshore wind projects in Ireland will rely on multiple locations to fulfil roles beyond that of staging and marshalling. Several locations have already indicated a desire to offer supporting roles to staging and marshalling activities (such as Waterford), whilst others are actively pursuing O&M (Greenore, Wicklow, Arklow). Shannon Foynes Port Authority have also indicated several locations within the Estuary as potential O&M bases, in addition to research and education facilities.

The following locations have been scoped out, the limitations which have led to their exclusion from the main study are outlined for clarity. These locations were considered within the Carbon Trust report from 2020 which included a port assessment. It is acknowledged that multiple additional small harbours exist around the Irish coast, however, and to avoid an exhaustive list, only those reviewed within the previous work have been screened out.

Table 7-1: Screened Out Port Locations

Greenore Port	Limited laydown area in proximity to quayside, quayside bearing capacity. Greenore indicated they will be pursuing O&M as opposed to staging and marshalling.
Drogheda Port	Limited water depths in channel and at berths, availability of quayside space, quayside bearing capacity, availability of landside areas, overhead draft limitations, proximity of town centre. Likely to be more suitable to accommodate O&M activities.
Dublin Port	Have significant infrastructure capabilities but are not pursuing activities within the sector due to current port capacity and commitments to existing sectors, particularly Roll-On-Roll Off (RoRo), amongst other trades.
Dun Laoghaire Harbour	Limited water depths, availability of landside space, quayside bearing capacities limited, jack-up suitability. Likely to be more suitable to accommodate O&M activities.
Arklow Harbour	Limited water depths, availability of landside space, quayside bearing capacities limited, jack-up suitability. Pursuing O&M to support Arklow Bank Phase 2.
Wicklow Harbour	Limited water depths, availability of landside space, quayside bearing capacities limited, navigational constraints. Pursuing O&M to support Codling Wind Park.
Port of New Ross	Limited water depths, availability of landside space, quayside bearing capacities limited, jack-up suitability.
Port of Waterford	Limited channel width, limited water depths, quayside capacity, jack-up suitability.
Kinsale Harbour	Limited water depths, availability of landside space, quayside bearing capacities limited, jack-up suitability. General lack of industrial harbour area.
Castletownbere FHC	Limited water depths, quayside bearing capacity limited, jack-up suitability, availability of landside space, demand on infrastructure from other sectors – particularly fishing industry.
Fenit Harbour	Limited water depths, availability of landside space, quayside bearing capacities limited, narrow access structure to harbour facilities, navigational constraints.

The locations noted above do not have any publicly known plans for port redevelopment as of Q3 2022, and as such the scoping has been completed to the best of GDG's knowledge at this time.

7.3 Selected Ports

Consideration has been given to the proximity of ports to the identified Irish projects as this will be a key driver of port selection for developers. The study has also highlighted the proximity of neighbouring ports as collaboration between locations will likely be required to meet the demand for certain projects. A total of 13 port locations have been selected as part of the study, with 3 sites in Northern Ireland and the remainder in the Republic of Ireland. The locations are shown on the map in Figure 7-1.

Shannon Foynes Port Authority have outlined a masterplan for the Shannon Estuary to become a renewable energy hub. The plans have indicated potential facilities suitable for manufacture, assembly and staging for floating wind installations. Foynes, Foynes Island and Moneypoint are located within the Shannon Estuary and under the jurisdiction of Shannon Foynes Port Company. For the purposes of the assessment, each potential facility will be considered separately but noted as Shannon Estuary sites. There is scope for collaboration between the Shannon Estuary facilities.

The locations in clockwise order around the coast are as follows;

- Larne
- Belfast, D1
- Belfast, Harland & Wolff
- Bremore
- Rosslare Europort
- Cork Dockyard
- Port of Cork, Ringaskiddy
- Foynes (within Shannon Estuary)
- Foynes Island (within Shannon Estuary)
- Moneypoint (within Shannon Estuary)
- Galway
- Ros An Mhíl (Rossaveel)
- Killybegs.

A map of the locations has been included in Figure 7-1, and the location of the ports relative to Irish project shown in Figure 7-2.

From review of the bathymetry around the Irish coast there are relatively few locations offering significant water depths as a natural selling point. Most of the port locations with natural deep water are outlined above, however, Bantry Bay offers significant natural water depths in addition to strategic positioning. Bantry Bay is accessible to both the east and west coast planned projects and within the typical 150 nautical mile radius for staging ports. Whilst there is limited existing infrastructure at present, this location is highlighted as an area of high potential to serve the floating wind sector.

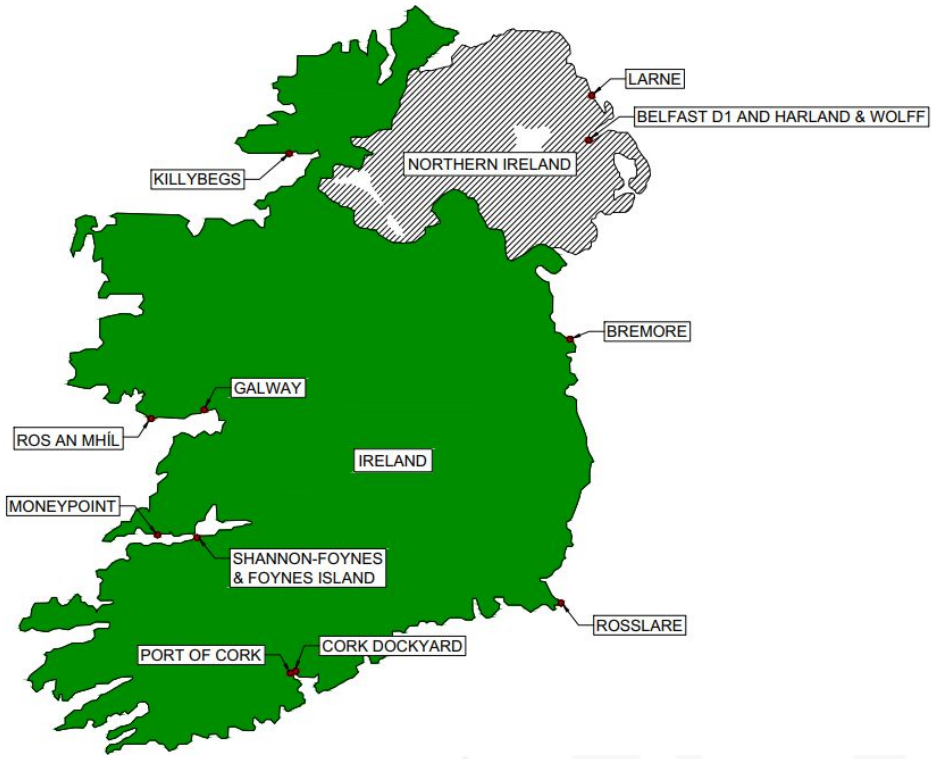


Figure 7-1: Ports Considered for National Port Study 2022

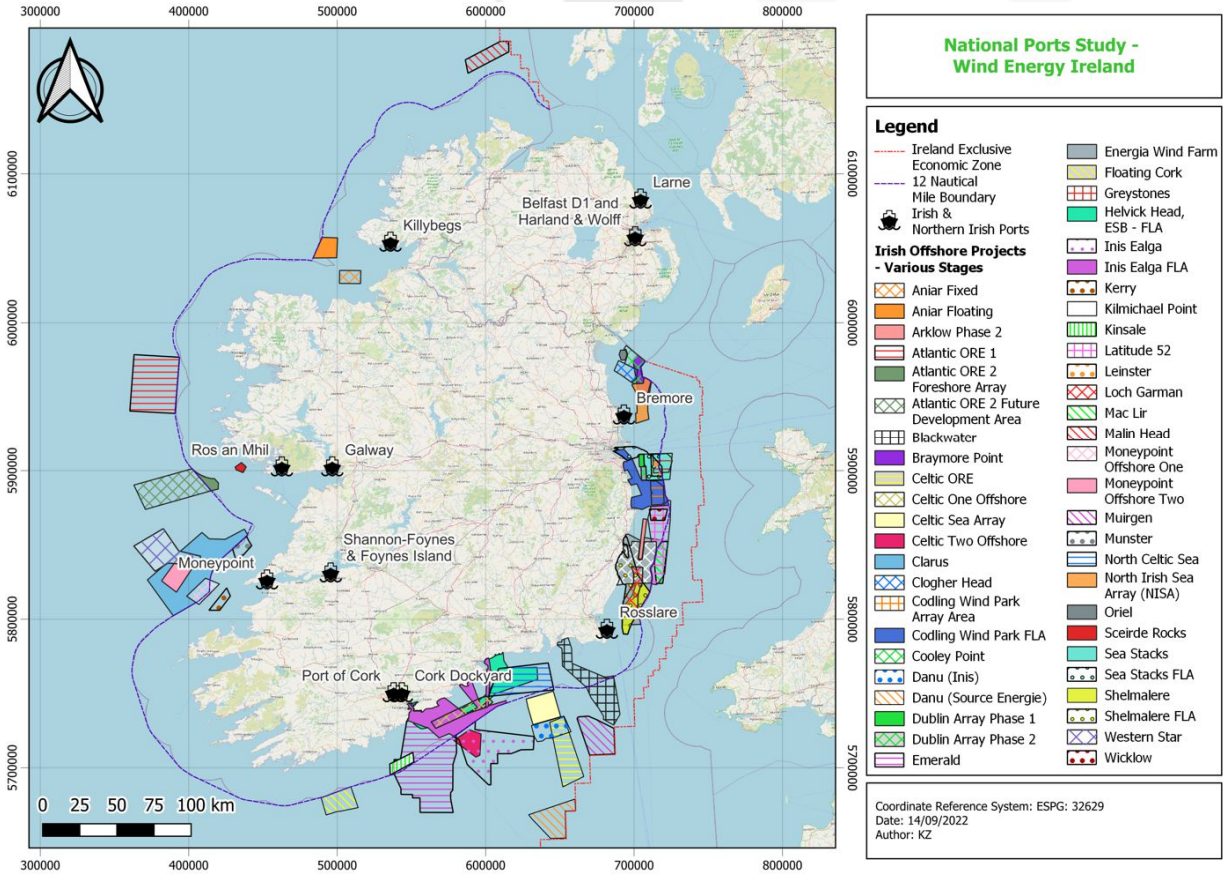


Figure 7-2: Ports Considered Relative to Proposed Irish Projects

7.4 Questionnaire Distribution

Informed by the criteria outlined for fixed and floating wind, a questionnaire was devised for distribution to the chosen ports. The questionnaire outlined the scope of the study and asked for the shortlisted ports to detail their existing infrastructure, in addition to outlining any port infrastructure development plans.

The questionnaire was distributed on the 19th of April 2022, with an initial three-week period for response. The rate of response was generally very good, with engagement from all the targeted locations. Follow-up emails and phone calls were conducted as necessary to allow for verification and clarification of information. The questionnaire issued to ports has been included in Appendix A for reference.

8 Port Profiles

Following receipt of the questionnaire responses a profile documenting the key information for each location has been created. The quantitative infrastructure parameters have been tabulated for the relevant port capabilities and a general overview of each location provided.

Development plans, where applicable, have been documented to allow for an understanding of the suitability. The development plans have been outlined in as much detail as provided and have included layout plans and schematics where available. Several development plans are in their infancy, and as such the known criteria have been outlined with any information currently unavailable indicated.

LARNE PORT

Port Overview	
Location	North (Northern Ireland)
Coordinates	54˚ 51’ N, 5˚ 48’ W
Ownership	Privately Owned (Larne Harbour Ltd)
Laydown & storage area (ha)	7.3 ha quayside area
Strengths	Availability of Ro-Ro facility. Relatively large bearing capacity at quayside.
Constraints	Relatively short quay length, limited laydown area and water depth, significant RoRo activity competing for land use.
Proximity to offshore renewable sites	In proximity to future Northern Irish projects. Furthest location from East Coast projects > 150 nautical miles. Likely too far from west coast projects.
Main usage	Ro-Ro, Ferry service, cargo etc.
Experience of renewables section	Mob and demob of projects to repair cables, storage services for windfarm projects, heavy lift capabilities used.
Proximity of supply chain	Several specialist engineering & electrical service providers (generator manufacture & maintenance) in proximity. Range of machining and tool providers, & suppliers of lifting and material handling equipment within the immediate locale.
RoRo Capabilities	4 available, 1 in permanent use by P&O ferry.
Pilot/Tug Support	Pilots available 24/7. 2 small tugs available

Background

Larne Port is strategically situated at the mouth of Larne Lough in the northeast of Northern Ireland approx. 35km north of Belfast. It is classified as a Coastal Natural (CN) port by the World Port Index (2019). The port is owned by Larne Harbour Ltd, part of P&O Holdings Division, which is owned by DP World. The Port provides direct access to the Irish Sea and the shortest most direct route to Scotland, with the port providing a daily ferry service. In addition to the ferry services, Larne can offer covered and open storage spaces within a secured International Security and Port Facility Site, suitable for land and marine based projects. The port has direct motorway connectivity via the A8 and is an active facility for transportation and the shipping of materials both import and export as part of the Northern Ireland Infrastructure.

Main Features and Limitations

The port’s 100m quay is capable of handling vessels up to 170m, with a total of 7 operational quays at the facility. It’s Ro-Ro infrastructure comprises of three double deck linkspans and one single deck linkspan, all having a safe working load of 180T. The port has jack-up capability (jacked-up the MPI Adventure, MPI Resolution and Wind Server previously) and can offer a small slipway. Larne is geographically well placed to serve future projects off the northern Irish coast, but less well placed to serve the east and west coast Irish Projects. It is strategically located in proximity of the Belfast D1 terminal (potential for overflow or a collaborative effort with D1 depending on project size). It is noted that a significant portion of the landside area is required for accommodation of the existing RoRo activities. The availability to service other sectors is unclear.


Source: Port of Larne

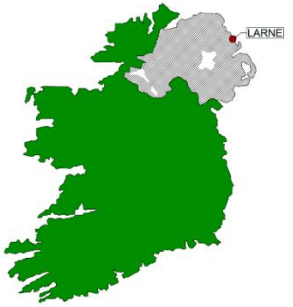


Table 8-1: Existing Port Infrastructure Larne

Critical Port Criteria	Value
Access Channel Width (m)	**125.0**
Access Channel Draft (m LAT)	**8.9**
Quay Draft (m LAT)	**7.1**
Quay Berth Length (m)	**100.0 (quay length – ignoring dolphins)**
Quay Berth Width (m)	**20.0**
Quayside Bearing Capacity (t/m2)	**18.0**
Jack-Up Capabilities - (y/n)	**Yes**
Laydown Area Adjacent to Quay (hectares)	**7.3**
Laydown Bearing Capacity (t/m2)	**18.0**
Air Gap Restrictions (y/n)	**No**
Potential Wet Storage Area (y/n)	**No**
Additional Criteria	
Pilot / Tug Support Available (y/n)	**Yes**
Slipway / Dry Dock Available (y/n)	**Yes (small)**
RoRo Capabilities (y/n)	**Yes**
Access to Transport Corridors (y/n)	**Yes**
Shore-to-ship Power (y/n) - (kW/Volts/Hertz)	**No**

LARNE PORT

Main Features and Limitations (continued)

Larne offers moderate water depths and good quayside and laydown bearing capacities. However, there is limited laydown area, limited quay length and a lack of wet storage in the order of magnitude anticipated to be required. Given the limitations, it is unlikely that Larne has the capabilities to accommodate staging and marshalling of foundations and turbines for fixed wind. The limited wet storage, draft, and limits on laydown area in proximity to the quay make the existing facility unsuitable for floating manufacture, assembly, or staging.

Proposed Redevelopment Plans

Larne Harbour have indicated future development plans to upgrade and extend quayside facilities, in addition to providing new storage areas within the harbour area. Refurbishment plans have been outlined for Curran Quay, Continental Quay, as well as the South end quaysides. The proposed development works will provide more fixed quay frontage to improve facilities for general cargo vessels and other additional project work potentially within the offshore sector. The proposals include for the provision of circa 3 ha of additional laydown area in proximity to the quaysides.

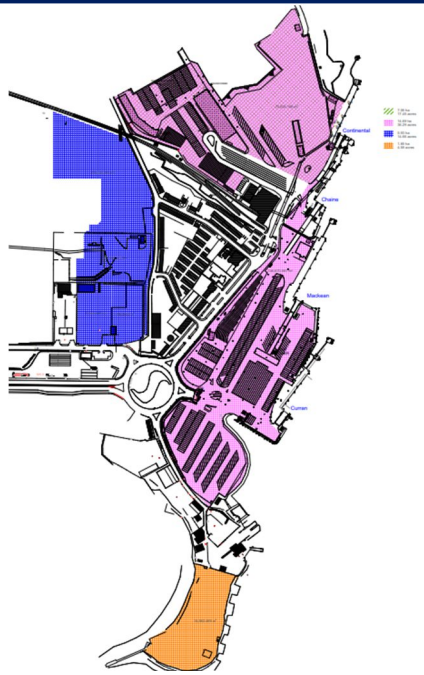


Figure 8-3: Landside Areas in Proximity to the Quayside (Pink Areas circa 14 ha total)

Anticipated Timescales & Progress to Date

Larne Harbour Ltd did not give any indication of how progressed the development plans were, nor has there been an indication of proposed timescales, or estimated costs for the plans.

Conclusion

The existing Larne Port offers relatively good quayside load capacities, with a relatively deep berth, and limited navigational constraints. However, Larne is currently limited in laydown area in proximity to the quay. Whilst the existing infrastructure would not be suitable for hosting staging and marshalling as a solo facility, there is potential for Larne to play a supporting role to another facility in proximity (potentially D1 or H&W). The port benefits from previous experience of the offshore sector and has hosted jack-up vessels in the past.

The port would benefit from upgrades including extension of the solid quay and provision of additional laydown areas in proximity to the quayside. The port could possibly accommodate staging of turbines with the existing infrastructure, however this would depend upon the project specifics. Given the proximity of Larne to the south and west coast floating projects, in addition to the infrastructure constraints, it is unliky to be a suitable staging port for the planned floating installations.

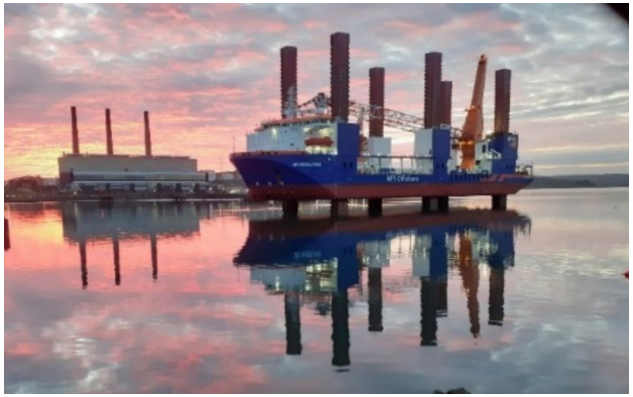
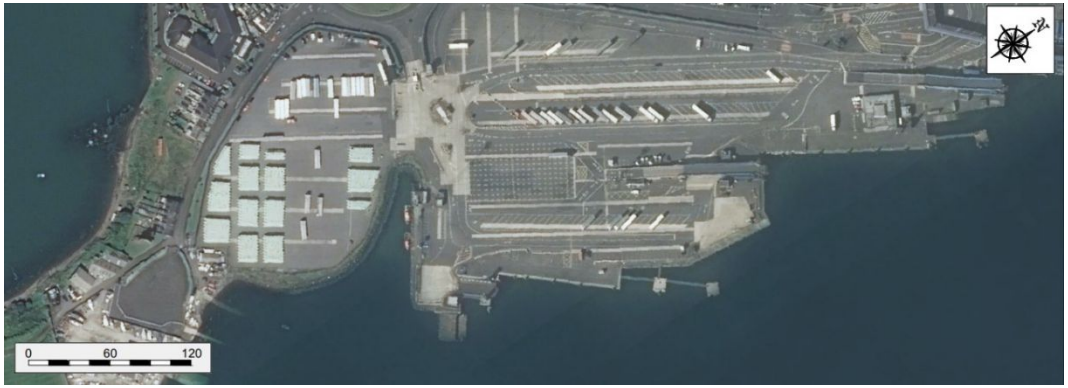


Figure 8-1: MPI Resolution Jacked-up in Larne Port

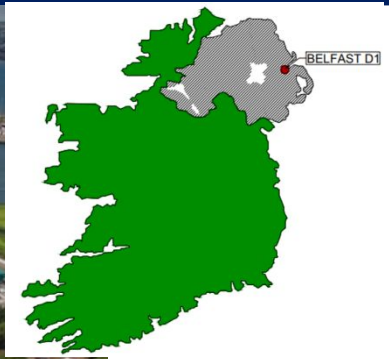
Figure 8-2: Onshore Turbine Towers being Offloaded in Larne Port



BELFAST, D1 FACILITY

Port Overview	
Location	East (Northern Ireland)
Coordinates	54˚ 36’ N, 5˚ 52’ W
Ownership	Privately Owned (Belfast Harbour Commissioners)
Laydown & storage area (ha)	21.6
Strengths	The first and only dedicated, purpose-built offshore wind logistics and assembly terminal developed in the Island of Ireland. Deep-water, heavy-duty quay.
Constraints	Proximity of Belfast City Airport creates air gap restriction.
Proximity to offshore renewable sites	Close to all potential offshore wind sites in Irish and Celtic Sea. Further from west coast sites.
Main usage	Liquid bulk, dry bulk, break-bulk, Ro-Ro & Lo-Lo container service and offshore renewables.
Experience of renewables section	Ireland’s only dedicated purpose-built facility for offshore renewables. Successfully used by Ørsted for several wind farms.
Proximity of supply chain	Several experienced Stevedores, agents, pilots, and towage/ boating companies with offshore wind experience. Machinery etc. nearby include H&W, Ridgeway, Balloo Hire, CASC, NIACE.
Craneage capabilities	None, however client’s own crane may be used on site. Quay designed for Liebherr LR 11350, Liebherr 1600 and Demag CC2800.

Source: Dong Energy and Scottish Power



Background

Belfast Harbour is located in the East of Northern Ireland and accounts for 20% of the Belfast City area. The harbour is run by the Belfast Harbour Commissioners and is classified as a River Basin (RB) port by the World Port Index (2019). Belfast Harbour’s main usage is liquid bulk, dry bulk, breakbulk, Ro-Ro & Lo-Lo container service and offshore renewables.

Main Features and Limitations

Belfast Harbour can offer a purpose-built offshore wind facility at the D1 site. The site was developed in collaboration with Ørsted to serve as an offshore logistics hub. The D1 terminal has a laydown & storage area of 25 ha, with a continuous quayside length of 480m and a quayside bearing capacity of 50 t/m^2. The hinterland offers an unbound surface with unrestricted quayside access and is ideal for handling and storage of large turbine and foundation elements. The site previously hosted marshalling and staging of both turbine and monopile elements for several projects. The terminal offers jack-up capability at the quayside and is well positioned to support the development of Irish offshore wind projects on the east coast.

Table 8-2: Existing Port Infrastructure D1

Critical Port Criteria	**Value**
Access Channel Width (m)	**220.0**
Access Channel Draft (m LAT)	**9.3**
Quay Draft (m LAT)	**10.2**
Quay Berth Length (m)	**480.0**
Quay Berth Width (m)	**61.0**
Quayside Bearing Capacity (t/m2)	**50.0**
Jack-Up Capabilities - (y/n)	**Yes**
Laydown Area Adjacent to Quay (hectares)	**25.0**
Laydown Bearing Capacity (t/m2)	**11.5**
Air Gap Restrictions (y/n)	**Yes**
Potential Wet Storage Area (y/n)	**Limited**
Additional Criteria	
Pilot / Tug Support Available (y/n)	**Yes**
Slipway / Dry Dock Available (y/n)	**Yes**
RoRo Capabilities (y/n)	**Yes**
Access to Transport Corridors (y/n)	**Yes**
Shore-to-ship Power (y/n) - (kW/Volts/Hertz)	**No, but HV available at quayside**

BELFAST, D1 FACILITY

Main Features and Limitations (continued)

The Belfast Harbour's D1 terminal is Ireland's (and the Irish Sea's) only dedicated purpose-built facility for offshore renewables. The terminal has been successfully used by Ørsted (formerly DONG Energy) for the delivery, pre-assembly and load out of over 225 wind turbines and foundations for West of Duddon Sands Wind Farm (2014) – 389MW, Burbo Bank Extension (2017) – 232MW, Walney Extension (2018) – 660MW in the Irish Sea.

The D1 facility has a proven track record delivering staging and marshalling of both turbines and foundations for fixed wind and meets the preferred fixed criteria set for most of the quantitative requirements outlined (where it does not meet the preferred criteria, D1 exceeds the minimum).

