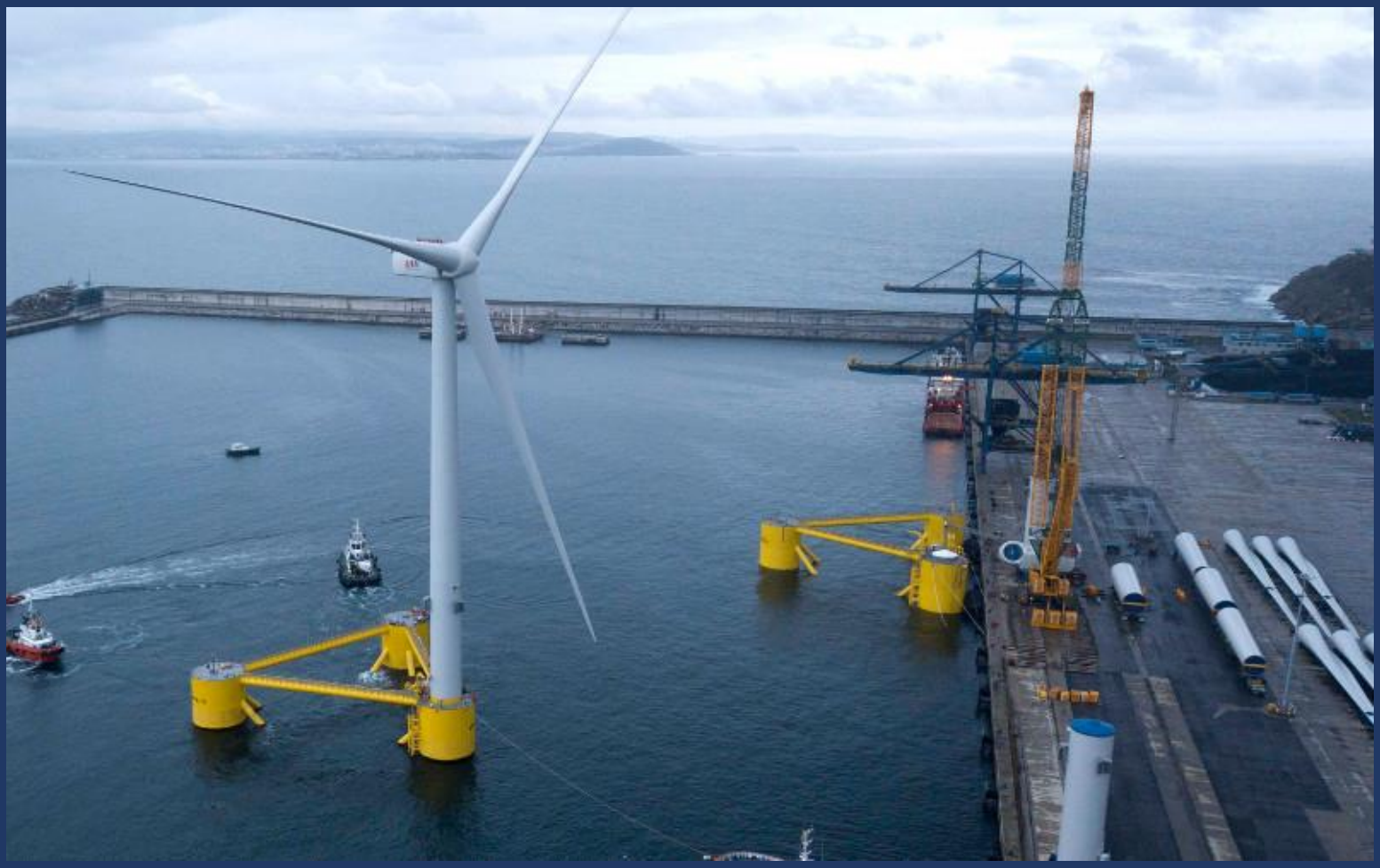
Dublin Offshore



EXTENDED SUMMARY

Growth of Onshore to Offshore Wind – Atlantic Region Wind Energy & Supply-Chain Feasibility Study

July 2022

Client

The study was commissioned by the Mid-West, North-West and West Regional Enterprise Offices and funded by the Enterprise Ireland Regional Enterprise Transition Scheme, Clare County Council, Donegal County Council, Leitrim County Council, Limerick County Council, Mayo County Council, Tipperary County Council and the Western Development Commission. Dublin Offshore Consultants were selected by tender to develop a report and briefings on how public bodies and educational bodies can support the development and growth of the wind energy industry and supply chain from onshore to offshore in the Atlantic region (from Donegal to Limerick, covering the NUTS3 areas defined by the Mid-West, Northwest and West Regional Enterprise Plans.

About this Report

Date of Issue: July 2022

Lead Author: Dublin Offshore

Project Team: Baseline & Scenario – Dublin Offshore

Economic Analysis – BIGGAR Economics

The Project Team authored this report based on an impartial analysis of primary and secondary sources, including stakeholder consultation. The Authors would like to thank everyone that has contributed their time and expertise during the preparation and completion of this report. Special thanks go to Leitrim County Council and the Stakeholder group whose input and feedback were invaluable in completing this report.

Disclaimer

Extended Summary

Report Purpose

The Atlantic Region, comprised of the Northwest, West, and Midwest regions (from Donegal to Limerick) has an abundance of natural resources along its coastline. The Atlantic region has an established onshore wind industry with significant potential for offshore wind in the medium term (5-10 years). A supply chain has developed to cater for the onshore wind industry and an offshore supply chain has developed to support fisheries and O&G activities in the region and internationally. For Ireland and the Atlantic Region to realise the full potential of their wind resources, and facilitate private investment and job creation, the supply chain must be encouraged to both develop further to cater for onshore wind and to diversify to cater for the future offshore wind industry.

The purpose of this study is to develop a report and briefings on how public bodies and educational bodies can support the development and growth of the wind energy industry and supply chain from onshore to offshore in the Atlantic region. This report and subsequent webinar events will form the basis of subsequent projects, educational courses, initiatives to support the development and growth of the onshore and offshore wind along the Atlantic Region.

Wind Energy in Ireland

Ireland