D1 also meets the majority of the minimum criteria required for floating staging, however the D1 site is constrained by the proximity of Belfast City Airport and also the limited potential for wet storage within the channel. The proximity of the airport is a significant limitation on the facility being used for turbine mating at the quayside, as the fully assembled units would prove hazardous to aviation activities. It may be that D1 would be more suited to accommodating the assembly of modular substructures prior to being towed elsewhere for mating of turbines topsides given the air draft limitations. The water depth whilst suitable for some types of floating substructure would be too shallow to accommodate the higher draft concrete foundations.

Proposed Redevelopment Plans

BHC have plans underway to develop the D3 Terminal which is the site fronting the deep-water channel in relative proximity to D1. The development will provide a further 340m quay, and c. 15 ha of storage space. There is a second development site to the rear of the D1 facility, both shown in Figure 8-4.

Figure 8-4: Development Sites in Proximity to D1

Anticipated Timescales & Progress to Date

This D3 project has received planning and marine construction licencing consents. The detailed design stage is currently underway for the proposed facility. Construction timelines are at present unknown, but the facility is anticipated to be operational by late 2024. The capital works are estimated at €30m.

Conclusion

The Belfast Harbour D1 terminal facilities are Ireland's only dedicated purpose-built location for the offshore wind sector. The facility is suitable to handle staging and marshalling for fixed offshore wind projects. The quayside at the D1 terminal can service multiple installation and component transfer vessels with jack-up capability. The 25 ha heavy-duty storage area can accommodate staging and installation activities for both turbines and foundations. The addition of the D3 facility, should this be realised, will provide useful additional laydown area and quayside which could offer additional capacity to D1.

The D1 facility, whilst suitable for fixed-bottom staging and marshalling is constrained by the existing water depth in the channel for accommodation of certain types of higher draft floating substructures. Beyond the potentially restrictive water depths, there is limited wet storage available. The presence of Belfast City Airport within the Harbour Estate is a limitation for the use of D1 as a staging location for turbines due to the aviation hazard. The extents of the limitation are currently unknown, with engagement between the airport and harbour required to fully understand the issue.

BELFAST, HARLAND & WOLFF

Port Overview	
Location	East (Northern Ireland)
Coordinates	54˚ 36’ N, 5˚ 54’ W
Ownership	Private: Harland and Wolff Group Holdings Plc
Laydown & storage area (ha)	8.5 at quayside plus additional landside areas gives total of circa 13 ha.
Strengths	Deep building dock, availability of heavy craneage and large laydown area, large, covered manufacturing facilities, proximity to D1 terminal.
Constraints	Proximity of Belfast City Airport, load capacity of dock quaysides.
Proximity to offshore renewable sites	In proximity to east coast sites. Likely too far from south and west coast projects.
Main usage	Ship and offshore unit repair, fabrication and assembly of topside and foundations (offshore).
Experience of renewables section	Significant experience of offshore renewable projects including Barrow, Robin Rigg, Humber Gateway Ormonde, Scotrenewables, Borkum Riffgrund 2 and East Anglia ONE.
Proximity of supply chain	As per Belfast Harbour.
Craneage capabilities	Twin 840t gantry cranes, two 60t Hensen cranes and one 9t Stothert & Pitt crane (Building Dock). Ship Repair facility has 2 x 40t Stothert & Pitt cranes, 1 x 80t Stothert & Pitt crane.

Background

Harland and Wolff Heavy Industries Ltd. (H&W) is situated on Queen’s Island in the Port of Belfast, Northern Ireland. Harland and Wolff has over 150 years of marine manufacturing experience and a legendary shipbuilding history with RMC Titanic and RMC Olympics built at their facility. H&W has one of Europe's largest heavy engineering and fabricating facilities and is located in close proximity to Belfast’s D1 terminal.

Main Features and Limitations

The H&W facilities in Belfast are located across two main sites: the Main Site and the Ship Repair Site, with circa. 6.5 ha and 2.0 ha storage area, respectively. The Main site has access to a further 5ha storage area with no permanent usage. The Main Site houses Europe's largest dry dock (the Building Dock) with an overall length of 556m, and a width of 93m. The facility is serviced by twin 840 tonne, Goliath gantry cranes. The availability of twin gantry cranes and heavy plants/equipment at the main site facilities allow for efficient handling and assembly of large offshore components. The Ship Repair facility is adjacent to the main channel and is equipped with another dry dock 335m x 50m, boasting 9.4m water depth at the dock floor. There is a 432m length of quayside available in addition to the two drydock facilities offering flexibility to the site. The total available quay length is 1323m.

The existing site has good water depth to support fixed wind and has excellent craneage capabilities. The site benefits from proximity to the supply chain and H&W have significant previous experience of the offshore sector. The available laydown area would have potential to accommodate staging of foundations/turbines, however the space requirements would likely preclude the site being used for handling both.

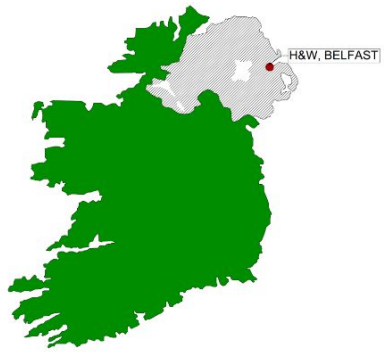


*Table 8-3: Existing Infrastructure H&W (*Building Dock)*

Critical Port Criteria	**Value**
Access Channel Width (m)	**93.0**
Access Channel Draft (m LAT)	**9.3 (main channel), 6.4 (building dock approach)**
Quay Draft (m LAT)	**6.4**
Quay Berth Length (m)	**556.0**
Quay Berth Width (m)	**N/A**
Quayside Bearing Capacity (t/m2)	**5.4**
Jack-Up Capabilities - (y/n)	**Yes**
Laydown Area (hectares)	**8.5**
Laydown Bearing Capacity (t/m2)	**5.4**
Air Gap Restrictions (y/n)	**Yes**
Potential Wet Storage Area (y/n)	**Limited**
Additional Criteria	
Pilot / Tug Support Available (y/n)	**Yes**
Slipway / Dry Dock Available (y/n)	**Yes**
RoRo Capabilities (y/n)	**In proximity**
Access to Transport Corridors (y/n)	**Yes**
Shore-to-ship Power (y/n) - (kW/Volts/Hertz)	**unknown**

BELFAST, HARLAND & WOLFF

Figure 8-5: Humber Gateway Substation Jacket Lifted by H&W Gantry Crane

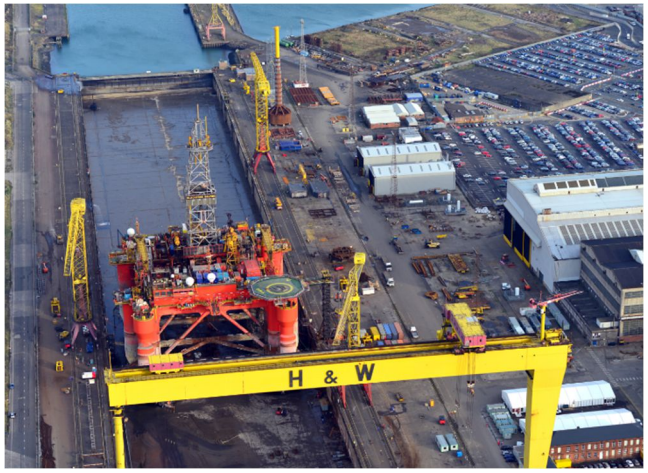


Figure 8-7: Blackford Dolphin Semi-submersible Rig in Building Dock

Main Features and Limitations (continued)

The H&W sites can offer a significant number of existing fabrication warehousing facilities with experience within the ORE, this is particularly advantageous when considering the possibilities for the supply chain within the floating sector. The site can boast manufacturing halls of circa 3 ha in area and 300t crane capacity.

There is excellent potential for use of the existing dry dock, given the scale of the structure for assembly of modular floating substructures. There is limited wet storage in the channel with some availability of layby docks, but no capacity for the wet storage of several completed units. The H&W site is also constrained by the proximity of Belfast City Airport. The limitations on the air draft would likely preclude tow out and storage of completed units (with WTG mated), and as such assembly of modular substructures may be the most suitable activity in relation to floating wind at H&W.

Proposed Redevelopment Plans

H&W have indicated plans for development to enhance the warehousing/fabrication/paint facilities. H&W also indicated they were also in consultation with 3rd party consultants in relation to shipyard regeneration plans.

Figure 8-6: Ship Repair Drydock and Craneage

Conclusion

The facility has significant previous experience with the ORE industry and has the capacity to support some fixed wind staging and marshalling. The site is limited by the degree of available laydown area to support staging of both foundations and turbines but could likely service one or the other. Given the proximity to the D1 terminal, there is potential for collaboration between the facilities.

The fabrication workshops, combined with the large Building Dock at the main site facility provide infrastructure for possible construction, and assembly of floating wind substructures. The site previously hosted semi-submersible oil rigs of a similar scale to the floating units anticipated (Figure 8-7).

With huge potential for floating wind across Ireland, the existing dry dock is a superb asset. However, the presence of Belfast City Airport within the harbour estate provides a significant air gap restriction. Should the air gap restrictions render turbine mating impossible in Belfast Harbour, there is an opportunity for H&W to support the assembly of modular substructure units (depending upon scale) prior to being transported to another location for turbine staging.

BREMORE

Port Overview	
Location	North East (Republic of Ireland)
Coordinates	54˚ 36’ N, 5˚ 54’ W
Ownership	Private: Drogheda Port Company (DPC) and Ronan Group Real Estates (RGRE)
Laydown & storage area (ha)	25 ha proposed as a minimum.
Strengths	Proximity to east coast sites. Purpose built infrastructure. Relatively deep water in proximity to shoreside.
Constraints	No material physical constraints at this stage although planning consent will be required adding complexity to the development plans.
Proximity to offshore renewable sites	In proximity to the majority of the east coast sites.
Main usage	None at present, but future facility will be a multi-modal deep-water port.
Experience of renewables section	Technical team are industry specialists.
Proximity of supply chain	Direct links to M1, M50 and Dublin/Belfast rail line.

Background

Bremore Ireland Port (BIP) is a new deepwater multi-modal energy port project that is currently working toward planning application submission. The first development phase is focussed on providing the offshore wind sector with lay down and assembly facilities built to industry requirements. Taking green electricity from offshore sites into a Green Hydrogen facility is a key part of the masterplan and offers a significant commercial opportunity. Bremore has the required hinterland connections, access to deep water, and is situated in a location ideal for regional economic development. The National Ports’ Policy lists Bremore as a project of scale in Ireland’s strategy to provide port infrastructure for the offshore wind industry.

The proposed ORE facility which will be completed as phase 1 will provide a large berthing length with a significant laydown area in proximity to the quay. The development will provide a minimum water depth of -11mCD in the berthing pocket and channel, the concept layout is included within Figure 8-10. The design and orientation will evolve as industry consultation and detailed site investigations progress.

Overview of Development

Drogheda Port Company is driving several development projects, both on the river Boyne and at a greenfield site north of Bremore Head. The river terminals will provide for additional port capacity and for O&M facilities to service nearby wind farms, offshore. The Bremore port provides new multi-modal capacity for larger vessels in the Greater Dublin transport node (Ten-T). The development location was chosen to balance the needs of the locality and the demands of the marketplace. Its location is also an ideal space for decarbonised transport logistics with direct onsite links to national road and rail networks.

Table 8-4: Proposed Infrastructure Bremore

Critical Port Criteria	Value
Access Channel Width (m)	**300.0**
Access Channel Draft (m LAT)	**11.0 (min)**
Quay Draft (m LAT)	**11.0 (min)**
Quay Berth Length (m)	**1300.0**
Quay Berth Width (m)	**To industry spec.**
Quayside Bearing Capacity (t/m2)	**To industry spec.**
Jack-Up Capabilities - (y/n)	**Yes**
Laydown Area Adjacent to Quay (hectares)	**25.0 (min)**
Laydown Bearing Capacity (t/m2)	**To industry spec.**
Air Gap Restrictions (y/n)	**No**
Potential Wet Storage Area (y/n)	**Yes**
Additional Criteria	
Pilot / Tug Support Available (y/n)	**Yes**
Slipway / Dry Dock Available (y/n)	**No**
RoRo Capabilities (y/n)	**Yes**
Access to Transport Corridors (y/n)	**Yes**
Shore-to-ship Power (y/n) - (kW/Volts/Hertz)	**Yes**

BREMORE

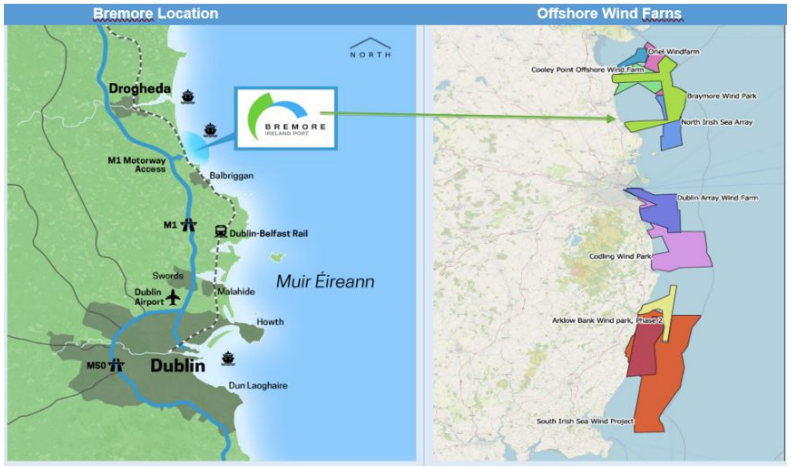


Figure 8-8: Proximity of Bremore to East Coast Wind Projects

Overview of Development (continued)

The Bremore deep-water port will provide the offshore wind sector with purpose-built infrastructure as well as strong demand for green energy and fuels. The initial construction phase will target high specification berths to facilitate staging and assembly of wind turbines, including berth beds suitable for repeated vessel 'jacking-up' operations.

Anticipated Timescales & Progress to Date

GDG are currently engaged as consulting engineers providing support for marine concept design and environmental services for the consenting process. The preliminary design stage including surveys to inform consents is targeting conclusion by Q2 2024. Roughan & O'Donovan are leading the shore side engineering works, whilst Brady Shipman Martin are undertaking the planning elements of the project. The planning submission is programmed for Q4 2024, aiming for approval by Q3 2026.

Anticipated Timescales & Progress to Date (continued)

Procurement and construction of the phase 1 works are proposed to be concluded by 2027 with the facility becoming operational thereafter. The phase 2 works, including for the provision of green hydrogen infrastructure, are proposed to be completed by 2029.

The project capital cost for phase 1 is estimated between €740-860 with a large proportion relating to the construction of the breakwaters and dredging works. Bremore Port indicated they have a funding programme in place and are eligible for EU supports as a Core port on the Ten-T network. The development vehicle is a public/private partnership with the capital resources to bring the project through planning. It is planned that the development costs will come from a blend of EU funding mechanisms, private sector funding/investment, further equity investments and appropriate debt instruments.

Figure 8-9: Hinterland Landside Connectivity for Bremore Facility

Conclusion

The project is now in the planning design phase and further consultation with the offshore wind farm industry is planned for Q3/Q4 2022. The timings of the development will be of key importance to ensure availability of the facility for Phase 1 and 2 projects. The Bremore leadership team which comprises a public/private partnership will likely be well positioned to deliver the infrastructure to meet market demand.

The geographic position of the facility is advantageous in relation to the east coast wind projects and the proposed facility will be well connected by both road and rail. Whilst it is most likely that the facility will target fixed wind given the east coast location, there is natural deep water in relative proximity. This would be suitable for wet storage of floating units with some dredging required to facilitate towing of units in and out of the port depending on the draft of the floaters.

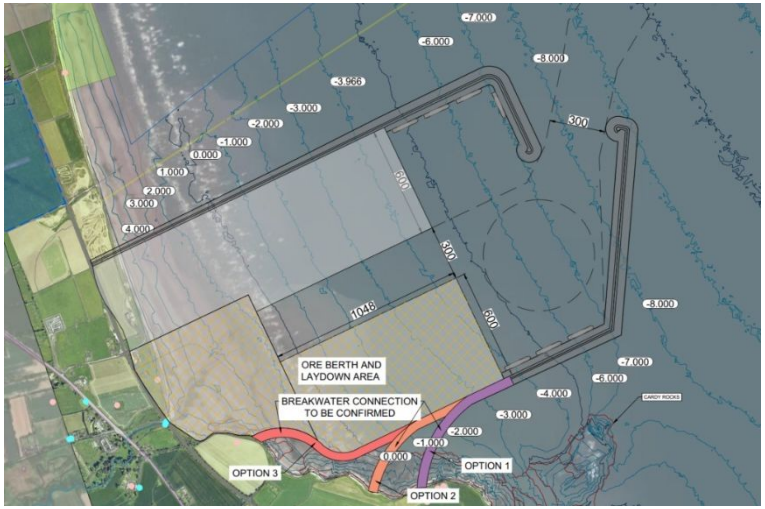


Figure 8-10: Proposed Bremore Development Concept Layout

ROSSLARE EUROPORT

Port Overview	
Location	South East (Republic of Ireland)
Coordinates	52˚ 15’ N, 6˚ 20’ W
Ownership	State Owned: Irish Rail
Laydown & storage area (ha)	7.2
Strengths	Experience with renewable sectors and adequate land connectivity. The port served as a construction base during the installation of Arklow Bank wind farm project – Phase 1.
Constraints	Relatively shallow water depth at berth, low bearing capacity at quay, and lack of jack up capability
Proximity to offshore renewable sites	Close to all the east coast projects (< 100 nautical miles), also in proximity of south coast projects.
Main usage	Ro-Ro, passenger and freight services.
Experience of renewables section	Arklow bank wind farm construction in 2003, handling 20 shipments of wind turbine blades and towers for assembly and subsequent deployment to Ireland’s only offshore wind farm project to date.
Proximity of supply chain	Several offshore companies within 15 minutes from the port offering training, fabrication and repairs.
Craneage capabilities	Crane hire available within port estate. Irish Rail can arrange heavy transport and craneage as necessary.

Background

Rosslare-Europort is in Co. Wexford in the southwest of Ireland and is operated by Irish Rail (Iarnród Eireann). It is classified as a Coastal Breakwater (CB) in the World Ports Index (2019). The port is well connected to the UK, the European mainland and is a hub of all the major Ro-Ro, passenger and freight services out of the southeast.

Main Features and Limitations

Rosslare Europort has a total laydown & storage area of 7.2 ha and a max. quay length of 215m. The port has several RoRo berths with the majority of the current business streams stemming from ferry and freight activity. Rosslare is well positioned relative to several proposed offshore renewable sites along the East Coast (within 100 nautical miles). The harbour has a number of quaysides, with the parameters included on the right pertaining to Berths 1 & 2 given these have the greatest functionality.

The current facility has limited potential to cater for staging and marshalling given the available laydown areas and low bearing capacity on the landside. There is currently no capacity for jack-up operations and the limited water depth would preclude larger offshore vessels from berthing. Whilst the facility was used previously for the Arklow Bank project, vessel and components are considerably larger in scale and the existing facilities would struggle to accommodate the increased requirements. However, Rosslare’s previous experience of the offshore wind industry is advantageous when considering future operations.

Given the limited water depths, quayside length and load capacity, floating wind is beyond the capacity of the existing facility.


Source: Port of Rosslare

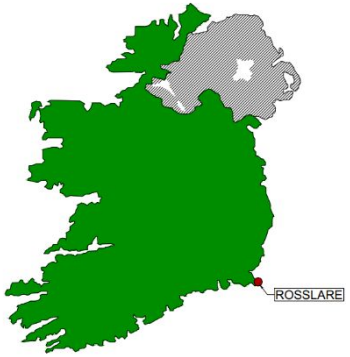


Table 8-5: Existing Infrastructure Rosslare

Critical Port Criteria	**Value**
Access Channel Width (m)	**150.0**
Access Channel Draft (m LAT)	**7.2**
Quay Draft (m LAT)	**7.2**
Quay Berth Length (m)	**221m (Berth 1), 215m (Berth 2)**
Quay Berth Width (m)	**15.0**
Quayside Bearing Capacity (t/m2)	**10.0**
Jack-Up Capabilities - (y/n)	**No**
Laydown Area Adjacent to Quay (hectares)	**5.4**
Laydown Bearing Capacity (t/m2)	**2.0**
Air Gap Restrictions (y/n)	**No**
Potential Wet Storage Area (y/n)	**No**
Additional Criteria	
Pilot / Tug Support Available (y/n)	**No**
Slipway / Dry Dock Available (y/n)	**Yes (small)**
RoRo Capabilities (y/n)	**Yes**
Access to Transport Corridors (y/n)	**Yes**
Shore-to-ship Power (y/n) - (kW/Volts/Hertz)	**No**

ROSSLARE EUROPORT

Proposed Redevelopment Plan

Rosslare have recently announced plans for the development of an offshore energy hub at the port including for a significant reclamation area, new quay length, dredging works and CTV berth. The proposed redevelopment will provide a new standalone quayside and landside area targeting use as an offshore staging and marshalling facility. A high-level concept layout is presented for clarity with the key parameters summarised in Table 8-6.

Rosslare Europort have previous experience of developing reclamation projects and are fortunate in that the site isn't overly sensitive in terms of environmental considerations. This should prove helpful in gaining the required consents for the marine works in a timely fashion.

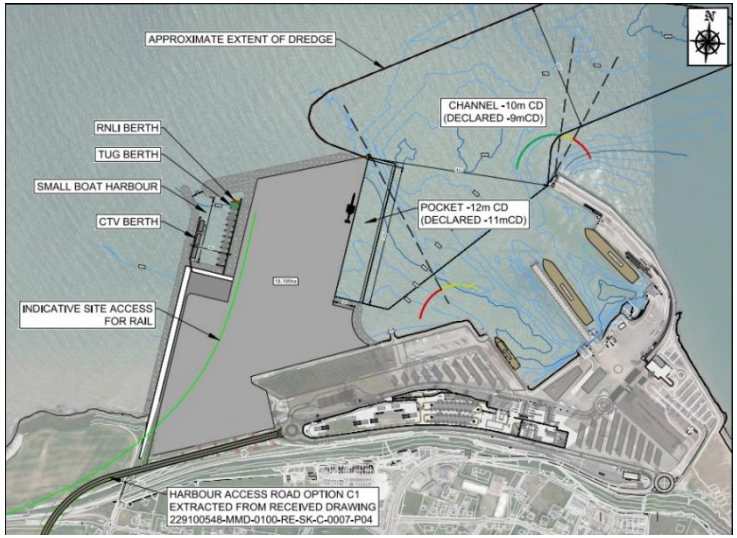


Figure 8-11: Proposed Rosslare Development Concept Layout

Table 8-6: Proposed Port Infrastructure Rosslare

Critical Port Criteria	Value
Access Channel Width (m)	**420.0**
Access Channel Draft (m LAT)	**9.0**
Quay Draft (m LAT)	**11.0**
Quay Berth Length (m)	**330.0**
Quay Berth Width (m)	
Quayside Bearing Capacity (t/m2)	**60 (heavy-lift) 10 (elsewhere)**
Jack-Up Capabilities - (y/n)	**Yes**
Laydown Area (hectares)	**20.0**
Laydown Bearing Capacity (t/m2)	**15.0**
Air Gap Restrictions (y/n)	**No**
Potential Wet Storage Area (y/n)	**No**
Additional Criteria	
Slipway / Dry Dock Available (y/n)	**Yes (small)**
RoRo Capabilities (y/n)	**Yes**

Figure 8-12: 3D Schematic of Concept Layout

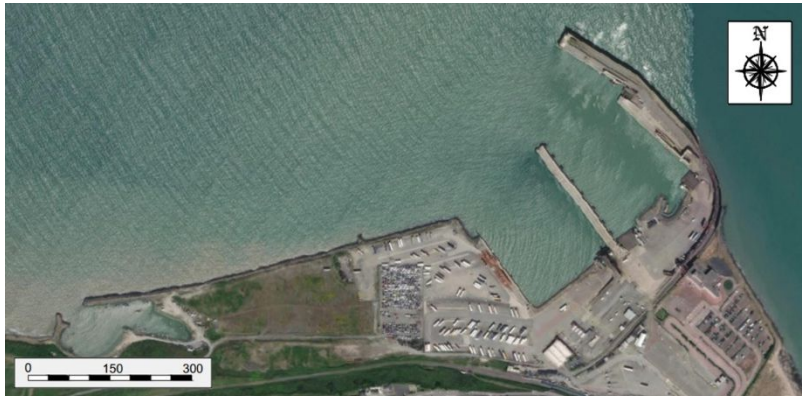
Anticipated Timescales & Progress to Date

GDG are currently engaged as consulting engineers providing both engineering and environmental services to Irish Rail for phases 1 & 2 of the redevelopment plans. Consents are being targeted for approval in Q4 of 2024, with construction commencing in Q2 2025 and finishing in Q4 of 2026. The total anticipated capital value of the works is estimated in the region of €200M. Irish Rail applied for CEF funding in Q1 of 2022 to support the development, however all of the Irish applications were rejected in July 2022. Rosslare intend to resubmit an application for the next opening in September 2022.

Conclusion

The current infrastructure at Rosslare, despite having catered to staging and marshalling in the past would struggle with the magnitude of vessel and components anticipated for the phase 1 & 2 projects.

Given the proximity to the east coast projects, fixed wind has been prioritised for the development. The final development will have water depth to accommodate most vessels anticipated for fixed installation and the new quayside and landside will provide adequate berthing lengths, load capacity and storage area making it an attractive prospect to host east coast site staging and marshalling.



CORK DOCKYARD

Port Overview	
Location	South (Republic of Ireland)
Coordinates	52˚ 35’ N, 09˚ 07’ W
Ownership	Private: Doyle Shipping Group Ltd- DSG
Laydown & storage area (ha)	Circa.13.5ha, DSG have additional 3ha at Passage West facility.
Strengths	Extensive quay length, minimum competing operations for existing landside areas, multiple slipways and an existing drydock.
Constraints	Depth at quay, quayside and landside bearing capacity.
Proximity to offshore renewable sites	Close to all potential wind sites on the east coast and southeast, in addition to relative proximity to southwest projects.
Main usage	Bulk material, project shipments, sawlogs, engineering works. Recently hosted pre-assembly of STS cranes.
Experience of renewables section	Experience with onshore wind sector and has track record of heavy civil works, including the assembly of large gantry cranes with similar requirements to jacket type foundations in a project completed for Liebherr. DSG Handled five projects in Belfast between 2013-2017, which were 8.25MW wind turbines.
Proximity of supply chain	Proximity to welders, technicians, fuel supply, electricity supply, etc.
Craneage capabilities	Mobile cranes up to 500t

Background

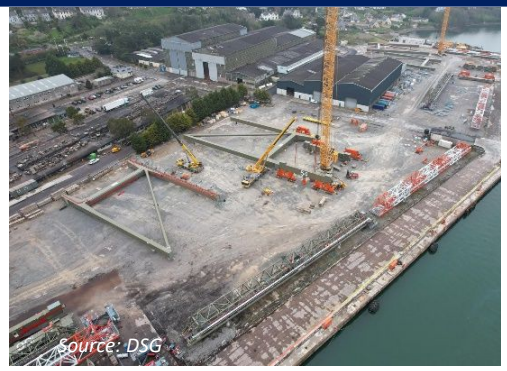
Cork Dockyard is located within Cork harbour in the south of Ireland, adjacent to Ringaskiddy, the main deepwater container terminal in Cork. The facility is accessed via a sheltered deepwater natural channel. Cork is classified as a River Natural (RN) port in the World Port Index (2019).

Main Features and Limitations

Cork Dockyard has a total laydown & storage area of approximately 13.5ha (this includes the footprint of existing buildings). There are three main quay lengths totalling 576m, including a continuous solid quay length of 250m, with a channel depth of 11m. Presently the dockyard offers a drydock structure and ship servicing facilities. There are two slipways with approximate dimensions of 200m x 40m. DSG have additional laydown area at the Passage West facility, which is circa 1.5 nautical miles from Cork Dockyard. However, this facility is more suited to O&M activities due to water depths.

At present the dockyard facility is hampered by limited water depths due to siltation along the berth and low load capacity on the quayside structures and laydown areas. Hosting of staging and marshalling for both fixed and floating installations at the current facility would likely be deemed unsuitable.

DSG have significant experience within the offshore sector having handled 5 offshore wind projects at the Belfast D1 facility. The existing site was recently used for the pre-assembly of Liebherr STS cranes (Ship-to-Shore Cranes) in May 2022.



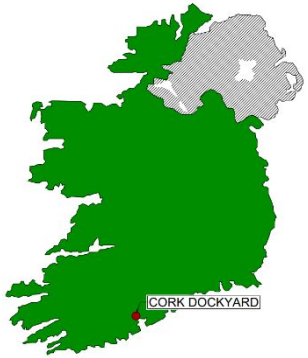


Table 8-7: Existing Infrastructure Cork Dockyard

Critical Port Criteria	**Value**
Access Channel Width (m)	**200.0**
Access Channel Draft (m LAT)	**11.2**
Quay Draft (m LAT)	**5.0-7.0**
Quay Berth Length (m)	**96.0/230.0/250.0**
Quay Berth Width (m)	**15.0**
Quayside Bearing Capacity (t/m2)	**2.0-7.0**
Jack-Up Capabilities - (y/n)	**Yes**
Laydown Area Adjacent to Quay (hectares)	**13.5**
Laydown Bearing Capacity (t/m2)	**2.7-5.4**
Air Gap Restrictions (y/n)	**No**
Potential Wet Storage Area (y/n)	**Limited**
Additional Criteria	
Pilot / Tug Support Available (y/n)	**Yes**
Slipway / Dry Dock Available (y/n)	**Yes**
RoRo Capabilities (y/n)	**No**
Access to Transport Corridors (y/n)	**Yes**
Shore-to-ship Power (y/n) - (kW/Volts/Hertz)	**Unknown**

CORK DOCKYARD

Proposed Redevelopment Plans

Cork Dockyard have indicated significant plans targeting the floating wind sector (with the ability to service fixed also). The ambitious plans propose to refurbish the existing quaysides, increasing the load capacity significantly and improving the landside bearing capacity. The plans also include for an element of dredging to allow for floating substructures to be pre-assembled at the quayside.
There is limited suitability of wet storage in the vicinity of the quayside and as such staging of an entire floating campaign may prove difficult given fully assembled units cannot be stored in proximity to the quayside prior to being towed out. Bantry Bay was proposed as a potential wet storage area, however this represents a significant tow distance to/from the quay. DSG suggested an area outside Roches Point which may be suitable. This would be a significantly shorter tow distance and improve the logistical suitability of the facility.

Anticipated Timescales & Progress to Date

The Masterplan has been outlined by engineering consultants in conjunction with financial consultants (2022). DSG are aiming to submit consent applications Q3 2023, targeting completion between 2027-2028. The capital value of the works is estimated in the region of €120m.

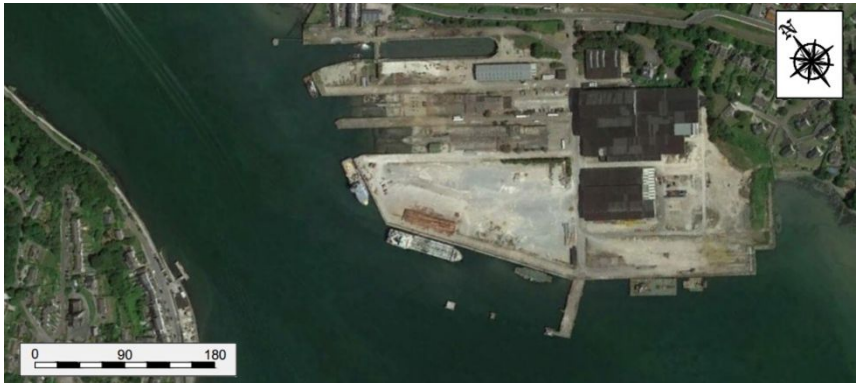
Table 8-8: Proposed Port Infrastructure Cork Dockyard

Critical Port Criteria	**Value**
Access Channel Width (m)	**200.0**
Access Channel Draft (m LAT)	**11.2**
Quay Draft (m LAT)	**8-12**
Quay Berth Length (m)	**225/260/225**
Quay Berth Width (m)	**30-50**
Quayside Bearing Capacity (t/m2)	**15-50**
Jack-Up Capabilities - (y/n)	**Yes**
Laydown Area (hectares)	**13.5**
Laydown Bearing Capacity (t/m2)	**15**
Air Gap Restrictions (y/n)	**No**
Potential Wet Storage Area (y/n)	**Yes**
Additional Criteria	
Slipway / Dry Dock Available (y/n)	**Drydock retained, slipway demolished**
RoRo Capabilities (y/n)	**No**

Conclusion

The Cork Dockyard existing infrastructure has limited capacity to offer staging and marshalling facilities given the constraints on water depth and load capacities of both the quayside and landside areas. However, the proposed development plans appear attractive for staging of both floating and fixed installations. The provision of suitable wet storage will be key for the staging of floating projects. DSG have indicated there are options for wet storage at both Bantry Bay and beyond Roches Point. The Roches point location would be more suitable logistically.

The location of Cork Dockyard is favourable to serve east and southeast installations and would likely be suitable for southwest projects. In addition to the favourable plans, DSG have significant experience within the offshore wind sector having handled several offshore wind projects at the D1 site in Belfast. DSG have also indicated plans for the Greenore site targeting O&M, further demonstrating a commitment to the offshore wind sector.



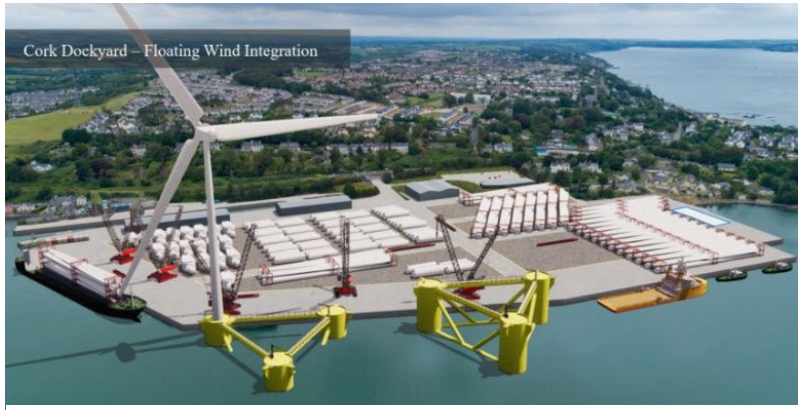


Figure 8-14: Concept Design 3D Imagery for WTG Mating (floating)

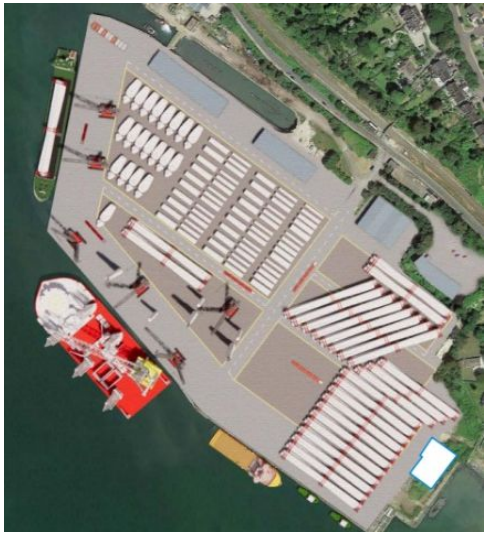


Figure 8-13: Concept Design 3D Imagery for WTG Marshalling

PORT OF CORK (RINGASKIDDY)

Port Overview	
Location	South (Republic of Ireland)
Coordinates	51˚ 48’ N, 8˚ 18’ W (Ringaskiddy)
Ownership	Port of Cork Company
Laydown & storage area (ha)	13 ha at new Ringaskiddy facility (pictured right), total 60 ha landside area.
Strengths	Naturally deep/protected port (dredging of Ringaskiddy development now allows for post panamax vessels to berth); good storage area, large quay length, and good connectivity.
Constraints	Conflicting usage, quayside load capacity.
Proximity to offshore renewable sites	Close to east coast, southeast and southwest projects.
Main usage	Lift-on Lift-off, Ro-Ro, liquid bulk, dry bulk, break bulk and cruise liners.
Experience of renewables section	Onshore wind turbines are handled on a regular basis at PoC. The Beaufort Research Laboratory is based at Ringaskiddy which hosts the SFI funded MarEI Research Centre and the LIR Ocean Test Facility.
Proximity of supply chain	On TEN-T corridor, DSG Cork Dockyard in close proximity.
Craneage capabilities	Liebherr LHM 550, 400,250 - 120/104/ 64t currently in use at Ringaskiddy DWB. Various large sized mobile cranes have been used previously at Ringaskiddy DWB.

Background

The Port of Cork is located on the south coast of Ireland and is accessed via a sheltered, deep-water natural harbour. It is classified as a River Natural (RN) port in the World Port Index (2019). The port consists of facilities at Cork City Quays, Tivoli, Ringaskiddy and Cobh, the port is also adjacent to Cork Dockyard. The port serves all six shipping modes i.e. Lift-on Lift-off, Ro-Ro, liquid bulk, dry bulk, break bulk and cruise liners.

Main Features and Limitations

For the propose of this study the new deepwater terminal located at Ringaskiddy has been assessed as the flagship facility having recently completed construction works to the value of €86m. The new facility has been considered as it offers significant laydown area in proximity to the quayside as would be required for staging and marshalling. The existing Deep-water Berth (DWB) is located opposite to the new berth and offers another large deep-water quayside.

The new Ringaskiddy facility offers a quayside length of 395m with 13 ha of laydown/storage area to the rear of the quay. This is in addition to the existing Deep-water Berth which can provide 485m of quay length with 13.4m water depth. The facility is equipped with Liebherr harbour mobile cranes and benefits from good road connectivity with access to N28 road.

Whilst the Ringaskiddy boasts excellent facilities, the terminal has several conflicting usages. The development of the new berth has mainly targeted the improvement of container shipping capabilities at the port. It is noted that the new Ringaskiddy facility has 13 ha of laydown adjacent to the new quay length, however there is circa 60 ha in total on the landside. This total area is of mixed use and is unlikely to be available exclusively for ORE activities, the area is typically used as a container laydown zone.

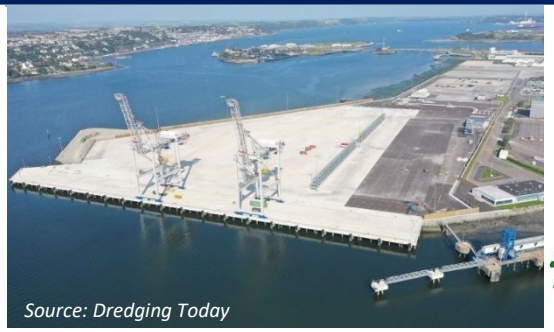

Source: Dredging Today

Table 8-9: Existing Infrastructure Port of Cork (Ringaskiddy – new deep-water facility)

Critical Port Criteria	**Value**
Access Channel Width (m)	**150.0**
Access Channel Draft (m LAT)	**11.0**
Quay Draft (m LAT)	**12.4**
Quay Berth Length (m)	**395.0**
Quay Berth Width (m)	**42.5**
Quayside Bearing Capacity (t/m2)	**5.0**
Jack-Up Capabilities - (y/n)	**No***
Laydown Area Adjacent to Quay (hectares)	**13.0**
Laydown Bearing Capacity (t/m2)	**5.1**
Air Gap Restrictions (y/n)	**No**
Potential Wet Storage Area (y/n)	**Yes**
Additional Criteria	
Pilot / Tug Support Available (y/n)	**Yes**
Slipway / Dry Dock Available (y/n)	**Yes**
RoRo Capabilities (y/n)	**Yes**
Access to Transport Corridors (y/n)	**Yes**
Shore-to-ship Power (y/n) - (kW/Volts/Hertz)	**No**

**Karst conditions in berth pocket likely unsuitable, further survey/investigation would be required to determine strength profile.*

PORT OF CORK (RINGASKIDDY)

Main Features and Limitations (continued)

Whilst the facility can boast relatively significant water depths at both the quayside and channel, there are limited areas for wet storage in direct proximity to the quay. POC have indicated that Anchorage B area as being at least partially available. Whilst this would likely be adequate in terms of size and depth, the location is circa 8 nautical miles (14.6km) from the POC quaysides. Given the proximity of Cork Dockyard some collaboration between the locations may be possible to serve the floating projects anticipated for the south and southwest coast.

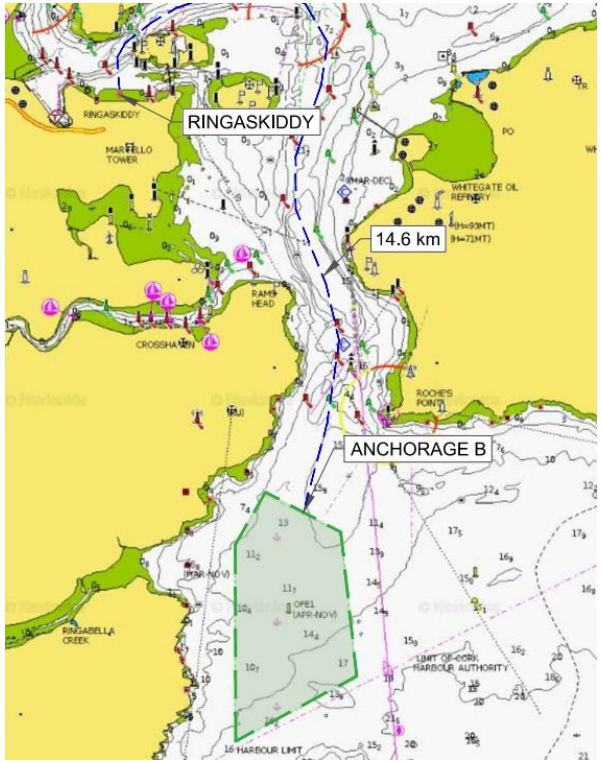


Figure 8-15: Anchorage B Relative to Quayside

Proposed Redevelopment Plans

The 2022 Port of Cork Masterplan has yet to be published, with this anticipated by Q3. However, POC have indicated that the Masterplan views the ORE sector as an integral part of the future for the Port of Cork. Plans are anticipated for the further extension of the capabilities at Ringaskiddy, with the existing Deep-water Berth (adjacent to the new terminal) proposed to be extended by 182m, and the berth pocket dredged at the quay face matching the 13.4m water depth at the existing quayside. POC have also indicated that Paddy's Point may be developed to increase the landside storage area adjacent to the new Ringaskiddy facility.

The high-level details released of the Masterplan indicated that several potential locations have been identified for development of ORE - Offshore Wind activities, as Marshalling and Assembly in the short-term and O&M in the longer-term.

Anticipated Timescales & Progress to Date

Given the Port of Cork masterplan has yet to be released in full, there is no indication of the timescales which POC may be targeting for any proposed development works. Further details will be understood on release of the full masterplan.

Conclusion

The new deepwater facility at Ringaskiddy offers excellent quay depth and length, vessel access, and significant storage area. For fixed-bottom wind, the facility has the potential to serve as a staging location for foundations or turbines but likely not both. It is noted that the quayside loading capacity is relatively limited by comparison to the minimum requested by the ORE industry. Ringaskiddy may have some potential as a floating wind staging location with wet storage available circa 8 nautical miles from terminal. Whilst this would be suitable for the wet storage of steel substructures, it would likely be too shallow for concrete types.

A notable constraint for the adoption of the port as a manufacturing/staging facility is the competing usage, including significant levels of container activity. However, it is encouraging that the 2022 Masterplan will highlight the ORE sector as key to the future of the port. Port of Cork have stated a desire to develop facilities for both staging and marshalling and O&M with locations under consideration at Ringaskiddy, Dognose Bay and Bantry Harbour.

Figure 8-16: Extension to Deepwater Berth Concept Plan

SHANNON ESTUARY (FOYNES)

Port Overview	
Location	West (Republic of Ireland),Shannon Estuary
Coordinates	52˚ 35’ N, 09˚ 07’ W
Ownership	Privately owned -Shannon Foynes Port Company Ltd.
Laydown & storage area (ha)	2 ha to rear of quayside, 10 ha in port area
Strengths	Proximity to potential offshore sites (floating wind, wave and tidal) along the west coast, in addition to extensive quayside length, laydown & storage area.
Constraints	Potential navigation constraints for heavy lift and jack-up vessels in the approach channel, limited bearing capacity at quayside, insufficient land connectivity.
Proximity to offshore renewable sites	Proximity to west, south west and south coast projects.
Main usage	Handling dry, liquid and break bulk.
Experience of renewables section	The port of Foynes has experience of handling large onshore wind turbine blades (75m) in the past.
Proximity of supply chain	Concrete manufacturing plant in close proximity of the port. Port is centrally located to main shipping channel for the west coast of Ireland and the US/ EU shipping lanes.
Craneage capabilities	1 Liebherr 100 (35 ton lift capacity, 30m reach), 1 Liebherr 420 (123 ton lift, 48m reach capacity), 2 Gottwald HMK 180 (64 ton lift, 40m reach).

Background

Shannon Foynes Port Company (SFPC) is located in the Shannon Estuary in the west of Ireland. It is classified as a River Natural port by the World Port Index (2019). The port is the second largest in Ireland comprising of the port of Foynes and Limerick Dock. Its main usage is catering for liquid bulk, dry bulk and break bulk.

Main Features and Limitations

Shannon Foynes existing infrastructure can offer a significant total quayside length of 560m between the East and West Jetty. The port is well situated to serve the west and southwest projects.

Whilst there is significant quay length, the facility is hampered by limited landside storage in proximity to the quayside, in addition to limited quayside and landside load capacities. At present the ground conditions within the berth pocket would preclude the safe mooring of jack-up vessels, with soft silt present at bed level. Despite the existing shortcomings, Shannon Foynes has access to excellent water depths within the Shannon Estuary, which could offer suitable wet storage if the infrastructure were improved.

Proposed Redevelopment Plans

Shannon Foynes have a number of plans to enhance the existing facilities at the port. Construction works began in Q1 2022 for the 120m extension of the existing East Jetty providing a connection with the West Jetty structure. The quay extension will bring the total available quay length at Foynes to 680m.

Table 8-10: Existing Infrastructure Shannon Foynes

Critical Port Criteria	**Value**
Access Channel Width (m)	**100.0**
Access Channel Draft (m LAT)	**7.8**
Quay Draft (m LAT)	**10.5**
Quay Berth Length (m)	**560.0**
Quay Berth Width (m)	**22/20m**
Quayside Bearing Capacity (t/m2)	**3.5-7.5t/m^2**
Jack-Up Capabilities - (y/n)	**No**
Laydown Area Adjacent to Quay (hectares)	**2ha (quayside), 10ha within port area**
Laydown Bearing Capacity (t/m2)	**7.5**
Air Gap Restrictions (y/n)	**No**
Potential Wet Storage Area (y/n)	**Yes**
Additional Criteria	
Pilot / Tug Support Available (y/n)	**Yes**
Slipway / Dry Dock Available (y/n)	**No**
RoRo Capabilities (y/n)	**No**
Access to Transport Corridors (y/n)	**Yes**
Shore-to-ship Power (y/n) - (kW/Volts/Hertz)	**No**

SHANNON ESTUARY (FOYNES)

Proposed Redevelopment Plans (continued)

There are additional plans to reclaim the area to the rear of the east jetty providing an additional 1.2 ha of landside storage at the rear of the quayside. SFPC also have plans to develop a 35-hectare green field site for a mix of open and covered storage at the Durnish lands. In addition to the existing facilities and redevelopment which will largely target the existing sectors, SFPC have indicated plans for a new deepwater facility at Foynes Island. A separate profile has been included for Foynes Island given it is specifically targeting the floating wind sector.

In June 2022, SFPC signed a memorandum of Understanding with Norwegian Offshore Wind [47]. Norwegian Offshore Wind is a cluster organisation seeking to deliver a strong global supply chain in offshore wind.

Table 8-12: Proposed Infrastructure Shannon Foynes

Critical Port Criteria	**Value**
Access Channel Width (m)	**100**
Access Channel Draft (m LAT)	**7.8**
Quay Draft (m LAT)	**10.5**
Quay Berth Length (m)	**680**
Quay Berth Width (m)	**22/20m**
Quayside Bearing Capacity (t/m2)	**3.5-7.5t/m^2**
Jack-Up Capabilities - (y/n)	**No**
Laydown Area (hectares)	**3.2ha (quayside), 10ha within port area**
Laydown Bearing Capacity (t/m2)	**7.5**
Air Gap Restrictions (y/n)	**No**
Potential Wet Storage Area (y/n)	**Yes**
Additional Criteria	
Slipway / Dry Dock Available (y/n)	**No**
RoRo Capabilities (y/n)	**No**

Figure 8-17: Location of Durnish Lands in Relation to Quayside

Anticipated Timescales & Progress to Date

All of the proposed development plans have been consented (planning and foreshore) as of Q2 2022. Construction of the East Jetty extension works started in Q1 of 2022 and are due to be completed in Q1 of 2023. The reclamation to the rear of the East Jetty commenced in Q1 2022 with completion anticipated in Q2 2023. The Durnish lands phase 1 commenced in Q1 2022 with a completion date of Q2 2024. The Phase 2 works will commence subject to commercial demand. The total value of the capital works for the developments at Foynes is not known.

Conclusions

Shannon Foynes is in a strong geographic position in relation to natural deep water and proximity to southwest projects. However, the existing infrastructure (including for the proposals underway) are not entirely suitable for fixed or floating staging or floating manufacture. Whilst Foynes inner port may not be suitable due to quayside and landside restrictions, SFPC have a number of additional sites across the estuary which could be developed to target the offshore wind industry.

There are several sites identified throughout the Shannon Estuary via the SIFP (Strategic Integrated Framework Plan) process which have significant land banks zoned for Marine Related Industry. These Strategic Development zones are prime development opportunities for the ORE sector and have been included in Figure 8-19. SFPC have engaged Bechtel to update the current Masterplan, Vision 2041, with a specific focus on the ORE sector and the opportunities within the Shannon Estuary. The updated document will be ready for publication in October 2022 and will provide a further roadmap of development opportunities for the ORE sector specific to the Shannon Estuary. An overview of the estuary map extracted from the Masterplan has been included overleaf for reference.

SHANNON ESTUARY (Masterplan Vision 2041)

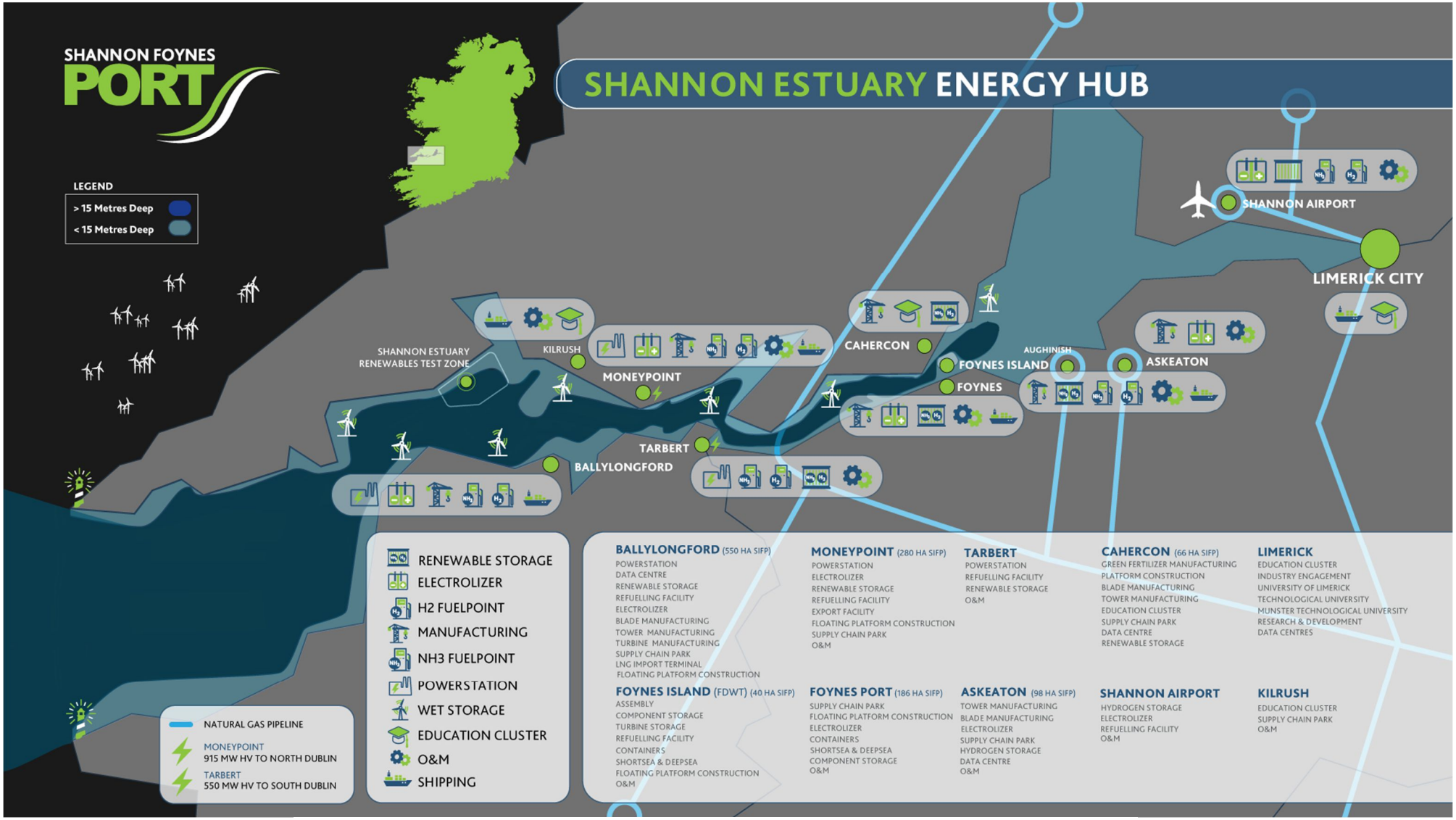


Figure 8-18: Shannon Estuary Masterplan Vision 2041 Layout Map

SHANNON ESTUARY (Strategic Development Lands)

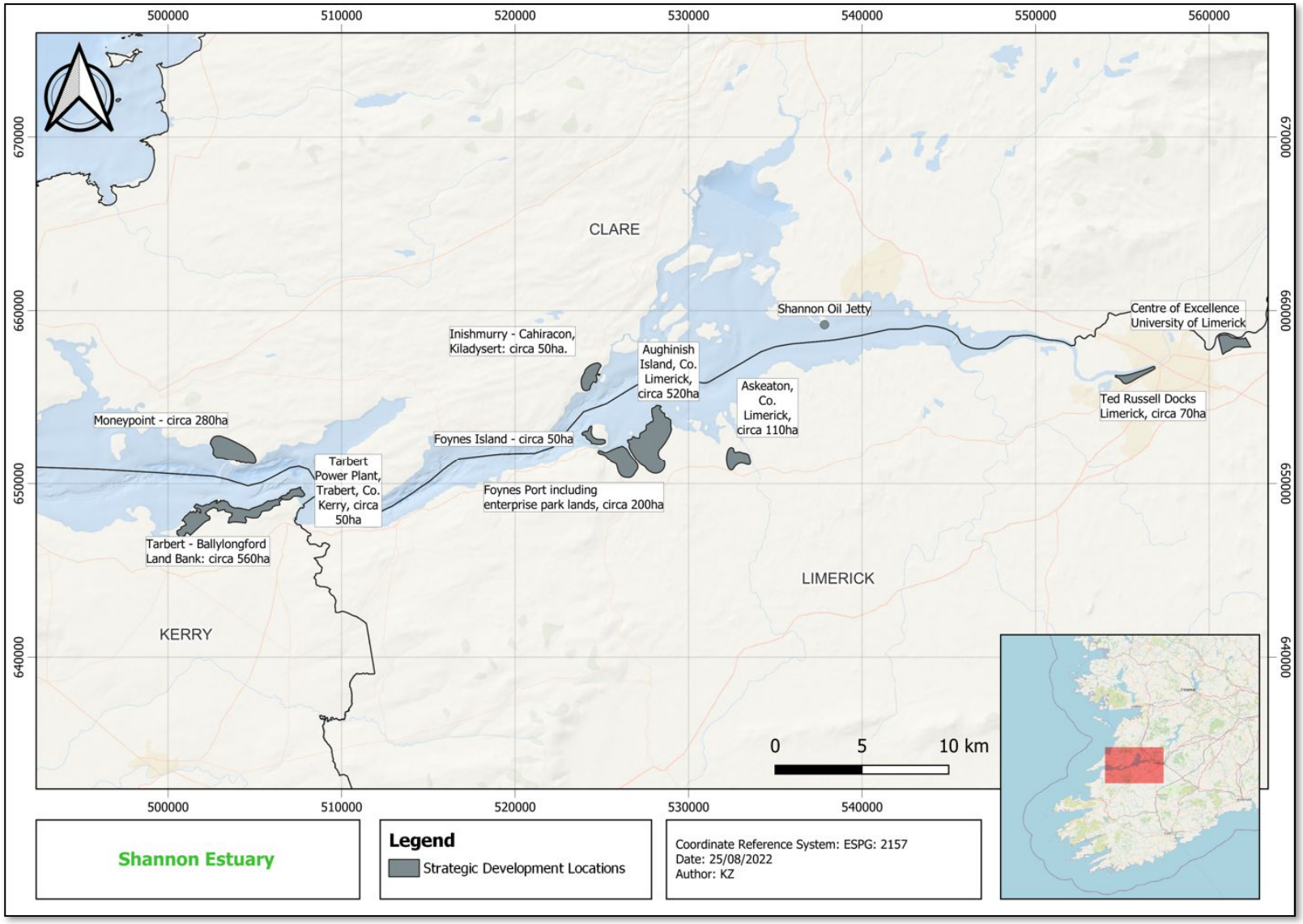


Figure 8-19 Shannon Estuary Strategic Development Lands

SHANNON ESTUARY (FOYNES ISLAND)

Proposed Redevelopment Plans

Outlined by the Vision 2041 Masterplan, SFPC are proposing to develop a significant deepwater facility on Foynes Island. The island is adjacent to the existing port infrastructure and is situated within the deep-water contours of the estuary. The Foynes Island deepwater facility will provide between 800-1000m of heavy-duty quayside, with 17.5m draft in the berth pocket and a heavy-duty hinterland area in the region of 25 ha.

There is significant deepwater within the Estuary channel, located adjacent to the proposed quayside, ideal for providing wet storage. Foynes Island is in relative proximity to the Moneypoint facility, with approximately 13 nautical miles between the locations within the Estuary.

Table 8-13: Proposed Infrastructure Foynes Island

Critical Port Criteria	**Value**
Access Channel Width (m)	**>200**
Access Channel Draft (m LAT)	**17.5-50**
Quay Draft (m LAT)	**17.5**
Quay Berth Length (m)	**800-1000**
Quay Berth Width (m)	**33**
Quayside Bearing Capacity (t/m2)	**50**
Jack-Up Capabilities - (y/n)	**Unknown**
Laydown Area (hectares)	**25 (min)**
Laydown Bearing Capacity (t/m2)	**50**
Air Gap Restrictions (y/n)	**No**
Potential Wet Storage Area (y/n)	**Yes**
Additional Criteria	
Slipway / Dry Dock Available (y/n)	**No**
RoRo Capabilities (y/n)	**No**

Proposed Redevelopment Plans (continued)

There is suitability for turbine staging of floating substructures at Foynes Island and potentially for substructure manufacture, depending on the final footprint of the new facility. Collaboration with Moneypoint is a potential option to maximum the opportunities in the estuary.

Anticipated Timescales & Progress to Date

SFPC appointed engineering and environmental consultants in March 2022 to deliver the project through planning and foreshore consenting. Works have commenced in Q2 2022 and lodgement of a planning/foreshore application is expected in Q2 of 2024. Construction works are expected to commence in late 2025/early 2026 for completion in late 2027/early 2028. The project represents €300m plus investment for SFPC.

Conclusions

The proposed plans for Foynes Island are significant and appear to be ideally suited to the deployment of floating wind, with potential to undertake both manufacture and staging of floating projects (depending on final footprint of site). The natural deep water would lend itself to the towing in/out of substructures (if manufactured elsewhere), and for wet storage of substructures both pre and post turbine mating.

Consenting of the project may prove challenging given the environmental sensitivity of the Shannon Estuary.

Figure 8-20: Proposed Concept Plan for Foynes Island

SHANNON ESTUARY (MONEYPOINT)

Port Overview	
Location	South West (Republic of Ireland)
Coordinates	52˚ 36' N, 09˚ 25' W
Ownership	Privately owned – ESB. Operated within the jurisdiction of SFPC.
Laydown & storage area (ha)	Circa 30 ha to rear of quay (entire site circa 180 ha, including plant)
Strengths	Deepwater quayside, extensive landside, wet storage.
Constraints	Exclusively in use as a powerplant until decommissioning.
Proximity to offshore renewable sites	Proximity to offshore sites along the west and southwest coast. Potential to serve floating projects on east coast if closer suitable facilities are not available.
Main usage	Jetty exclusively used for coal importation.
Experience of renewables section	The facility has no renewables experience. However, ESB as owners and operators have significant offshore wind experience (such as Galloper, Neart na Gaoithe and Inch Cape)
Proximity of supply chain	Port is centrally located to main shipping channel for the west coast of Ireland and the US/ EU shipping lanes.
Craneage capabilities	2 x 40t STS Gantry Cranes.

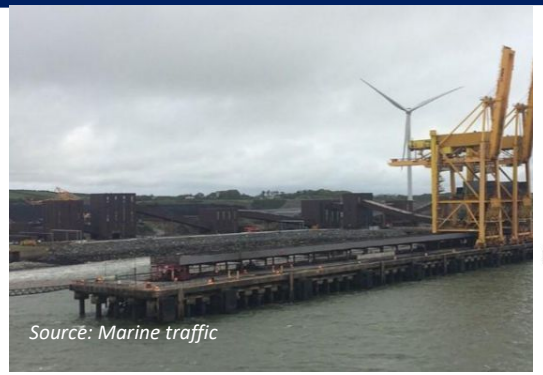
Background

Moneypoint port/Jetty is located on the northern shore of the Shannon Estuary in Co. Clare, approximately 3 km west of Killimer and 6 km south-east of Kilrush. The Jetty is part of the coal fired power plant site which was acquired by ESB in 1970s as part of its strategy to diversify from oil dependent electricity generation. Currently the existing jetty accepts coal and oil import for use at the power plant, which is intending to phase out coal burning by 2025. The Moneypoint site currently houses Ireland's largest electricity generating station in Ireland, with three 305 MW rated units. In addition to the power generation units, the site houses a coal storage yard to the east of the power plant, and an ash storage yard to the north of the site and the N67 access road.

Main Features and Limitations

Moneypoint is situated in proximity to the west and southwest coast projects, with a strategic location within the Shannon Estuary. The existing jetty provides 380m of berthing length and services vessels up to 275,000 dwt, with water depth of 25m at the quayside. The jetty is connected to the landside by a 105m long approach trestle carrying a roadway, conveyor housing, oil and water pipeline and electrical cabling. The jetty, whilst suitable for current operations, does not lend itself to the handling of large items such as turbine elements or foundations given the narrow access structure, limited load rating and lack of laydown directly adjacent.

The quayside benefits from excellent deep water and proximity to the naturally deep channel which would provide suitable area and draft to allow for storage of floating structures. However, at present marine operations at the site are limited to coal importation. The laydown bearing capacity at the hinterland is currently unknown.


Source: Marine traffic

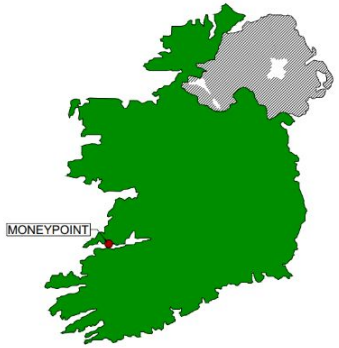


Table 8-14: Existing Infrastructure Moneypoint

Critical Port Criteria	Value
Access Channel Width (m)	**N/A**
Access Channel Draft (m LAT)	**20.0**
Quay Draft (m LAT)	**25.0**
Quay Berth Length (m)	**380.0**
Quay Berth Width (m)	**33.0**
Quayside Bearing Capacity (t/m2)	**15.0**
Jack-Up Capabilities - (y/n)	**No**
Laydown Area Adjacent to Quay (hectares)	**30.0**
Laydown Bearing Capacity (t/m2)	**unknown**
Air Gap Restrictions (y/n)	**No**
Potential Wet Storage Area (y/n)	**Yes**
Additional Criteria	
Pilot / Tug Support Available (y/n)	**Yes**
Slipway / Dry Dock Available (y/n)	**No**
RoRo Capabilities (y/n)	**No**
Access to Transport Corridors (y/n)	**Yes**
Shore-to-ship Power (y/n) - (kW/Volts/Hertz)	**No**

SHANNON ESTUARY (MONEYPOINT)

Table 8-15: Proposed Infrastructure Moneypoint

Critical Port Criteria	Value
Access Channel Width (m)	**>200.0**
Access Channel Draft (m LAT)	**15-50**
Quay Draft (m LAT)	**15-20**
Quay Berth Length (m)	**800.0**
Quay Berth Width (m)	**TBC**
Quayside Bearing Capacity (t/m2)	**50.0**
Jack-Up Capabilities - (y/n)	**No**
Laydown Area (hectares)	**44.0-77.0**
Laydown Bearing Capacity (t/m2)	**50.0**
Air Gap Restrictions (y/n)	**No**
Potential Wet Storage Area (y/n)	**Yes**
Additional Criteria	
Slipway / Dry Dock Available (y/n)	**No**
RoRo Capabilities (y/n)	**TBC**

Proposed Redevelopment Plans

ESB are proposing to develop the existing site to specifically target floating wind. The new facility will make use of the site when the existing powerplant is decommissioned.

The proposed facilities will have the suitability to cater for floating wind manufacture and staging, with the site offering significant landside areas. The exact nature of the operations proposed will be determined when projects specifications are more defined. The facility is proposed to provide 800m of new quay berthing length, with a reclamation area to the rear. The site is currently hoping to provide a minimum of 44 ha landside area with the potential to develop a further 33 ha to the west of the existing power station (potential total of 77 ha).

The quayside and landside area will be designed to cater for significant load capacity and the floating wind site can exploit the natural deep-water to provide significant wet storage areas. Moneypoint benefits from proximity to an established grid connection. Given the location and proximity to Foynes Island, collaboration between the two facilities is a possibility.

Anticipated Timescales & Progress to Date

ESB have indicated they will be targeting planning permission approval for Q1/Q2 2025 with work currently ongoing in preparing concept designs and the required surveys. On receipt of the required consents, construction is anticipated to commence in Q2 2025 and finish in Q1/Q2 2027, with the facility being operational by Q2 2027. Capital works for the new facility are estimated as >€180M at concept stage.

Conclusion

Moneypoint at present is still in use as a coal fired power plant with decommissioning proposed for 2025. The proposed facilities for the site post decommissioning are targeting the floating wind sector and the final proposed infrastructure will be suitable for both the manufacture and staging. The Shannon Estuary offers excellent natural water depths in proximity to the site. The natural contours will result in minimum dredging works to provide the required water depths at the quayside and in the channel for wet storage areas. The positioning of the facility will suit the construction of the west and south coast projects. Moneypoint are in an advantageous position given the proximity of a suitable grid connection.

Figure 8-21: High Level Concept Layout for Moneypoint

PORT OF GALWAY

Port Overview	
Location	West (Republic of Ireland)
Coordinates	53˚ 16’ N, 9˚ 02’ W
Ownership	Private: Galway Harbour Company
Laydown & storage area (ha)	Limited at quayside, 10 ha 800m from quay.
Strengths	Proximity to offshore resource along the Atlantic corridor.
Constraints	Navigational restrictions, limited available laydown at quayside.
Proximity to offshore renewable sites	In proximity to west coast projects.
Main usage	Handling steel, projects cargo, petroleum, RDF cargoes, bitumen, and limestone.
Experience of renewables section	The port has extensive experience within the onshore wind sector and has handled various wind turbine projects for Siemens, Enercon and Nordex (current project). By the end of 2022, Port of Galway will have been responsible for the deployment of 450MW of onshore wind. The port also serves as the primary base for the Marine Institute and hosts foreign marine research vessels on an annual basis.
Proximity of supply chain	Several in proximity including; Ocean Crest Marine – Ireland’s largest jack-up pontoon located at the Port, Rynn Engineering – Fabrication engineering workshop, Ondine – Marine Survey Company, Bluewise Marine – onsultancy for marine tech, Geomara – Geotechnical survey company, Wood - Engineering and technical services to energy industry.

Background

The Port of Galway is located in the west of Ireland and is privately owned by the Galway Harbour Company. The port is sheltered within the east corner of Galway Bay and has multiple quays which are all located in the city centre. The port is classified as a River Tide Gate (RT) port by the World Port Index (2019). The port’s main use is handling steel, petroleum, RDF cargoes, project cargoes, bitumen and limestone. Port of Galway is also the cargo port for the Aran Islands and caters for a ferry service running to the islands.

Main Features and Limitations

The Port of Galway is the closest large port to the west coast wind resource including Sceirde Rocks. The Port of Galway’s quayside and storage areas have reasonably good bearing capacities, however there is limited laydown area in proximity to the quay. The quayside is further constrained by the quayside and channel water depth, in addition to the entrance through the lock gate which limits the vessel beam to 19.8m. At present the existing facility relies on the tidal variation for movement of certain vessels in and out of the basin. The Port owns and operates two cranes; one is fixed boom and the other is a wire rope machine. Larger cranes are hired as required.

The port has significant experience within the onshore wind energy industry. In the period from 2014 to 2021, Galway handled 14% of Irish onshore wind deployment.

Table 8-16: Existing Infrastructure Galway

Critical Port Criteria	**Value**
Access Channel Width (m)	**80.0**
Access Channel Draft (m LAT)	**3.4**
Quay Draft (m LAT)	**3.6**
Quay Berth Length (m)	**164.0**
Quay Berth Width (m)	**15.0**
Quayside Bearing Capacity (t/m2)	**12.0**
Jack-Up Capabilities - (y/n)	**Yes**
Laydown Area Adjacent to Quay (hectares)	**Limited**
Laydown Bearing Capacity (t/m2)	**10.0**
Air Gap Restrictions (y/n)	**No**
Potential Wet Storage Area (y/n)	**No**
Additional Criteria	
Pilot / Tug Support Available (y/n)	**Pilot no tugs**
Slipway / Dry Dock Available (y/n)	**Slipway**
RoRo Capabilities (y/n)	**Yes**
Access to Transport Corridors (y/n)	**Yes**
Shore-to-ship Power (y/n) - (kW/Volts/Hertz)	**Planned installation imminent**

PORT OF GALWAY

Main Features and Limitations (continued)

The port also serves as the primary base for the Marine Institute which include testing of wave devices (¼ scale) as the part of the Smart Bay project.

Proposed Redevelopment Plans

Port of Galway have significant development plans for the port area. Development plans for Galway have been in circulation for several years but have yet to receive planning permission. The current proposed scheme will provide significant upgrades with over 20 ha of reclamation planned for phase 1, in addition to 660m of new quayside.

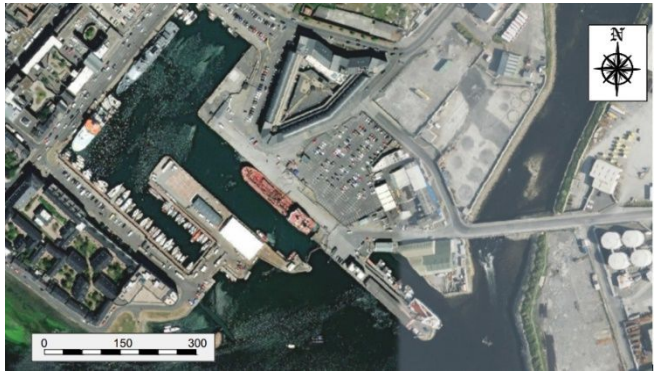
It is unlikely that the entirety of the proposed reclamation would be made available for the offshore wind industry, with a degree of this anticipated to be dedicated to other uses including the existing port business streams. Given the anticipated limits on the available laydown areas, it is likely that the redeveloped port may only be suitable for staging/marshalling of either foundations, or turbines but not both given the space requirements indicated by industry. In terms of suitability for floating wind, the proposed quayside depth would be suitable for mating of topsides for certain types of substructure, with concrete semi-sub types likely unsuitable for the proposed -10mCD channel depth. Whilst there is no suitable area for wet storage in proximity of the quaysides a possible location has been identified circa 7.5 nautical miles from the port.

Anticipated Timescales & Progress to Date

The redevelopment plans have been submitted for planning approval, with Port of Galway suggesting a decision may be made by June 2023. Should the planning permission be granted within the timescales anticipated, construction would be proposed to be completed by Q4 of 2027. The current estimate for the phase 1 capital works is €120m.

Table 8-17: Proposed Infrastructure Galway

Critical Port Criteria	Value
Access Channel Width (m)	**100.0**
Access Channel Draft (m LAT)	**10.0**
Quay Draft (m LAT)	**12.0**
Quay Berth Length (m)	**660.0**
Quay Berth Width (m)	**50.0**
Quayside Bearing Capacity (t/m2)	**15.0**
Jack-Up Capabilities - (y/n)	**Yes**
Laydown Area (hectares)	**20.0**
Laydown Bearing Capacity (t/m2)	**12.0**
Air Gap Restrictions (y/n)	**No**
Potential Wet Storage Area (y/n)	**Yes**
Additional Criteria	
Slipway / Dry Dock Available (y/n)	**Yes (existing)**
RoRo Capabilities (y/n)	**Yes**



Conclusion

Port of Galway offers relatively good bearing capacity at the existing quayside and a moderate existing quay length. However, the navigational constraints, pose serious challenges for use by modern offshore wind construction vessels. The port would require major upgrades in order meet the demand of future offshore wind projects for staging and marshalling. Significant proposals are planned for Galway, with large areas of reclamation and new heavy duty quay part of the proposals. The proposals have yet to earmark uses for the landside areas, but it is unlikely that all of the 20 ha would be dedicated to offshore wind. The water depths proposed would likely suit fixed-bottom deployment rather than floating, but this would be dependent on the type of substructure proposed.

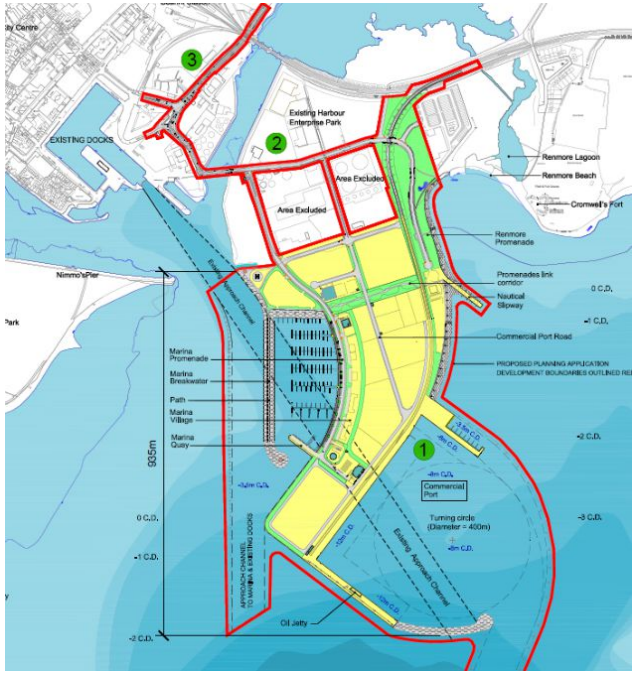


Figure 8-22: Layout of Galway Proposed Redevelopment

ROS AN MHÍL HARBOUR

Port Overview	
Location	North West (Republic of Ireland)
Coordinates	53˚ 16’ N, 09˚ 33’ W
Ownership	Publicly Owned (Department of Agriculture, Food and the Marine: DAFM)
Laydown & storage area (ha)	0.5
Strengths	Proximity to offshore resource along the Atlantic corridor
Constraints	Navigational restrictions, very little laydown area, load capacities of quay and laydown area unknown.
Proximity to offshore renewable sites	Proximity to offshore sites along the west coast.
Main usage	Fishing fleets, ferries to Aran Islands.
Experience of renewables section	None.
Proximity of supply chain	None.
Craneage capabilities	None on site, available from local contractors for hire.

Background

Ros An Mhíl Harbour is located on the North East shore of Cashla Bay near the village of Ros An Mhíl. The existing harbour is used to serve the Irish and foreign fleets that currently fish off the coast of Galway, in addition to acting as the main ferry port for foot passengers travelling to the Aran Islands. There is also a small craft harbour to the north of the Aran Island Ferry berths. Recently, there was an extension to the small craft harbour which is well utilised year-round. There are several localised industries surrounding Ros An Mhíl harbour such as fish processing plants, boat repairs and diesel and oil supply companies.

Main Features and Limitations

The existing infrastructure at Ros An Mhíl is relatively limited, with little available laydown area and shallow water depth in the berthing pocket and approach. The existing quayside loading capacity is also unknown, making it impossible to state if the quay would be suitable for handling of offshore components. At present the exiting berthing pocket at the quayside would be unsuitable for the use of jack-up vessels. In addition to the limitations stated, the existing infrastructure is heavily used by the fishing industry, and it would be difficult to see how offshore wind could be accommodated on the existing quays without displacing existing stakeholders.

Despite the limitations, Ros An Mhíl is positioned in proximity to the proposed Sceirde Rocks installation.

Proposed Redevelopment Plans

DAFM are currently pursuing development plans for a new 200m deepwater quay at Ros An Mhíl, with -10mCD berth pocket and -7mCD approach channel. The works will also provide circa 3 ha of laydown area with 5t/m^2 load rating.

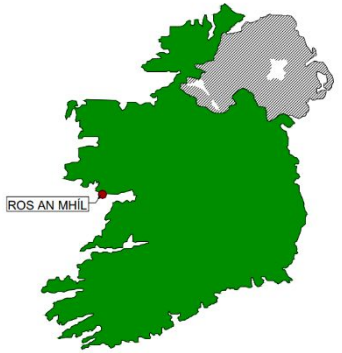


Table 8-18: Existing Infrastructure Ros An Mhíl

Critical Port Criteria	**Value**
Access Channel Width (m)	**300**
Access Channel Draft (m LAT)	**3.7**
Quay Draft (m LAT)	**4.2**
Quay Berth Length (m)	**380 (across 3 main quaysides)**
Quay Berth Width (m)	**15**
Quayside Bearing Capacity (t/m2)	**Unknown**
Jack-Up Capabilities - (y/n)	**No**
Laydown Area Adjacent to Quay (hectares)	**0.5**
Laydown Bearing Capacity (t/m2)	**Unknown**
Air Gap Restrictions (y/n)	**No**
Potential Wet Storage Area (y/n)	**No**
Additional Criteria	
Pilot / Tug Support Available (y/n)	**Yes**
Slipway / Dry Dock Available (y/n)	**Yes**
RoRo Capabilities (y/n)	**No**
Access to Transport Corridors (y/n)	**40min from Galway**
Shore-to-ship Power (y/n) - (kW/Volts/Hertz)	**Yes**

ROS AN MHÍL HARBOUR

Proposed Redevelopment Plans (continued)

The new facility has been proposed due to the lack of deepwater quaysides in the harbour and has largely been driven by the needs of the fishing industry, with any potential ORE involvement likely to be competing for use of the new quayside and laydown areas. Beyond competing usage, the facilities are being designed to suit the fishing industry and as such are largely unsuitable for staging and marshalling as a solo offering. There may be an opportunity for collaboration with ports in relative proximity such as Galway and Killybegs to service projects through a multi-port approach. It is not within the typical remit of DAFM to support the ORE sector so the availability of the facility for this activity is currently unknown.

In August 2022, Údarás na Gaeltachta, the state agency responsible for the Gaeltacht region announced a Strategic Enterprise Zone event to meet with interested parties in respect of servicing the ORE industry. The event is proposed as part of the "Vision for Ros An Mhíl 2037". This is an interesting development and an indication of an understanding of the regional development opportunities.

Anticipated Timescales & Progress to Date

As Ros An Mhíl is under the control of the Department of Agriculture, Food and the Marine no Foreshore Licence was required for the scheme. The proposed works received planning approval from Galway Co. Council in 2018, with a recent required for extension of the permission declined, the existing permission will lapse in 2023, works are expected to have commenced by this stage. Engineering consultants were appointed by DAFM in Q2 of 2022 for the detailed design phase of the project. Construction is programmed to start in Q3 of 2022, finishing in Q2/3 of 2024.

Table 8-19: Proposed Infrastructure Ros An Mhíl

Critical Port Criteria	Value
Access Channel Width (m)	**300.0**
Access Channel Draft (m LAT)	**7.0**
Quay Draft (m LAT)	**10.0**
Quay Berth Length (m)	**200.0**
Quay Berth Width (m)	**30.0**
Quayside Bearing Capacity (t/m2)	**5.0**
Jack-Up Capabilities - (y/n)	**Yes**
Laydown Area (hectares)	**3.0**
Laydown Bearing Capacity (t/m2)	**5.0**
Air Gap Restrictions (y/n)	**No**
Potential Wet Storage Area (y/n)	**No**
Additional Criteria	
Slipway / Dry Dock Available (y/n)	**No**
RoRo Capabilities (y/n)	**No**

Conclusion

Ros An Mhíl Harbour at present has limited suitable infrastructure to accommodate staging and marshalling of offshore wind. The harbour is constrained by the limited water depth and competing use from the fishing industry. Whilst development plans are relatively well progressed in terms of moving through detailed design stage toward construction, the proposed facilities will be designed to suit the requirements of the current fishing fleet. Consequently, the parameters fall short of the requirements for both staging of fixed and floating projects. Restrictive load capacities of the quayside and limited laydown areas make Ros An Mhíl an unrealistic proposition as a solo staging and marshalling port, despite being advantageously positioned in relation to west coast projects with relatively good water depth. There is potential for collaboration with neighbouring ports to support staging activities.

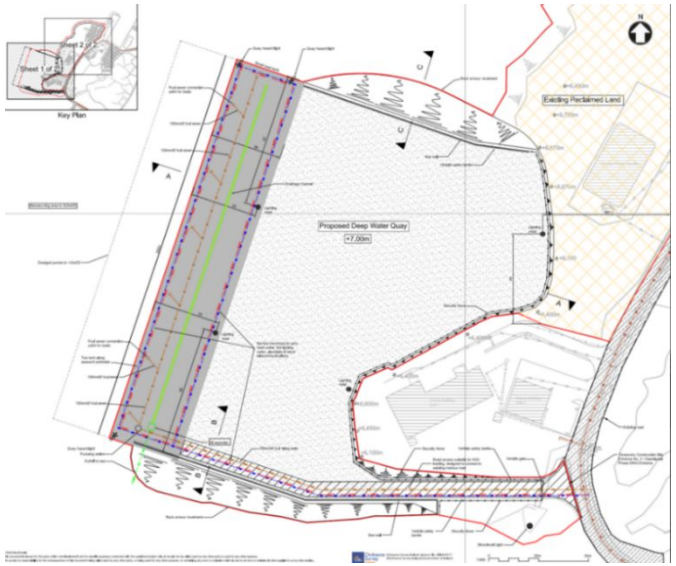


Figure 8-23: Planning Layout for Ros An Mhíl New Facility

KILLYBEGS HARBOUR CENTRE

Port Overview	
Location	North West (Republic of Ireland)
Coordinates	54˚ 37’ N, 8˚ 26’ W
Ownership	Publicly Owned (Department of Agriculture, Food and the Marine: DAFM)
Laydown & storage area (ha)	Circa 4.0 in proximity to main quayside, with 8.0 in total.
Strengths	Sheltered natural harbour, deep water depth at quay and approach channel, significant quay length & skilled labour
Constraints	Competing use during winter months (fishing industry)
Proximity to offshore renewable sites	West coast projects (north zone), future potential Northern Irish sites.
Main usage	Fishing Industry and unloading/loading of cargo.
Experience of renewables section	Handled large volumes of wind turbine components for various onshore wind farms, working with Enercon, Nordex, Siemens, GE, Vestas etc. The port has also serviced vessels from the oil and gas industry
Proximity of supply chain	Good vessel service industry available in Killybegs. Shipping Agents available locally with significant supply chain experience in energy area. Killybegs Marine Cluster represents 20+ business contributing to several areas including ORE.
Craneage capabilities	Crane hire available in proximity to the port.

Background

Killybegs Fisheries Harbour Centre (FHC) is located in Co. Donegal in the north-west of Ireland. The deepwater harbour is classified as a Coastal Natural (CN) port by the World Port Index (2019). The facility is run by the Department of Agriculture, Food and the Marine (DAFM). It is primarily a fishing port (largest fisheries port in Ireland) but also handles dry and break bulk, manufactured goods, containers and project cargoes.

Main Features and Limitations

Killybegs FHC offers a total laydown area of circa. 4 ha (in proximity to the main quayside) and has two berths with quay lengths of 300 and 250 m, and quayside depths of 12m and 9m, respectively, with jack-up capability. There is also 730m in the inner harbour which is mostly used by the fishing industry. The port has a syncrolift (650t), plus a 35m x 20m slipway. The port is home to ship building and repair companies, with skilled labour in proximity to the port. A concrete manufacturing plant is located within 5km of the harbour.

The port is well connected to the National Road – N56. As the largest port facility in the northwest, Killybegs is well positioned to service potential offshore wind sites on the west coast, as well as future NI projects off the north coast.

Despite the favourable water depths and quay lengths, in addition to the skilled workforce, Killybegs is constrained by the limited laydown area in proximity to the quayside and by the landside bearing capacity. Killybegs has excellent potential with deep water in proximity to the quaysides ideal for wet storage. Limited, but focused development could transform the harbour for the offshore sector should there be the appetite.

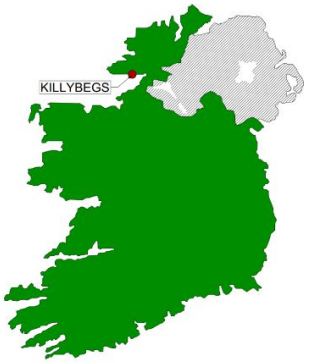


Table 8-20: Existing Infrastructure Killybegs

Critical Port Criteria	**Value**
Access Channel Width (m)	**250.0**
Access Channel Draft (m LAT)	**12.0**
Quay Draft (m LAT)	**9-12**
Quay Berth Length (m)	**450 total (over two main quays)**
Quay Berth Width (m)	**27.0**
Quayside Bearing Capacity (t/m2)	**7.0**
Jack-Up Capabilities - (y/n)	**Yes**
Laydown Area Adjacent to Quay (hectares)	**Circa 4.0**
Laydown Bearing Capacity (t/m2)	**2.0**
Air Gap Restrictions (y/n)	**None**
Potential Wet Storage Area (y/n)	**Yes**
Additional Criteria	
Pilot / Tug Support Available (y/n)	**Yes**
Slipway / Dry Dock Available (y/n)	**Yes**
RoRo Capabilities (y/n)	**No**
Access to Transport Corridors (y/n)	**Yes**
Shore-to-ship Power (y/n) - (kW/Volts/Hertz)	**No**

KILLYBEGS HARBOUR CENTRE

Proposed Redevelopment Plans

The current quay is being extended by 120m to increase the quay length from 450m to 570m. The new quay length has been designed to match the existing quayside design criteria and will cater for vessels up to 200m length and 40,000dwt. As part of the works shore-to-ship power will be provided within the new quay length.

In June 2022, Killybegs Fishermens Organisation announced details of a memorandum of understanding with Sinbad Marine Services Ltd and Swedish developer Hexicon to develop a floating wind farm off the Donegal coast [48]. The move from the local supply chain indicates an understanding of the potential for floating wind off the west coast, in addition to the natural potential at Killybegs harbour.

Anticipated Timescales & Progress to Date

The works are currently going through tender stage with expected construction commencing Q3 2022 (contract award expected in July 2022). The estimated timeline for construction is 6-9 months. The capital value of the works €15m.

Figure 8-24: Killybegs Quayside Handling Onshore WTG Towers

Table 8-21: Proposed Upgraded Infrastructure Killybegs

Critical Port Criteria	**Value**
Access Channel Width (m)	**250.0**
Access Channel Draft (m LAT)	**12.0**
Quay Draft (m LAT)	**9-12**
Quay Berth Length (m)	**570.0**
Quay Berth Width (m)	**27.0**
Quayside Bearing Capacity (t/m2)	**7.0**
Jack-Up Capabilities - (y/n)	**No**
Laydown Area (hectares)	**2.5**
Laydown Bearing Capacity (t/m2)	**2.0**
Air Gap Restrictions (y/n)	**None**
Potential Wet Storage Area (y/n)	**Yes**
Additional Criteria	
Slipway / Dry Dock Available (y/n)	**Yes**
RoRo Capabilities (y/n)	**No**
Shore-to-ship Power (y/n) - (kW/Volts/Hertz)	**Yes**

Conclusion

Killybegs currently would struggle to serve as a manufacturing/staging port for potential offshore wind projects (fixed and floating). However, the natural deep water in proximity to the quay and relatively significant quay lengths are strong attributes, particularly when considering floating wind requirements. Focused development providing heavy lift quayside and additional laydown area with suitable bearing capacity would allow for significant staging/marshalling activities to be undertaken from Killybegs.

The harbour benefits from having a strong existing skilled workforce, in addition to a fishing fleet which is dormant for large portions of the year due to quota restrictions. Should legislative changes permit the repurposing of fishing licenses and vessel certification, the area would be in a strong position to serve the offshore market. Killybegs is also well situated to service offshore renewable sites along the west and north-west coast.

9 Port Infrastructure Assessment

The following tables present an assessment for the suitability of the existing and proposed infrastructure based on the key criteria outlined previously. The tables have been coloured coded to indicate suitability. The colour coding represents the following:

Table 9-1: Colour Key for Assessment of Port Infrastructure

	Meets preferred
	Meets minimum
	Doesn't meet criteria

Where submitted information has been close to the desired requirements discretion has been applied when assessing suitability.

Note that where laydown areas are noted these represent the laydown area available adjacent to the quayside as this is what will be most relevant for developers wishing to use a port location as a staging/marshalling facility. Most major components are unsuitable to be transported by public road due to the dimensions and weight and as such laydown areas adjoining the quayside is required. For the assessment of fixed suitability, the assessment has considered the laydown areas available for marshalling turbines and foundations separately in addition to marshalling of both together.

Table 9-2: EXISTING INFRASTRUCTURE – SUITABILITY ASSESSMENT FIXED-BOTTOM

Port	Access Channel Width, m	Access Channel Draft, mLAT	Quay Water Depth, mLAT	Air Draft Limit, m	Quay Berth Length, m	Quayside Bearing Capacity, t/m2	Jack-up Suitability of Ground Conditions	Laydown Area (Turbines & Foundations), ha	Laydown Area (Turbines Only), ha	Laydown Area (Foundations Only), ha	Laydown Bearing Capacity , t/m2
Minimum	120	8	8	30	200	15	-	15	10	5	7.5
Preferred	200	12	12	40	300	>25	-	20	13	7	>20
Belfast, D1	220	9.3	10.2	Proximity of Belfast City Airport, but >40m	480	50	Yes	25	25	25	11.5
Bremore	N/A AS PORT IS NEW DEVELOPMENT - NO EXISTING INFRASTRUCTURE TO CONSIDER										
Ringaskiddy (new deep-water berth)	150	11	12.4	None	395	5.0	No	13	13	13	5.0 (typical)
Cork Dockyard	200	11.2	5-7 (varies due to siltation)	None	Three berthing lengths, 96m, 250m, 230m	2-7	Yes	13.5	13.5	13.5	2.74-5.35
Galway	80	3.4	3.6	None	164 (North Dun Aengus Quay)	12	Likely	None at quayside	None at quayside	None at quayside	10 (not at quayside)
Harland & Wolff	220	6.4	6.4	None	556 (1323 total)	5.4	Yes	8.5	8.5[1]	8.5	5.4
Killybegs	250	12	9-12	None	450	7	No	2.5	2.5	2.5	2
Larnedid	125	8.9	7.1[2]	None	185[3]	18	Yes	7.3	7.3	7.3	18
Moneypoint		20	25	None	380[4]	15	Unknown	30[5]	30[5]	30[5]	unknown
Ros An Mhíl	300	3.7	4.2	None	200 (main quay)	unknown	No	0.5	0.5	0.5	unknown
Rosslare	180	7.2	7.2	None	221m (Berth 1), 215m (Berth 2)	10	No	5.4	5.4	5.4	unknown
Shannon-Foynes	100	7.8	10.5	None	295m East Jetty, 265m West Jetty	3.5-7.5	No	2	2	2	7.5

1. Would be considered suitable when taking account of additional areas available to H&W.
2. 7.1m LAT at Curran Quay.
3. 185m of available quayside, split between two lengths located at different berths.
4. Quay structure is located circa 165m from shore with narrow access trestle leading to jetty structure.
5. 30 ha is not directly adjacent to quayside.

Table 9-3: EXISTING INFRASTRUCTURE – SUITABILITY ASSESSMENT FLOATING (1 of 2)

Port	Access Channel Width, m	Access Channel Draft, mLAT	Quay Water Depth, mLAT	Air Draft Limit, m	Quay Berth Length, m (staging)	Quay Berth Length, m (m/f plus staging)	Quay Berth Width, m	Quayside Bearing Capacity, t/m2	Laydown Area (assembly), ha	Laydown Area (turbine staging), ha	Laydown Area (manufacture/ assembly of substructure plus staging), ha	Laydown Bearing Capacity , t/m2	Wet Storage, ha	Wet Storage Water Depth, mLAT	Wet Storage Location Comments
Minimum	150	9	9	None	300	600	40	15	12	6	34	7.5	Yes/No	13	
Preferred	200	14	14	None	600	900	80	50	18	12	50	20		23	
Belfast	220	9.3	10.2	Proximity of Belfast City Airport	480	480	61	50	25	25	25	11.5	Limited	≤9.3	Layby berth storage for limited number of units, may depend on substructure beam as to suitability. No capacity to store multiple units in channel. Airport will restrict storage of fully assembled units.
Bremore	N/A AS PORT IS PURELY REDEVELOPMENT - NO EXISTING INFRASTRUCTURE TO CONSIDER														
Ringaskiddy (new deep-water berth)	150	11	12.4	None	395	395	42.5	5.0	13	13	13	5.0 (typical)	Yes	12-16	Availability at mouth of inlet (Anchorage B), circa 7/8 nautical miles tow distance to quay. Depths would likely not suit concrete substructure types.
Cork Dockyard	200	11.2	5-7	None	Three berthing lengths, 96m, 250m, 230m	Three berthing lengths, 96m, 250m, 230m	15	2-7	13.5	13.5	13.5	2.74-5.35	Yes	>13	Bantry Bay highlighted as a potential wet storage area (significant tow distance). Area outside Roches Point highlighted as another potential location. Depths would likely not suit concrete substructure types.
Galway	80	3.4	3.6	None	164	164	25	12	None at quayside	None at quayside	None at quayside	10 (not at quayside)	Yes	>20	Suitable area and water depth circa 8 nautical miles from the port.
Harland & Wolff	220	6.4	6.4	Proximity of Belfast City Airport	556 (1323 total)	556 (1323 total)	40	5.4	8.5	8.5	8.5	5.4	Limited	≤9.3	Layby berth storage for limited number of units, may depend on substructure beam as to suitability. No capacity to store multiple units in channel. Airport will restrict storage of fully assembled units.
Killybegs	250	12	9-12	None	450	450	27	7	2.5	2.5	2.5	2	Yes	>20	Several potential options in proximity to harbour 3-5 nautical miles from quay.

Table 9-3: EXISTING INFRASTRUCTURE – SUITABILITY ASSESSMENT FLOATING (2 of 2)

Port	Access Channel Width, m	Access Channel Draft, mLAT	Quay Water Depth, mLAT	Air Draft Limit, m	Quay Berth Length, m (staging)	Quay Berth Length, m (m/f plus staging)	Quay Berth Width, m	Quayside Bearing Capacity, t/m2	Laydown Area (assembly), ha	Laydown Area (turbine staging), ha	Laydown Area (manufacture/assembly of substructure plus fitout), ha	Laydown Bearing Capacity , t/m2	Wet Storage, ha	Wet Storage Water Depth, mLAT	Wet Storage Location Comments
Minimum	150	9	9	None	300	600	40	15	12	6	34	7.5	Yes/No	13	
Preferred	200	14	14	None	600	900	80	50	18	12	50	20		23	
Larne	125	8.9	7.1	None	185	185	20	18	7.3	7.3	7.3	18	Limited	12-14	Disused oil berth could host a small number of substructure units along the length. No areas identified as suitable for storage of several units with space for temporary moorings.
Moneypoint	>200	20	25	None	380	380	33	15	30	30	30	unknown	Yes	>20	Excellent deep water at existing berth and in the channel, either could accommodate.
Ros An Mhíl	300	3.7	4.2	None	200	200	20	unknown	0.5	0.5	0.5	unknown	No	N/A	N/A
Rosslare	180	7.2	7.2	None	221m (Berth 1), 215m (Berth 2)	221m (Berth 1), 215m (Berth 2	15	10	5.4	5.4	5.4	unknown	No	N/A	N/A
Shannon-Foynes	100	7.8	10.5	None	295m East Jetty, 265m West Jetty	295m East Jetty, 265m West Jetty	22m East Jetty, 20m West Jetty	3.5-7.5	2	2	2	7.5	Yes	>20	Significant wet storage available within the Shannon Estuary. Scale of sites available still to be determined but estimated to be in the 100's of hectares

9.1 Conclusion from Assessment of Existing Infrastructure

9.1.1 Existing Infrastructure – Fixed

The assessment of the existing infrastructure against the fixed-bottom criteria for staging and marshalling highlighted the following:

- At present Belfast Harbour's D1 is the only facility which meets all of the defined requirements (meets minimum for all criteria and meets preferred for several) to serve as a staging and marshalling base for turbines and foundations.
- The new deep-water facility at Ringaskiddy has significant infrastructure capabilities and would be able to accommodate the staging of either turbines, or foundations but likely not both. It is noted the facility lacks heavy-duty quayside facilities in addition to the required bearing capacity in the laydown area. Should additional areas of the larger 60 ha landside become available the site could accommodate staging of both foundations and turbines. There is significant competing use from container activity at the Ringaskiddy terminal, so the viability of this is unclear.
- The Harland & Wolff main facility in Belfast, including the drydock could potentially to be used as a facility for staging of foundations or turbines (the laydown is shy of the prescribed requirement but considering the total available area this would likely prove viable). However, the facility is constrained by the bearing capacity of the quay and landside areas. The facility is also restricted by water depth, as the draft reduces on moving from the main fairway channel to 6.4mLAT in the Building Dock approach and within the Dock, as such the viability of this would depend upon vessel selection for installation.
- Cork Dockyard has some potential to serve as a fixed-bottom staging location for foundations, however the draft is shy of the minimum preferred criteria. It is noted that whilst the minimum and preferred criteria have been outlined as per industry engagement, it is recognised that certain vessels serving the industry will have lesser draft. Whilst the maximum 7m draft could accommodate certain vessels, the silted berth length with 5m water depth would likely prove restrictive. With focused upgrades Cork Dockyard could prove a viable location, including dredging and upgrading of quayside load capacities.
- Port of Larne appears to have potential to allow for the staging of foundations, however, the degree of laydown which could be available to the ORE industry is unclear given the existing commitments to RoRo traffic and the daily ferry service. It is noted there is a limited length of solid quay and as such the suitability of Larne would be largely dependent on vessel selection for installation.
- The assessment highlighted the scope of possibility for the Moneypoint site. Whilst the existing facilities may not be entirely suitable at present, with infrastructure upgrades the site could prove viable. It is noted that the current jetty structure is located circa 165m from shore with a narrow access trestle and no laydown area adjacent to the quay, and as such would not be suitable for staging and marshalling. The Moneypoint facility is also still in use as a coal fired plant until decommissioning which is planned for 2025.

9.1.2 Existing Infrastructure – Floating

The assessment of the existing infrastructure against the floating criteria for staging and marshalling highlighted the following:

- At present there are no existing facilities entirely suitable to accommodate manufacture (of substructures), assembly or turbine staging for floating wind deployment.
- The air draft restrictions due to the proximity of Belfast City Airport coupled with limited wet storage reduce the suitability of facilities in Belfast Harbour. The air draft restrictions are a significant limitation for the staging, storage and tow-out of fully assembled units from D1 and Harland & Wolff.
- There may be the possibility for assembly of steel modular units at the D1 site given the loading bearing capacities of both quayside and laydown area and the degree of available landside area. It is noted adequate craneage would be required for this to be viable.
- The Harland and Wolff site and dry dock facilities in Belfast may also be suitable for assembly of certain types of modular substructures depending upon the draft, beam, and weight of units. Whilst the existing dry dock is significant in scale, the beam of the substructure units suitable for assembly would be limited to circa 80m (considering some lateral clearance). Harland & Wolff can benefit from an existing skilled workforce in steelwork and has onsite fabrication warehousing facilities. As the substructures will be only partially ballasted prior to turbine mating, the draft of the Building Dock would likely be adequate for this activity.
- The potential for wet storage in the Shannon Estuary is significant but the current infrastructure requires upgrading to capitalise on the natural capabilities.
- Killybegs lacks the required laydown areas and heavy lift capacity at the quayside, but has potential to serve the floating market with certain upgrades. The site benefits from natural deep water in relative proximity the harbour, in addition to the relative proximity to the north-west coast projects (and potentially future Northern Irish projects).

10 Proposed Development Plans

10.1 Overview of Development Plans

In addition to considering the suitability of the existing infrastructure to serve the fixed and floating market, the same exercise has been completed for the proposed redevelopments (where relevant).

In some instances, the development plans are wholesale in terms of an overhaul of the existing infrastructure or creation of a new facility. Where this is the case, the parameters noted represent what is proposed for the new facility. The following locations represent new quayside infrastructure:

- Bremore Port; a new port is proposed to the South of Drogheda, with the facility targeting the ORE industry on the east coast, Bremore intends on accommodating green hydrogen.
- Rosslare; a new facility within the port is proposed specifically targeting the ORE industry with a focus on the east coast fixed-bottom projects.
- Cork Dockyard; the existing infrastructure is to be upgraded allowing for heavy duty quaysides and laydown area, the facility is hoping to act as a floating wind staging facility.
- Moneypoint; redevelopment of the existing coal fired plant landside and quay. The plans will provide significant laydown areas adjacent to a new quayside and wet dock. The facility will target the floating wind sector.
- Foynes Island; the new development at Foynes Island comprises a significant length of heavy-duty quay, with a large reclamation to the rear of the quayside. Foynes Island will focus on the floating wind sector.
- Galway; the redevelopment plans span across four phases with the main bulk of marine civils delivered in Phase 1. This includes 20 ha of reclamation in addition to 560m of quayside. The development plans will serve a number of business streams including the ORE sector.
- Ros An Mhíl (Rossaveel); a 200m new quay and 3 ha reclamation is proposed adjacent to the existing infrastructure. The facility is being driven by the fishing industry and financed by DAFM so the availability to the ORE sector is unclear at this stage.

In other instances, development plans will be complementary to the existing port offering or enhance existing facilities. Those which have indicated complementary developments are the following locations:

- Belfast Harbour; D1 and the addition of the D3 facility. The D1 facility will remain the flagship offshore wind location with support offered from D3. The new facility will provide a significant new quay length in addition to a large laydown area. D3 is located in proximity the D1 facility.
- Killybegs; 120m of new quay is being developed extending the existing quayside. It is noted this development has been driven by the fishing industry, which is the key commercial element for Killybegs at present.
- Shannon Foynes; 120m of quay extension is being provided connecting the East and West structures. Additional reclamation to the rear of the East Jetty adding an additional 1.2 ha of laydown area. And the development of the Durnish lands, adding 35 ha of greenfield open and closed storage.

Harland & Wolff provided excellent detail of the existing capabilities but limited information regarding future plans. Port of Cork gave high-level details of plans which form part of the 2022 Masterplan, however these were not detailed enough to allow for a quantitative assessment. Larne also offered details of high-level plans for several infrastructure improvements; however, the exact specification and future parameters were limited in detail. These three locations were not considered in the context of development plan assessments given the lack of detailed information available at present.

10.2 Funding Sources

Of the projects planning significant redevelopments, four locations applied for support from the CEF funding vehicle (Bremore, Rosslare, Cork Dockyard and Shannon Foynes – Foynes Island). Applications were submitted in early 2022, however each of the applications were rejected in July 2022.

To understand the potential impact of the failure of the applications, the locations have been asked to provide details of the funding sources for the proposed developments.

Table 10-1: Overview of Funding Sources

Location	Estimated Capital Value of Works	Funding Sources *(if known at this stage)*
Belfast Harbour, D3	€35m	BHC have capital resource to self-fund the development.
Bremore Port	€740-860m	This public/private partnership will use capital resources to finance the planning stage. The development capital costs are proposed to be covered by EU funding mechanisms (Bremore applied for CEF funding to support the development plans), with the remainder of funds to be sourced from a combination of private sector investments and lending from national banks.
Cork Dockyard	€120m	Applied for CEF funding to support the development plans, the remainder of the funding is proposed to be sourced from a combination of national and international investment and finance institutions and a national bank (likely EIB, ISIF and AIB).
Galway	€120m (phase 1)	Funds for phase 1 are proposed to come from a mixture of sources with the rough split between each indicated as follows; 40% from sale of dockland property, 8% Port of Galway cash reserves, 25% borrowing from national banks, with the remainder proposed at be financed from grants and other sources (private investment).
Killybegs	€15m	Funded by DAFM.
Moneypoint (Shannon Estuary)	€180m	Likely to be at least partly funded by ESB, commercial plan not yet developed in enough detail to provide further information.
Ros An Mhíl	€25m	Funded by DAFM.
Rosslare	€200m	Applied for CEF funding to support the development plans. Irish Rail anticipated to self-fund some portion of capital works costs, with additional funds expected to be obtained from investment vehicles such as ISIF and EIB.
Shannon Foynes (Shannon Estuary) – jetty extension & reclamation works	Value not known	CEF funding received to support the current construction, the remainder of the balance is being funded through SFPC cash reserves and national bank funding.
Foynes Island (Shannon Estuary)	€300m	Applied for CEF funding to support both studies and the capital works – CEF funding for studies informing design and planning were approved, the remainder of funds for the capital works are anticipated to be from national and international financial institutions including the ISIF, EIB or the national banks. There is also potential for private investment.

Whilst the failure of the initial CEF applications is disappointing, it is noted that several Irish ports have been successful in obtaining grant funding from Europe in the past. Shannon Foynes for example have been successful in four out of six applications made for European funding since 2013. The successful applications were for funding derived from the TEN-T/CEF scheme, two of the applications supported studies informing developments, with two supporting capitals works projects. Of the studies obtaining funding approval, the most recent successful application was that supporting the design and planning processes for the Foynes Island development (successful in 2021). Port of Cork has also availed of European funding to support major developments in previous years, with circa €13m of funding provided from the TEN-T fund to support the recently developed Cork Container Terminal [39]. Whilst not included within this study, Dublin Port also availed of a significant degree of European support for the Alexandra Basin Redevelopment project. The degree of past support from European sources provides optimism that Irish ports may be successful in securing CEF funding on reapplication.

10.3 Assessment of Proposed Infrastructure

The assessment of proposed infrastructure has been completed on a quantitative basis (as per the assessment of existing infrastructure), and considers the information provided by port locations for development plans. There is no consideration within the infrastructure assessment of the viability of the proposals in relation to timescales, funding or consenting and has been completed as a summary of the physical suitability of proposed infrastructure. An overview of the proposed timescales and progress to date has been included within Section 11.

The assessment for floating wind suitability does not consider environmental conditions within the harbour areas and proposed wet storage locations, nor does it account for likely considerations such as visual impact or consenting viability which is deemed beyond the scope of the works.

Table 10-2: PROPOSED INFRASTRUCTURE – SUITABILITY ASSESSMENT FIXED

Port	Access Channel Width, m	Access Channel Draft, mLAT	Quay Water Depth, mLAT	Air Draft Limit, m	Quay Berth Length, m	Quayside Bearing Capacity, t/m2	Jack-up Suitability of Ground Conditions	Laydown Area (Turbines & Foundations), ha	Laydown Area (Turbines Only), ha	Laydown Area (Foundations Only), ha	Laydown Bearing Capacity , t/m2
Minimum	120	8	8	30	200	15	-	15	10	5	7.5
Preferred	200	12	12	40	300	>25	-	20	13	7	>20
Belfast, D1 and D3 Development	220	9.3	10.2	Proximity of Belfast City Airport, >40m	480m D1, 340m D3	50	Yes	25ha D1, 15ha D3	25ha D1, 15ha D3	25ha D1, 15ha D3	11.5
Bremore	300	11	11	None	1300	TBC	Yes	25	25	25	TBC
Cork Dockyard	200	11.2	8-12	None	Berthing lengths refurbing old quaysides, total 710m	15-50	Yes	13.5	13.5	13.5	15
Galway	>200	10	12	None	660 (total)	15	Potentially	20 (phase 1)[1]	20 (phase 1)[1]	20 (phase 1)[1]	12
Killybegs	250	12	9-12	None	570 (including 120m extension)	7	Yes	2.5	2.5	2.5	2
Moneypoint	> 200	12-50	12-20	None	800	50	TBC	44	44	44	50
Ros An Mhíl	300	7	10	None	200 (new quay)	5	Yes	3	3	3	5
Rosslare	420	9	11	None	330	60 on heavy lift area, 15 elsewhere	Likely (rock anticipated in berth pocket)	20	20	20	15
Shannon-Foynes	100	7.8	10.5	None	Addition of 120m jetty extension (total berthing length, 680m)	3.5-7.5	No	3.2	3.2	3.2	7.5
Foynes Island (Shannon Estuary)	> 200	17.5-50	17.5	None	800-1000	50	TBC	25	25	25	50

1. 20 ha is the total reclamation area provided by phase 1 of the Galway redevelopment. Port of Galway have indicated that the proposed landside usages have yet to be earmarked, but the 20ha total will service a number of sectors.

Table 10-3: PROPOSED INFRASTRUCTURE – SUITABILITY ASSESSMENT FLOATING (1 of 2)

Port	Access Channel Width, m	Access Channel Draft, mLAT	Quay Water Depth, mLAT	Air Draft Limit, m	Quay Berth Length, m (staging)	Quay Berth Length, m (m/f plus staging)	Quay Berth Width, m	Quayside Bearing Capacity, t/m2	Laydown Area (substructure assembly), ha	Laydown Area (turbine staging only), ha	Laydown Area (manufacture of substructure plus staging), ha	Laydown Bearing Capacity , t/m2	Wet Storage, ha	Wet Storage Water Depth, mLAT	Wet Storage Location Comments
Minimum	150	9	9	None	300	600	40	15	12	6	34	7.5	Yes/No	13	
Preferred	200	14	14	None	600	900	80	50	18	12	50	20		23	
Belfast, D1 and D3 Development	220	9.3	10.2	Proximity of Belfast City Airport	480m D1, 340m D3	480m D1, 340m D3	61	50	25ha D1, 15ha D3	25ha D1, 15ha D3	25ha D1, 15ha D3	11.5	Limited	≤9.3	Layby berth storage for limited number of units, may depend on substructure beam as to suitability of approach. No capacity to store multiple units in channel. Airport will restrict storage of fully assembled units.
Bremore	300	11	11	None	1300	1300	TBC	TBC	25	25	25	TBC	Potentially	10-14	Deep water in relative proximity, could accommodate preferred area with dredging of channel to suit.
Cork Dockyard	350	11.2	8-12	None	225m, 260m, 225m = total 710m	225m, 260m, 225m = total 710m	30-50	15-50	13.5	13.5	13.5	15	Yes	>13	Bantry Bay highlighted as a potential wet storage area (significant tow distance). Area outside Roches Point highlighted as another potential location. Depths would likely not suit concrete substructure types.
Galway	>200	10	12	None	660 (total)	660 (total)	50	15	20 (phase 1)	20 (phase 1)	20 (phase 1)	12	Yes	>20	Suitable water depth circa 8 nautical miles from the port.

Table 10-3: PROPOSED INFRASTRUCTURE – SUITABILITY ASSESSMENT FLOATING (2 of 2)

Port	Access Channel Width, m	Access Channel Draft, mLAT	Quay Water Depth, mLAT	Air Draft Limit, m	Quay Berth Length, m (staging)	Quay Berth Length, m (m/f plus staging)	Quay Berth Width, m	Quayside Bearing Capacity, t/m2	Laydown Area (substructure assembly), ha	Laydown Area (staging), ha	Laydown Area (manufacturing of substructure plus staging), ha	Laydown Bearing Capacity , t/m2	Wet Storage, ha	Wet Storage Water Depth, mLAT	Wet Storage Location Comments
Minimum	150	9	9	None	300	600	40	15	12	6	34	7.5	Yes/No	13	
Preferred	200	14	14	None	600	900	80	50	18	12	50	20		23	
Killybegs	250	12	9-12	None	570 (incl. 120m extension)	570 (incl. 120m extension)	27	7	2.5	2.5	2.5	2	Yes	>20	Several potential options in proximity to harbour 3-5 nautical miles from quay.
Moneypoint	> 200	12-50	12-20	None	800	800 min	TBC	50	44	44	44-77	50	Yes	>20	Excellent deep water at existing berth and in the channel, either could accommodate.
Rossaveel	300	7	10	None	200 (new quay)	200 (new quay)	TBC	5	3	3	3	5	No	N/A	N/A
Rosslare	>200	9	11	None	330	330	TBC	60 on heavy lift, 15 elsewhere	20	20	20	15	No	N/A	N/A
Shannon-Foynes	100	7.8	10.5	None	Addition of 120m jetty extension (total 680m)	Addition of 120m jetty extension (total 680m)	22m East Jetty, 20m West Jetty	3.5-7.5	3.2	3.2	3.2	7.5	Yes	>20	Significant wet storage available within the Shannon Estuary. Scale of sites available still to be determined but estimated to be in the 100's of hectares.
Foynes Island (Shannon Estuary)	> 200	17.5-50	17.5	None	800-1000	800-1000	TBC	50	24 (includes quayside)	24 (includes quayside)	24 (includes quayside)	50	Yes	>20	Significant wet storage available within the Shannon Estuary. Scale of sites available still to be determined but estimated to be in the 100's of hectares.

10.4 Conclusion from Assessment of Proposed Infrastructure

10.4.1 Proposed Infrastructure – Fixed

The assessment of the proposed development plans against the fixed-bottom criteria for staging and marshalling highlighted the following:

- Several of the development plans have the potential to service fixed-bottom wind installations for staging and marshalling with the following outlining suitable proposals; Bremore, Cork Dockyard, Moneypoint, Rosslare and SFPC Foynes Island (in addition to Belfast's D1 terminal plus the enhanced D3 facility). It is noted this considers staging of both turbines and foundations.
- Several of the developments are currently in the early conceptual stage and the parameters are not entirely understood.
- The D3 development in Belfast has received approval for the required consents for construction and as such is in a favourable position. Belfast Harbour Commissioners also have experience of self-funding and constructing marine infrastructure projects which should prove beneficial for the development of the D3 site.
- The Port of Galway have significant redevelopment plans, including for circa 20 ha of reclamation and 560m of new quay in Phase 1 of the project. Whilst the plans appear suitable for staging and marshalling of fixed projects, it is unlikely that the entirety of the 20 ha laydown area would be designated for a single use, with several existing sectors likely to be serviced from the new development. The Port of Galway will likely offer a portion of the quayside and total 20 ha to the offshore wind industry (the total of which is currently unknown). Consequently, Galway would have the potential to marshal either turbines or foundations for fixed installations but would likely be unsuitable to cater for both.

10.4.2 Proposed Infrastructure – Floating

The assessment of the proposed development plans against the floating criteria for manufacture and staging highlighted the following:

- The port requirements are more onerous for floating requirements than fixed and as such there is less suitability across the redeveloped plans. It is worth noting that east coast locations such as Bremore and Rosslare have focused on targeting the fixed projects which are in relative proximity and as such this is not surprising.
- Whilst the design parameters are yet to be fully fleshed out, Bremore could have the potential to act as a staging location for turbine mating. This would be dependent upon water depths at the quaysides and final specification of the quay. As stated previously, given the east coast location, Bremore may seek to focus on the east coast fixed projects.
- Moneypoint appears to have the potential to serve as both manufacturing/assembly and staging ports for floating wind. Foynes Island could accommodate both activities should the final footprint of the site provide adequate landside area. Development timescales will be

critical, particularly in relation to consenting for Moneypoint and Foynes Island given the environmental sensitivity of the Shannon Estuary.

- The Cork Dockyard proposed infrastructure appears suitable for substructure assembly and staging of turbines. Bantry Bay was suggested by Doyle Shipping Group as a possibility for wet storage, however this would represent a significant tow of circa 90 nautical miles to the quayside. Another location close to Roches Point was proposed circa 8 miles from the facility, this would be much more suitable logistically. The site does not have the capacity to manufacture or assemble substructures.
- The facilities at Belfast's D1 and the proposed D3 have significant capability, however the location is hindered by the proximity of Belfast City Airport. The limitations imposed by the airport would likely impede the staging, storage and towing of fully assembled units. D1 also lacks the draft to accommodate certain types of fully ballasted floating units. There is limited water depth to support significant areas of wet storage without severely impeding the existing shipping lane or going out to the edge of Belfast Lough. Despite these limitations, it is possible that D1 and D3 could host preassembly of substructure units should these be constructed elsewhere and transported into Belfast.
- Considering the degree of laydown area which may be available to the ORE sector at Galway, manufacturing of floating units is likely to be unfeasible. Depending on how much of the 20 ha reclamation laydown in made available to the ORE, there is potential for turbine fit out for certain types of substructure (draft dependent). Should the degree of laydown available to the ORE sector be relatively small, Galway could play a supporting role to another location, or potentially provide staging of cables or anchoring/moorings for floating installations.
- Killybegs has excellent natural deep-water in proximity to the existing quaysides and suitable areas for wet storage but is limited by the existing infrastructure. Whilst currently unsuitable to service the floating wind sector for staging of turbines, targeted infrastructure improvements could make best use of the deep water. A memorandum of understanding between Sinbad Marine Service Ltd and Killybegs Fishermen's Organisation with Hexicon was signed in June 2022. This signals an understanding of the potential of the port to support floating activities in addition to the appetite of the existing supply chain to serve the ORE industry.

11 Assessment of Redevelopment Proposals Progress & Timescales

In addition to the proposed infrastructure details provided, the anticipated timescales, progress to date and cost estimates for the developments indicated by each location have been tabulated for review in Table 11-1.

11.1 Typical Marine Civil Project Timescales

The timescales proposed by the port locations for consenting and construction of the development plans have been reviewed next to typical timescales for marine civils projects of a similar scale. It is noted that the indicative timescale has been produced as a guidance tool to assess the development plans and does not represent any specific project. The indicative programme assumes that the project requires Foreshore Licensing, in addition to Planning Permission from An Bord Pleanála.

The consenting timescales proposed are optimistic and assume no licence approval problems such as legacy foreshore issues, requests for further information, unforeseen environmental issues, or opposition from stakeholders.

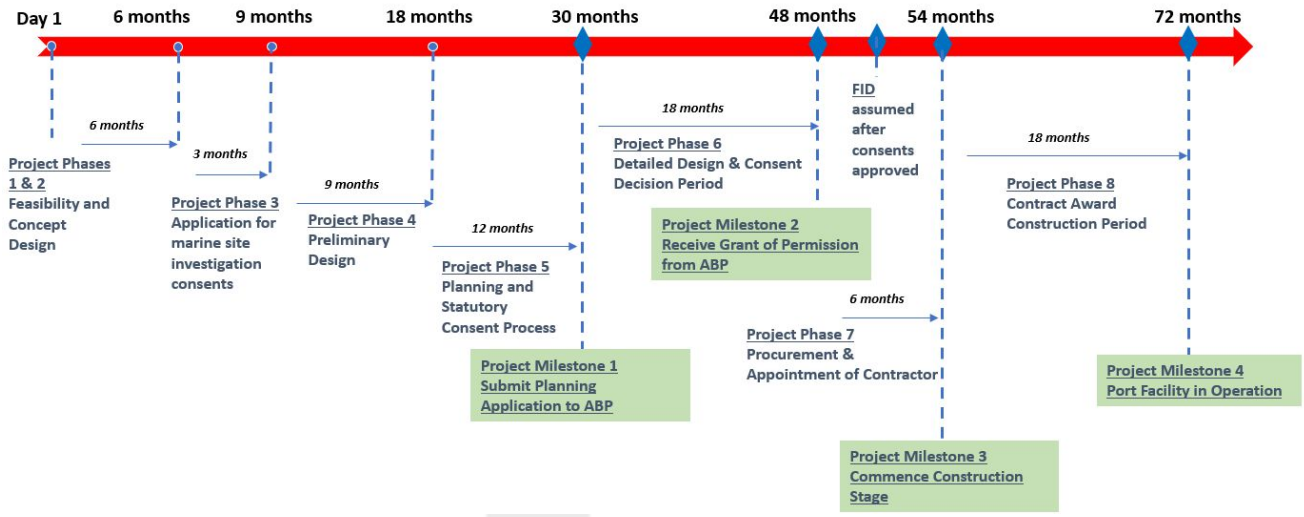


Figure 11-1: Typical Timescales for Marine Civils Infrastructure Project

11.2 Timescales for Completion

The timescales for completion of construction will be of key importance relative to the Phase 1 & 2 projects commencing construction. As per the previous discussion in Section 3.2, it is anticipated that the Phase 1 projects will be commencing construction earliest 2027, with 1 to 2 years delay possible. Phase 2 projects will be anticipated to be commencing construction earliest 2028, again with possible delays of 1 to 2 years. Port redevelopment plans will need to be fully operational around 2027/2028 depending on which projects the port locations may be hoping to service. It is noteworthy that the majority of the Phase 1 projects are located on the east coast and are also fixed-bottom installations, this will be relevant when considering the port development plans located in proximity to these projects and the relative capabilities of these facilities.

Table 11-1: Summary of Development Plans Timescales and Estimated Project Costs (1 of 4)

Port Location	Development Timescales	Consent Status and Progress to Date	Cost Estimate for Development	Commentary on Timescales/Consenting/Cost
Belfast, D1 and D3 Development	Planning approval has been obtained in addition to marine construction consents. Facility hoped to be operational by late 2024.	Planning approval obtained for the development, marine consents approved, detailed design started (2022).	€35m	Timescales appear reasonable given the progress to date. If the facility were constructed by Q4 2024 or Q1 2025 there would ample opportunity to support Phase 1 projects. Belfast Harbour Commissioners have experience of managing and constructing facilities for the ORE industry and as such are in an advantageous position to develop the D3 facility.
Bremore Port	Engineering and conceptual designs programmed between now and Q2 2024. Consenting (EIA Scope/EIA/Applications for Foreshore/Approval for Foreshore) scheduled between Q4 2024 and Q3 2026. Procurement for phase 1 (ORE marine infrastructure) is anticipated for Q3 2025 with construction programmed between Q3 2026 and Q4 2027.	Marine engineers to undertake concept design and environmental consultants to undertake initial consenting steps have been appointed with work beginning 2022. CEF application has been made to help fund the development.	Estimated in the region of €740-860m for Phase 1 development works	Timescales for concept design and consenting appear optimistic. Consenting for the project is likely to be contentious given this is a new port facility and will be introducing industrial activities to the site. There are also several sensitive features in the area, a judicial review seems likely. The requirement for an oral hearing could add a further 12-18 months on to the consenting programme. Procurement appears to be programmed to start ahead of obtaining key consents (i.e. at risk). The construction period for phase 1 appears unrealistic given the scale of marine works proposed. The programme is targeting an operational facility for 2027, however considering the scope of the works required that may be unobtainable. Considering a best-case construction stage for Phase 1 projects starting in 2027, the facility may be available too late to service some projects. However, as delays of 1-2 years are possible for deployment of Phase 1 projects, the facility will likely still be available in time to support staging of Phase 1 projects should no major consenting issues render the development unfeasible.
Cork *Ringaskiddy	Port Masterplan due for issue in Q3/4 2022 will address proposed redevelopment plans in more detail. ORE infrastructure is understood to be recognised as part of the Masterplan.	N/A	N/A	Limited information provided at this stage. Masterplan anticipated to offer detail in relation to timescales for development plans. POC have indicated the ORE sector is seek a key to the future of the port.

Table 11-1: Summary of Development Plans Timescales and Estimated Project Costs (2 of 4)

Port Location	Development Timescales	Consent Status and Progress to Date	Cost Estimate for Development	Commentary on Timescales/Consenting/Cost
Cork Dockyard	Masterplan has been outlined by engineering consultants in conjunction with financial consultants (2022). Targeting construction completion late 2026, early 2027. However, with DSG applying for CEF funding and the initial application being rejected, timescales are anticipated to be impacted.	DSG are aiming to submit consenting applications Q2 2023, with construction completed and ready to accept turbines for pre-assembly late 2026, early 2027.	€120m	Timescales for construction completion appear slightly ambitious, these will come under additional pressure due to the rejection of the CEF application to support the development. DSG have indicated that some programme impact will be expected, with reapplication required and a further decision period. The facility may be expected to be operational later than the initially anticipated Q2 2027. However, with the first floating projects anticipated no earlier than 2028 for construction, some programme slippage could be tolerated.
Galway	Targeting completion of Phase 1 in Q4 2027. Phase 1 provides 400m quayside and 20 ha laydown with further plans for Phase 2-4.	Awaiting planning permission, initial submission was made in 2014 but has been unsuccessful. Port of Galway anticipating a decision Q2 2023.	€120m - phase 1	The planning application for Galway has been in circulation for several years without being fully approved. It remains to be seen if the project will gain planning permission. Should planning approval be granted at the time suggested, the proposed targeted completion date for phase 1 would appear reasonable. Sceirde Rocks is in proximity to the port and so 2027 completion would dovetail well with phase 1 projects starting construction in 2027 (or after).
Harland & Wolff	No information provided on timescales or progress to date.	No information provided on timescales or progress to date.	N/A	N/A
Killybegs	Contractor appointed in July 2022 for 120m quay extension with estimated timeline of 6-9 months.	As construction works are beginning in Q3 2022 consents required are assumed to be in-place.	€15m	With construction anticipated to be completed in 2023, infrastructure will be in-place for when offshore construction of west coast projects commences (2027 earliest for Sceirde Rocks, phase 2 west coast projects 2028 earliest). Killybegs would benefit from a heavy lift quayside and provision of additional laydown, these could be potential future projects pursued over the next few years. The re-location of some small buildings near the quayside may also improve flexibility of component movements and storage.

Table 11-1: Summary of Development Plans Timescales and Estimated Project Costs (3 of 4)

Port Location	Development Timescales	Consent Status and Progress to Date	Cost Estimate for Development	Commentary on Timescales/Consenting/Cost
Larne	No information provided.	No information provided.	No information provided.	N/A
Moneypoint	Planning permission granted – Q1/Q2 2025. Construction phase programmed between Q1/Q2 2025 to Q1/Q2 2027. ESB targeting operations for Q1/Q2 2027.	Engineering and environmental consultants appointed in Q4 2021 to undertake concept design and gain consents.	€180m	Timescales indicated by Moneypoint appear slightly ambitious, with circa 2.5 years allowed for concept design and gaining consents. Given the scale of the project and sensitivity of the Shannon Estuary, the planning and consents phase could be challenging. However, the previous industrial nature of the site and the previous activities could aid in gaining approvals for use as an ORE facility. Procurement of construction contractor appears to be proposed prior to obtaining planning approval (i.e. at risk). With some degree of programme slippage the facility will likely still be able to offer staging and marshalling services for Phase 2 south and south west coast projects with construction anticipated earliest 2028.
Ros An Mhíl (Rossaveel)	Detailed design being completed at present (Q1/2 2022). Construction programmed to start Q3/Q4 2022 finishing in Q3 2024.	DAFM control harbour so no foreshore licence required, planning application has been submitted.	Estimated at circa €25m	The Ros An Mhíl (Rossaveel) new quayside, whilst not specifically targeting the offshore sector will be available for use by the anticipated 2028 (earliest). Whilst the facility would not be suitable to act as a sole staging/marshalling location there may be an opportunity to work with neighbouring ports (Galway) to offer staging/marshalling or offer staging of elements such as cables or moorings.
Rosslare	Targeting consent approval for Q4 2024, procurement Q1 2025, construction beginning Q1/2 2025 and completing in Q4 2026.	Engineering consultants undertaking concept design at present, scoping for EIA underway and foreshore licence applications for marine site investigations. CEF application was submitted to support the development, but the application was reject along with other Irish applications.	€200m	Irish Rail have indicated a relatively ambitious timescale for the project. Significant work has been done to date with concept design stage 1 and 2 nearing completion. Despite the progress to date, the consents approval timescales seem optimistic. Considering the timescales proposed, if a degree of programme slip did occur (9-12 months delay), the completed facility would still likely be available to serve the east coast Phase 1 projects commencing earliest 2027. It is noted that the Rosslare development is not in proximity to any SAC/SPAs and the consenting procedure is likely to be relatively uncontentious. Irish Rail have also indicated they do not anticipate any delays stemming from initial rejection and resubmission of the CEF funding application.

Table 11-1: Summary of Development Plans Timescales and Estimated Project Costs (4 of 4)

Port Location	Development Timescales	Consent Status and Progress to Date	Cost Estimate for Development	Commentary on Timescales/Consenting/Cost
Shannon-Foynes	Quay extension commenced Q1 2022, due to be completed Q1 2023. Reclamation of additional landside space commenced Q1 2022, due to be completed Q2 2023. 35 ha additional landside phase 1 commenced Q1 2022, due to be completed Q2 2024.	All plans fully consented, planning and foreshore. Foynes received CEF funding of €2.3m to support the works in 2021.	Total estimate for works not detailed	Construction works have already begun for the extension works, with the reclamation scope being completed in tandem. Whilst these upgrade works have not specifically targeted the offshore industry, the upgraded infrastructure will improve the functionality of the port. Shannon Foynes main facility has limited capacity to serve as a staging and marshalling port, however the port could offer support to other port locations and would likely be suitable for staging of smaller elements (perhaps chains/moorings). The upgraded quay length and additional quayside laydown will be available to support these types of activities with construction expected to be complete by Q2 2023. The Durnish lands would provide useful additional laydown within the port area and also would be available to serve the Phase 2 projects anticipated in proximity to Foynes. As the Durnish lands are only accessible to the quayside by road, it would most likely be suitable for storage of smaller elements such as cables and mooring equipment.
Foynes Island (Shannon Estuary)	Construction estimated for commencement in 2025 with completion late 2027/28. Given the consenting application submission is anticipated in Q2 2024, allowing for a 12-month decision period, construction would be expected to start Q3 2025 as a best-case scenario allowing for contractor procurement.	Engineering and environmental consultants appointed in March 2022 to deliver project through planning and foreshore consenting. Application submission targeting Q2 2024. CEF funding applied for studies to inform the development, in addition to funding for capital works. CEF funding application for studies was successful, with capital works application rejected.	€300m+	Timescales indicated appear quite optimistic given the scale and nature of the project. Considering the sensitivity of the Shannon Estuary in relation to proximity of SACs/SPAs, the consenting phase could be complex. Planning approval will likely require judicial review given the sensitive nature of the estuary. With the possibility of delay, and assuming best case 2028 for floating deployment, the facility may not be available in time. However, with delays of 1-2 years possible for Phase 2 construction, programme slippage could be tolerated with the facility still being operational in time for Phase 2 deployment. The CAPEX estimate was indicated as €300m plus, this would appear slightly low given the level of infrastructure proposed. Considering the success of the application for funding supporting studies for the planning and consent stages, SFPC are relatively confident that a future CEF application to support the capital works may be successful. SFPC do not anticipate any significant delay stemming from the rejection of the initial CEF application.

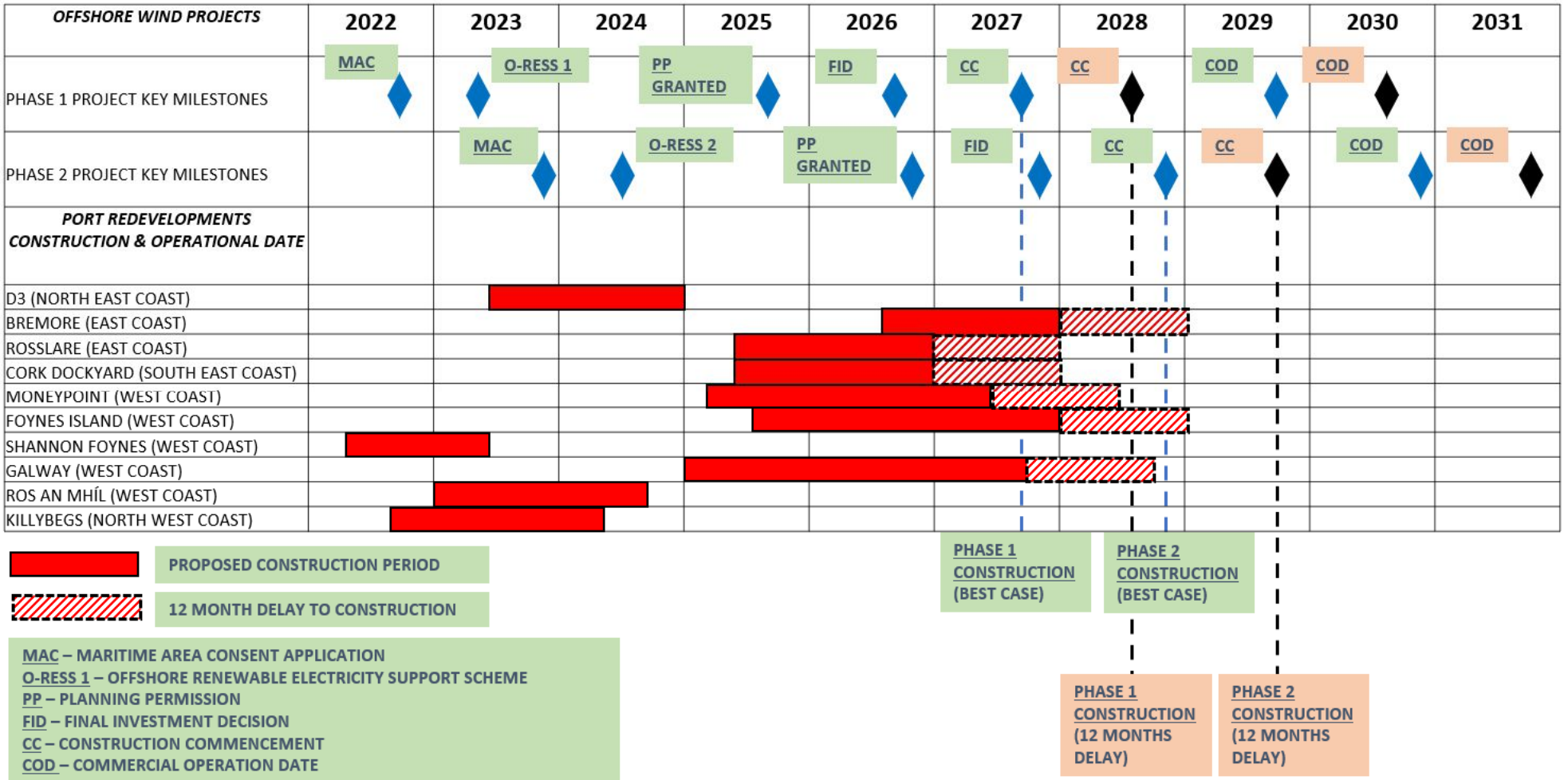


Figure 11-2: Schematic of Proposed Construction Timescales for Developments Compared to Indicative Phase 1 and 2 Installation/Construction Commencement

12 Summary of Overall Assessment

12.1 Existing Infrastructure Summary

The following were highlighted as key outcomes of the assessment of existing infrastructure:

- Currently, the D1 facility in Belfast is the only facility suitable to serve Irish fixed-bottom wind installations as a staging and marshalling facility for both turbines and foundations.
- The new deep-water facility at Ringaskiddy (Port of Cork) has the capacity to potentially service staging of either foundations or turbines. Should additional areas of the total 60 ha landside become available the site could accommodate staging of both foundations and turbines, however the site is limited by the load bearing capacity of the laydown area and load capacity of quayside. Whilst load spreading could be undertaken to some extent, the practicality of this is unknown. It is noted that whilst this represents what is physically possible, there is significant competing use from container activity at the Ringaskiddy Terminal, so the actual viability of this is unclear.
- Harland & Wolff have significant capabilities in terms of marine infrastructure, workshop facilities and existing workforce. The existing facility appears suitable for staging of foundations alone, the laydown requirements are just shy of that required for staging of turbines but when considering the entire site total area of circa 11.0 ha this is likely suitable. The facility is constrained by limited quayside and landside loading capacity in addition to the draft within the Building Dock and dock approach.
- Cork Dockyard could potentially offer staging facilities for foundations with limited improvements to the water depth (maintenance dredging to return entire berth to 7mLAT). Limited loading capacity is available on both the quayside and laydown zone so the practicality of this is unknown.
- Port of Larne appears to have potential to allow for the staging of foundations, however, the degree of laydown which could be available to the ORE industry is unclear given the existing commitments to RoRo activity and the daily ferry service. Additionally, the facility has a limited length of solid quay and as such the suitability of Larne would be largely dependent on vessel selection for installation.
- There are currently no port locations with existing infrastructure and water depths suitable to allow for manufacturing or staging of floating wind projects in Ireland.
- Belfast D1 has significant capabilities but is restricted by the proximity of Belfast City Airport in catering for staging of turbines for floating structures. There is also limited suitability for wet storage within the channel. There may be an opportunity to undertake assembly of prefabricated modular substructure units if these were manufactured elsewhere and transported into Belfast. However, this may or may not prove viable and will ultimately depend on several factors such as substructure type and material, logistics, programme, availability of heavy lift vessel and project costs.
- Harland and Wolff have an excellent dry dock facility with a skilled workforce and fabrication warehousing, but the facility is hampered by similar issues to D1. Harland & Wolff also has the

potential to accommodate assembly of substructure units or potentially pre-assembly of modular units given the existing workforce and available infrastructure.

12.2 Proposed Infrastructure Summary

The following were highlighted as key outcomes of the assessment of the proposed development plans:

- Several port locations have indicated significant development plans, should these come to fruition there would be several facilities capable of acting as staging and marshalling port for fixed-bottom installations. In addition to the existing D1 facility, the following locations are proposing developments matching the required specification; Bremore Port, Cork Dockyard, Moneypoint, Rosslare and SFPC Foynes Island.
- Whilst limited information was available, the 2022 Port of Cork Masterplan is anticipated to detail future plans for infrastructure developments targeting the ORE industry. Additional deep-water quay lengths and landside areas would improve the already significant offering at Ringaskiddy.
- Galway will likely offer a portion of the quayside and total 20 ha planned to the offshore industry (the total of which is currently unknown), this would have the potential to marshal either turbines or foundations for fixed-bottom installations but would likely be unsuitable to cater for both.
- Belfast Harbour indicated plans for the redevelopment of the D3 facility which is adjacent to the D1 site. The D1 site would remain the flagship location, with D3 providing a supporting facility with additional laydown area and significant quayside length. The enhanced facilities could likely accommodate greater capacity projects for fixed-bottom installations, but the facility would still be hindered by the presence of the airport and limited wet storage capacity for floating wind staging.
- Moneypoint appears to have the potential to serve as both manufacturing/assembly and staging ports for floating wind. Foynes Island could accommodate both activities should the final footprint of the site provide adequate landside area. Development timescales will be of critical importance particularly in relation to consenting for the large-scale projects with complex issues around environmental sensitivity.
- The Cork Dockyard proposal appears suitable for assembly and staging of turbines for floating installations. Although it is understood the facility will focus on turbine staging. Bantry Bay was suggested by DSG as a possibility for wet storage although this would represent a significant tow of circa 90 nautical miles. A second potential area was highlighted close to Roches Point, circa 8 nautical miles from the site, this represents a more feasible tow distance.
- Galway has limited capacity to support staging of floating wind considering the degree of laydown and quayside that may be available. However, there may be some capability depending on the degree of laydown available and draft of proposed substructure. Galway could also play a supporting role to another location, potentially providing staging of cables or anchoring/moorings for floating installations.
- Several of the proposals are at a relatively undeveloped stage with several design basis parameters yet to be determined.

- A number of locations have applied for CEF funding to support the developments plans.
- The timescales for the developments indicated by the various locations have been reviewed. Some of the timescales indicated for procurement and construction appear slightly ambitious for projects of the scale anticipated. However, some degree of programme slip could be tolerated given delays are possible for the deployment of Phase 1 and 2 projects.

13 Conclusions and Recommendations

13.1 Conclusions

The study has highlighted Belfast's D1 as the only facility currently entirely suitable (as per the criteria stipulated) to act as a staging and marshalling facility for fixed-bottom installations. The Ringaskiddy facility and the Harland & Wolff site may have the capability to partially support staging of either turbines or foundations (but not both). Whilst both these facilities have the required water depths and laydowns area, the facilities lack heavy duty quayside and laydown areas. To date there has been uncertainty regarding the availability of Port of Cork infrastructure to serve the ORE sector given the significant competing use for the facilities. However, the Port of Cork Masterplan (due for release later in 2022) is anticipated to identify ORE specific ambitions, including plans targeting the development of staging and marshalling facilities. The study has indicated that there are no existing facilities entirely suitable to provide staging for floating installations in Ireland at present. Whilst D1 has the most favourable infrastructure, the limitations on the degree of wet storage, and the presence of Belfast City Airport in proximity to the quayside limit the potential for staging, storage or towing within the channel.

If Ireland is to realise the near future 2030 targets in addition to 2050 Net Zero ambitions, several projects will likely be under construction concurrently. Given the typical scale of the projects anticipated, Belfast Harbour's D1 would have the capacity to serve only one such project at any given time. Multiple port facilities will need to become available to ensure Ireland's climate goals can be realised and that the Irish economy can fully benefit from the opportunity the ORE sector presents. Separate dedicated facilities will be required to allow for the deployment of floating wind, with regional port infrastructure critical to the commercial viability of these type of installations. Should no further suitable port facilities materialise, the Phase 1 & 2 Irish projects and beyond may be serviced by port infrastructure in the UK and Europe.

There is an additional port capacity issue, as many of the ports will likely have competing usages for existing and proposed infrastructure. Where infrastructure is proposed and not being pursued specifically for the ORE sector, for example at Galway, there will be significant competition for the quaysides and landside areas from existing business streams. Similarly, Port of Cork have significant existing infrastructure, however, the degree to which the port may be available is uncertain given the significant container activity in Ringaskiddy. Additionally, if O&M bases materialise at port locations, this will add an additional landside space constraint putting further pressure on port landside availability. Beyond the requirements of the Phase 1 & 2 projects, there will be relatively significant landside spatial requirements for accommodating green hydrogen when this comes to fruition. Green hydrogen is likely to be proposed at port locations in relative proximity to the offshore wind farms and it would be reasonable for this to include locations considered within this study. The establishment of green hydrogen at port locations will provide additional competition for landside areas in proximity to the quaysides. Given the port capacity issues, the provision of several ORE port hubs with relatively significant degrees of laydown area seems critical to the pursuit of Ireland's climate goals.

The port review indicated that in most cases some level of existing supply chain was in proximity to the port areas, and highlighted several ports experienced in handling onshore renewables

components. The emergence of new staging and marshalling ports in Ireland will require additional expertise across several sectors, with only Belfast Harbour having experience of staging large-scale projects. The emergence of floating wind poses a different challenge to the supply chain with much of the required technology still under development.

Whilst the study has painted a relatively bleak outlook of the current port infrastructure capabilities, the indication of numerous development plans is encouraging. Several locations outlined significant development plans specifically for the ORE market, with the assessment highlighting that should these reach completion, several suitable facilities will be available along the Irish Coast. This represents an excellent opportunity for regional development across the island of Ireland.

The assessment of the proposed timescales indicated that the project programmes being pursued were in some cases ambitious, several of the projects represent large scale marine developments with likely complex consenting phases. Delays of 12-18 months in the planning and consenting decision-making phases could be reasonably foreseen, with this impacting the operational date for the port infrastructure. Additionally, it is anticipated that the recent rejection of all four CEF applications will have some impact on the initial programmes proposed with additional time and effort required to resubmit for the second call for applications. This will also provide uncertainty as to how the projects will be financed, potentially pushing back the final investment decision for these locations. Should delays occur, port infrastructure plans in some instances may be operational too late to serve the construction stage for Phase 1 and 2 projects. However, it is noted that the programmes for the Phase 1 and 2 projects may also experience delays, if this were the case and depending upon the scale of the delay, the proposed port infrastructure would be available to serve the construction stages. It is noteworthy that ports are starting to pursue development plans now, and that there is a recognition of the significant timescales to take large scale marine infrastructure projects from initial feasibility to completion.

Whilst several of the port development plans are starting to gather momentum, the consenting and planning processes will be critical to the timely completion of the proposals. In most instances the consenting and planning determination periods will represent the critical path.

Assessment of the development proposals has indicated the scale of investment required to bring the infrastructure up to the required specification, with most cost estimates for capital works in excess of €100 million.

13.2 Summary of Conclusions

1. Belfast Harbour's D1 facility is the only existing facility which can accommodate staging and marshalling of fixed-bottom projects of the scale anticipated.
2. Port of Cork's Ringaskiddy has potential to serve as a staging port for either foundations or turbines (but not both) but is restricted by loading capacities. Port of Cork have indicated that infrastructure plans targeting the ORE industry will be detailed within the 2022 Masterplan due for release later this year. Additional infrastructure would improve the already considerable facilities at Ringaskiddy and reduce the potential competition for use of the terminal.
3. Harland & Wolff and Larne appear to have some suitability to serve as staging ports, however this is largely dependent upon vessel selection due to limitations on draft and quay length respectively.
4. There are no existing facilities suitable to allow for manufacture and staging of floating wind projects in Ireland. D1 and Harland & Wolff at present could potentially offer assembly of modular floating units but are restricted for turbine staging due to air draft constraints and limited wet storage potential. The reduced draft within the Harland & Wolff Building Dock and approach would also limit the suitability of the facility to be used for turbine mating.
5. Several new facilities will be required to meet the demand on staging ports (in addition to the suitable facilities at D1) given that several projects may be under construction simultaneously. This considers the near future 2030 target and the 2050 Net Zero ambitions. Without investment in Irish port infrastructure, offshore projects in Ireland will likely be serviced from UK or European ports.
6. Several ports have indicated development plans suitable to accommodate the deployment of fixed-bottom installations. Locations which have plans suitable for fixed-bottom installation are: Bremore, Cork Dockyard, Moneypoint, Rosslare and SFPC Foynes Island.
7. Several ports have indicated development plans suitable to accommodate the manufacture, assembly and staging of floating installations. Moneypoint and SFPC Foynes Island have the potential to accommodate manufacture (depending upon final footprint), assembly and staging. With Cork Dockyard's plans suitable for staging of most types of substructure, wet storage may be an issue if proposed at Bantry Bay given the significant tow distance. The wet storage areas proposed by Cork Dockyard would likely be suitable for steel substructures only given the water depths. The locations most suitable for floating wind are located on the west and south coast.
8. The indicative timescales indicated for port infrastructure development are in some cases quite ambitious. Consenting and planning phases of the marine infrastructure proposals will be of critical importance to the timely delivery of operational port facilities.
9. The local supply chain will require development if the several new port facilities materialise, particularly when considering floating wind. The identification of several suitable port infrastructure proposals around the coast could provide a significant level of regional development if the plans are realised.
10. Significant investment is required for ports to realise the development plans proposed, with all the large-scale redevelopment plans indicating cost estimates north of €100

million. With several locations relying on CEF funding to support the developments and considering the responses to the first round of applications, funding will likely be critical to the successful delivery of the development plans considered.

13.3 Recommendations

On the basis of the conclusions of the study, the following key recommendations are proposed to ensure that suitable port infrastructure is available to serve Irish offshore wind deployment:

13.3.1 Government Support for Funding

The need for additional port infrastructure to support the emerging Irish offshore wind sector is a key conclusion of the study. Several new or upgraded facilities are required to allow for the successful deployment of Irish fixed and floating wind to meet the 2030 targets and beyond. From engagement with the port locations considered in the study, where large scale development plans are proposed, the capital value of the works is estimated between €100-300m (with the exception of Bremore which represents a significantly larger spend given it proposes to develop a new port). Large degrees of funding will be required to cover the capital costs of the developments, this is a challenge for ports, particularly as no future ORE revenue is guaranteed from the facilities at this stage. Ports may also need to step away from existing business streams to pursue the ORE industry given the limited port capacities and the scale of the development plans. Considering the anticipated duration to take large-scale port projects from feasibility to completion, there is a need for ports to pursue these developments now (without the assurance of future revenue), if the port infrastructure is to be operational for the Phase 1 and 2 project construction stages.

Port locations seeking to avail of traditional private sector investment to finance ORE specific infrastructure may encounter difficulties. Considering the position as it stands today, where no ORE contracts have been secured by ports, it is likely that the proposed developments will be estimated to be unable to generate enough revenue to cover the debt repayments over the investment term. Where this is the case, the difference between the required investment and the degree of investment which could be sustainably serviced is known as the "funding gap" [40]. In instances where the funding gap is significant, the development plan cannot go ahead without additional forms of funding. The current lack of surety for project demand of ORE specific infrastructure also serves to reduce the chances of achieving investment on favourable terms, adding a further barrier to the timely delivery of these key infrastructure projects. It is noted that the significant scale of the 2030 climate targets, and the likely offshore wind targets to meet Net Zero will serve to provide a vast pipeline of future projects requiring these services.

Whilst ports may have difficulty in gaining investment for ORE facilities on the basis of a business case built solely around servicing offshore construction, it is worth noting that facilities built to ORE specification are suitable to service a wide number of sectors. The demands of offshore wind staging require high specification quaysides in addition to significant landside areas. These types of facilities have the suitability to market themselves as multi-modal, as opposed to ORE specific and as such can make best use of the facilities for other business streams. The flexibility of high specification ORE port facilities should help strengthen the business case for port infrastructure projects.

The EU currently offer a method of funding to support infrastructure schemes across transport, energy and telecommunications (CEF scheme). Considering the European climate goals, the CEF criteria were recently extended to cover studies and capital costs relating to ORE port infrastructure. Four of the port locations discussed applied for CEF funding to support the proposed development plans. It was hoped that the availability of such funding would serve to de-risk some of the upfront spending by ports. However, all four of the Irish port applications relating to ORE developments were rejected in July 2022. It is likely that unsuccessful locations will reapply during the second call for applications opening in September.

Given the uncertainty around the availability of CEF funding at this stage, and the potential for difficulties in gaining investment, some degree of Irish Government support to the locations pursuing development plans appears critical. Support from the Government would provide confidence to the infrastructure proposals and ensure the infrastructure upgrades are delivered in the timescales required. There are several possible channels and methods from which Government support could be provided. Public sector grants supporting infrastructure developments are an option to reduce funding gaps making projects more attractive for investors. Grants will typically only be offered to schemes where there is strategic importance and potential for socio-economic benefits stemming from the contribution. ORE port infrastructure would meet the criteria for both. Government grant support for port developments has been seen in the UK, recently the UK Government announced £160 million in funding for ports targeting the floating wind sector (FLOMIS Scheme). The provision of such support is hoped to stimulate the creation of thousands of new jobs and reduce the need for imports from Europe and further afield [41].

Beyond grant funding, low interest rates could be offered to port locations to support development plans. Loans secured through the Government could benefit from lower interest rates than the private sector thus improving the commercial viability of the projects. A Government backed loan scheme as opposed to a pure government contribution could be more attractive at Government level if the money were proposed to be paid back, thus removing a level of risk from the scheme. Examples of similar funding models have been seen in Scotland, where the Scottish National Investment Bank (SNIB) provided lower cost loans to Aberdeen Harbour to support recent port developments.

The 2021 Port Policy outlines potential “future” sources of investment for port infrastructure, including the European Investment Bank, the Ireland Strategic Investment Fund (ISIF) and Green Funds. Whilst there is an understanding of the necessity for funding, this needs to become available now to allow for timely development of port infrastructure projects targeting the ORE sector. The Irish Government could facilitate access for port authorities to these funding vehicles, particularly the ISIF given the public nature of the funds. Whilst the port policy notes these alternative investment vehicles, it states that investment would only be made on the basis of a viable business case for the project. As per the discussion on the potential difficulty for private investment, there needs to be some degree of backing or guarantee from Government to support business cases seeking investment from these sources.

13.3.2 Clarity on Timescales

Feeding into the uncertainty surrounding project revenue is the lack of clarity on timescales for Phase 1/2 projects and beyond. The developers have limited clarity on timescales and process and consequently this is being fed back during engagements with port locations. Whilst the proposed timescales for marine infrastructure developments require action now, developers are unwilling to help fund port infrastructure plans with no assurance the project will move beyond the O-RESS stage or planning stages. Additionally, the port locations cannot get a definite answer as to when the projects may be at construction stage, nor are they sure what will happen post Phase 2. The lack of clarity is introducing additional nervousness around the level of investment. Port locations have no guarantee when they might start to get a return on investment, or if there will be more than one project serviced out of a facility. Further Government guidance and updates on the relevant processes, including O-RESS and GCA would serve to reduce anxiety around the viability of the sector as a business stream.

13.3.3 Roadmap to 2050 and Net Zero

Beyond the deployment of Phase 1 & 2 projects, there is lack of understanding on what will happen beyond 2030 and the route to Net Zero emissions by 2050. Accelerated publication of Government documents outlining the roadmap toward the 2050 goals would serve to highlight the volumes and location of offshore wind required to meet the ambitions. Reference to Government strategy documents would be key to successful consenting outcomes for port infrastructure by demonstrating the primary need for the developments. A clearer picture on the requirements to meet the 2050 Net Zero ambitions would also aid in fully understanding the demands on port infrastructure and help to quantify the number and scale of facilities needed. Timely publication of documents such as OREDP II, Hydrogen Strategy & Long-Term Strategy is recommended to provide the roadmap needed to allow for developers and port authorities to plan for the future and ultimately meet the 2050 climate targets.

13.3.4 Continued Engagement and Collaboration

Engagement between the industry, port operators and other stakeholders was a key recommendation of the 2018 IPORES report and this does appear to have been tangibly improved. Continued engagement between parties will be essential for guiding the development of port infrastructure to successful completion and ensuring fit-for-purpose facilities. In addition to engagement between industry and port operators, dialogue between port locations would be highlighted as a key recommendation of this study.

The Government's multi-port policy, in addition to the scale of what is required to be achieved by 2030, will likely need some level of collaboration between ports to ensure projects can be delivered. There are several neighbouring ports identified within this study which appear to be at least partially suitable to act as staging ports. Locations of this nature could potentially partner-up to provide the required staging and marshalling facilities for offshore wind projects (for example one location could provide staging for turbine elements, whilst another location in relative proximity could provide staging of foundations if space not available at one port). It is also anticipated that ports in proximity

to staging facilities will play a supporting role for these construction activities, an example of such is Waterford which have indicated an intention to offer support to the proposed development at Rosslare. Collaboration of this nature should also serve to promote further regional supply chain development.

WindEurope established a Ports Platform in recognition of the importance of port infrastructure to the development of a robust offshore wind sector. The platform has been established as a vehicle for knowledge transfer and allows for discussion of the challenges and opportunities within the offshore sector between port organisations [42]. A similar type of platform could be established in Ireland to allow for those ports seeking to become involved in the wind energy sector to engage with other locations. At present there is no specific Irish port group for those locations seeking to pursue opportunities within the offshore market. An Irish port grouping would allow for sharing of information, understanding of capabilities, and planning for collaboration between ports to overcome the anticipated challenges. It would be suggested that this could be established through Wind Energy Ireland as the representative body for the Irish Wind Industry. Wind Energy Ireland also has strong links with many supply chain organisations, with WEI responsible for the Supply Chain Working Group. As ports are so inextricably linked to the supply chain (for both construction staging and O&M), this could allow for exploitation of synergies across organisations. If a grouping or platform were formed, it would be suggested that this is done in collaboration with the Ports Coordination Group to ensure the goals and ambitions of the platform match that of the Department of Transport.

There is also an opportunity for ports in relative proximity to come together to form port clusters, where the attributes of the grouping can be showcased with the aim of attracting business and investment. Port clusters have been seen in Scotland, where ports within Cromarty Firth and Moray Firth are collaborating to form a floating wind cluster. Scotland's Highlands and Islands Enterprise (HIE) partnered with Scottish Development International (SDI) and the Department for International Trade (DIT) to create the cluster, with the aim of attracting overseas manufacturing companies relevant to floating wind. Provision of Irish port clusters could have a similar impact and aid in de-risking projects with investment a key issue for the development of port infrastructure in Ireland. The provision of an Irish Port Platform could allow for communication between ports and act as a stimulus for the development of port clusters between relevant port locations targeting specific areas (for example north-west projects, or floating projects).

13.3.5 Planning and Consent Resourcing and Prioritisation

The planning and consenting element will be of key importance to the successful and timely delivery of the ORE port infrastructure projects. The foreshore consenting system have proven cumbersome to date, with significant decision periods required for marine activities. The introduction of the Maritime Area Planning (MAP) Act in late 2021 is hoped to improve the consenting framework in Ireland, with the introduction of Maritime Area Regulatory Authority (MARA) proposed to assess marine consenting applications once operational.

The Department for Housing, Local Government and Heritage has come under increased scrutiny with a significant backlog of foreshore applications currently in the system. This is not surprising given the

foreshore department oversees a large range of activities, and consequently a significant volume of proposed applications. Whilst the introduction of the new Maritime Area Regulatory Authority (MARA) will likely reduce the burden on the current system, this will not be introduced until at least 2023. In April 2022, the Minister for Housing, Local Government and Heritage highlighted how the site investigation foreshore licence applications from the Phase 1 projects were being prioritised within the system [43]. This is recognised as a positive step, with similar prioritisation for port development plans recommended to ensure the backlog does not negatively impact any of the port infrastructure proposals.

In addition to foreshore consenting, there has been relative dissatisfaction with the timescales for planning decisions in the past, with a shortage of planners to deal with the demand highlighted as recently as May 2022 [44]. It is strongly recommended that An Bord Pleanála increase resourcing to alleviate potentially lengthy decision-making periods. In 2021, it was proposed that 8 additional planning staff should be appointed to deal with an anticipated surge in applications [45]. However, to date there has been relatively limited recruitment and without additional staff, delays to planning approvals seem unavoidable. Additionally, given the significance of the failure to meet the required operational timescales, it would be suggested that ministerial instructions are placed on ABP to expedite applications for renewable projects and port development plans to serve such projects.

The study has highlighted that for certain projects, developers may need to pursue a multi-port approach to serve projects. It would be proposed that a degree of flexibility is allowed for within the consents granted to port locations as the exact nature of the staging activity may vary. Similarly, as the ports may serve other sectors when not in use for ORE construction staging, consents granted to ports should be afforded a degree of flexibility to ensure consenting conditions do not preclude the use of the facility for differing purposes.

13.3.6 Support for the Supply Chain and R&D

The emergence of the ORE sector in Ireland represents a significant opportunity for the Irish supply chain and economy, particularly for regional development. Further steps are needed to ensure that supply chains in proximity to port locations can service as much of the industry as possible. There is an opportunity to develop thriving ORE hubs around staging ports, with the positive impact of dedicated ORE ports in developing the supply chain seen in mature markets across Europe. However, without improvement of port infrastructure, the Irish projects will likely be serviced by UK or European ports and supply chain with the Irish economy losing out on a large degree of potential revenue. The development of an Irish supply chain is interdependent upon the development of suitable port infrastructure to a certain degree.

The presence and emergence of supply chain clusters is encouraging, and will improve the degree of Irish involvement, but more could be done to improve the outlook for Phase 1 & 2 projects. Enterprise Ireland and Wind Energy Ireland have done considerable work in relation to the supply chain, with the Gael Offshore Network emerging in June 2022, and WEI continuing to promote development of an Irish supply chain through the Supply Chain Working Group. Engagement and collaboration across clusters and working groups is proposed to allow for identification of opportunities and understanding of synergies across the sector. It is recommended that a form of Government support is made available

for new players trying to enter the market, this could be in the form of grants to support development of new technologies or training, or through the development of local enterprise zones.

Whilst several Irish SMEs have supported the fixed-bottom wind industry in the UK, significant supply chain development will be needed to serve the offshore wind industry in Ireland. This is particularly true for floating wind projects and the provision of floating wind specific components. Floating wind will be critical to achieving the Net Zero targets of 2050, but large areas of the required technology are currently underdeveloped. Continued research and development will help ensure commercial scale floating deployment is viable and provide surety for ports pursuing floating wind specific infrastructure. Government support for research and development has been seen in the UK, where the early support schemes focused on research and innovation to drive improvements. More recently, the UK Government announced circa £60 million in funding (£31 million of public funding in addition to £31 million of private investment) to support the development of the floating sector, indicating an understanding of the importance of this phase of development [46]. The Irish Government could take a lead from the well-established and proven success of the UK and provide funding or access to investment for the R&D sector in Ireland.

Relevant to both the staging of construction and O&M, Government led action is recommended to tackle the anticipated skills gap. Developers could be engaging with local colleges to develop links and establish training opportunities and schemes, with a route to qualification and employment guaranteed after the scheme is complete. Government promotion and incentivisation for such training opportunities and STEM careers would also be suggested to provide graduates for skilled positions which will be available in the next 5-10 years. There is also an opportunity to harness the skillset from other sectors, with significant maritime experience located in many of the coastal towns considered within this study. Locations such as Killybegs have large numbers of skilled fishermen, however the current ticketing system does not allow for these workers to service other sectors. If a scheme were proposed which would allow for a short training period and transition of the fishing tickets to the required Merchant tickets, the existing skillset could be leveraged. This example presents an opportunity to benefit from an already skilled workforce.

13.3.7 Summary of Recommendations

Table 13-1: Summary of National Port Study Recommendations

Item	Recommendation	Reasoning & Details of Proposed Action	Government Body or Organisation
1.	Irish Government support for port locations pursuing development plans to serve the Irish ORE market, potentially including State funding.	Active support from the Irish Government would serve to help de-risk the level of upfront investment for port authorities and plug any funding gaps which may exist. Government led support could be in the form of direct funding from the exchequer, a low interest loan scheme or access to funding vehicles such as the ISIF (Ireland Strategic Investment Fund) and EIB (European Investment Bank).	**Department of Transport, Department for Public Expenditure and Reform.**
2.	Clarity on timescales and processes for key milestone events and decisions (O-RESS, GCA, etc) from Government level.	Clarity on timescales and processes would provide assurance to both developers and port authorities that timescales being pursued are sensible. This would provide clarity and add confidence to the commercial viability of port infrastructure plans.	**Department of the Environment, Climate and Communications.**
3.	Accelerated publication of key Government strategy documents outlining the roadmap beyond 2030 and toward the Net Zero goal of 2050.	At present there is significant emphasis on the near future 2030 goals and the fixed-bottom opportunity. It is less clear how the 2050 Net Zero goal will be reached and what this may mean in terms of volumes of offshore wind and other related activities. Additional clarity on the route beyond 2030 will facilitate planning for the required level of infrastructure and strengthen the case for port development.	**Department of the Environment, Climate and Communications.**
4.	Continued engagement between developers, statutory authorities, port authorities and other relevant stakeholders.	Facilitation of continued dialogue between developers, statutory authorities, port authorities and other relevant stakeholders will ensure all parties are aware of the current state of play. To facilitate this, it would be proposed that the port co-ordination group is expanded to include industry personnel and port authorities seeking to serve the offshore wind market.	**Department of Transport.**
5.	Encouragement for collaboration between ports to ensure successful delivery of Irish Projects.	Given the likelihood that multiple Phase 1 and Phase 2 projects might be under construction at the same time, smaller ports should be encouraged to co-operate and work together to compete for the opportunity to provide construction services. To aid in encouraging collaboration, it would be proposed that an Irish port platform is established for ports seeking to serve the ORE sector in Ireland. Such a grouping would allow for knowledge transfer between port locations and provide a platform for discussion of challenges and opportunities.	**Wind Energy Ireland.**
6.	Properly resource the planning system and prioritise applications from	Government commitment to a streamlined consenting and planning system will ensure delays to decision making periods do not detrimentally impact project programmes and completion dates for port facilities. It is proposed that the Department for Housing, Local Government and Heritage	**Department for Housing, Local Government and Heritage, An Bord Pleanála.**

	ports for ORE related infrastructure.	prioritise foreshore licence applications from ports targeting the ORE sector (in addition to applications from developers). This would aid in the timely delivery of operational facilities. Additionally, increased levels of resourcing for the Department for Housing, Local Government and Heritage and ABP would help to alleviate the delays which have been seen previously, largely attributed to staffing issues. Given the national importance of the climate targets, it would be further suggested that the Minister for Housing, Local Government and Heritage instruct ABP to prioritise planning applications from port locations seeking to accommodate the ORE industry.	
7.	Supply chain support to ensure Ireland can service as much of the industry as possible.	Significant work has already been done by Enterprise Ireland with the formation of offshore specific clusters. It is recommended that this is continued with engagement between clusters and working groups encouraged to allow for identification of opportunities and synergies. Government support is recommended to allow new players to enter the market (through grants supporting new technologies or training, or creation of ORE local enterprise zones). Government promotion and incentivisation of STEM careers is also suggested to help address the skills gap.	**Enterprise Ireland and the Department of Enterprise, Trade and Employment, Department of Further and Higher Education.**
8.	Support for research & development, particularly within the floating wind sector.	Government support for research & development is recommended to aid the development of an Irish supply chain. Particularly for the emerging floating wind sector which will be critical for reaching the 2050 Net Zero ambitions and could make a significant contribution to our 2030 targets. Continued research and development will ensure commercial scale deployment is viable and provide certainty for ports pursuing floating wind specific infrastructure. Funding and support for the research and development phase will help to refine much of the fledging technology required for floating wind.	**Enterprise Ireland and the Department of Enterprise, Trade and Employment.**

Several of the proposed recommendations align with the 8 points proposed by the Department of Transport in March 2022, outlined within Section 4.3. It is noteworthy that these have been identified at Government level and suggests an understanding that without Government led support, Ireland could lose out on the significant opportunity that offshore wind deployment presents.

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Appendix A - 2022 Wind Energy Ireland Port Questionnaire

National Ports Study: Consultation with Irish Ports

Introduction

The offshore wind sector in Ireland is starting to gain increased momentum with the Maritime Area Planning (MAP) Act signed into law on 23 December 2021 and the Department of Environment, Climate Action and Communications (DECC) publishing the timeline for the first Offshore RESS auction with a date of Q4 2022. These major milestones provide a consenting framework and route-to-market for the first round of offshore wind projects and with consultation recently concluded for defining the Phase Two project strategy, the wider industry can finally see a clear pathway to achieving the Climate Action Plan target of at least 5 GW of offshore wind energy by 2030.

Attention is urgently required on the practical aspects of how these projects will be delivered. Port infrastructure to support construction, maintenance and decommissioning will require significant investment to be fit for purpose. There is a lack of suitable infrastructure on the island of Ireland to ensure that all projects can be delivered in a timely manner. To ensure a robust long-term offshore wind sector, it is imperative that a local supply-chain is developed to service industry.

Ports can serve as a hub for suppliers to congregate and can act as a catalyst for upskilling and upscaling of maritime businesses to become key suppliers to the offshore wind sector. To facilitate port upgrades around the country, the current status of the existing infrastructure needs to be established and the potential for this infrastructure to service the offshore wind sector needs to be assessed.

Purpose of this document

GDG have been commissioned by Wind Energy Ireland to undertake a national study of the port infrastructure on the island of Ireland, i.e. both Northern Ireland and the Republic of Ireland. The outcome of the study will be a concise summary of the existing infrastructure in Ireland with an assessment of the suitability of such to support the offshore wind industry for **both fixed and floating** installations. The assessment will also consider the suitability of any proposed developments to meet the anticipated industry requirements.

The study and this questionnaire will consider the parameters and criteria relevant for the following only;

- Staging and marshalling for **fixed** installations.
- Substructure manufacturing and marshalling/fit-out activities for **floating** installations.

The scope of this study will not consider O&M or decommissioning. The questionnaire responses will be assessed against a benchmark of minimum and preferred criteria as informed by consultation with the ORE industry, alongside research and previous experience.

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Consultation inquiries

We would appreciate if you would populate the table below, which captures the key parameters and will allow for assessment of suitability.

Where several berths exist within the port area, identify specific berth(s) which may be suitable as opposed to an overview of total number and length of quayside.

Parameter	*Value*	*Additional Comments*
Port Criteria		
Access Channel Width (m)		
Access Channel Draft (m LAT)		
Quay Draft (m LAT)		
Quay Berth Length (m)		
Quay Berth Width (m)		
Quayside Bearing Capacity (t/m^2) - *including any details of heavy lift zones (dimensions and load rating)*		
Details of Proposed Quay – *existing use, date constructed, current conditions and any other relevant criteria*		
Nature of Ground Conditions in Berth Pocket (if known) – *provide details*		
Laydown Area (hectares)		
Laydown Bearing Capacity (t/m^2)		
Additional Landside Storage Areas within the Port (which may be used for storage/compounds) – *provide details*		
Air Gap Restrictions (y/n) – *provide details*		
Potential Wet Storage Area (ha) – *provide details of proximity to quayside*		
Craneage capabilities (existing) - *provide details on lift capacity and reach*		
Pilot / Tug Support Available (y/n) - *provide details*		

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Slipway / Dry Dock Available (y/n) - *provide details*		
Tidal Range (m)		
RoRo Capabilities (y/n) - *provide details*		
Access to Transport Corridors (y/n) - *provide details*		
Welfare / office facilities near quayside (m^2)		
Shore-to-ship Power (y/n) - (kW/Volts/Hertz)		
Bunkering Facilities within port area (y/n) – *provide details*		
I.T./comms facilities within port – *provide details*		
Provide details regarding HSE standards/regulations/equipment in the port		

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Parameter	*Value*	*Additional Comments*
Additional Relevant Criteria		
Proximity of relevant supply chain to port area - *provide details*		
Previous experience within the renewables industry (y/n) - *provide details*		
Proposed redevelopment plans/details (if applicable)? Details can be appended in separate attachment if required. Include timelines for proposed developments in addition to status of consents (planning, foreshore licenses etc). Provide details of value of capital investment required for proposed infrastructure development.		

We would also appreciate any open feedback on additional or specific port capabilities that may be relevant.

Next steps

- Consultation opens Tuesday 19th April.
- Response back by Tuesday 10th May.
- GDG may propose a site visit on receipt of the information if the port is amenable to such.

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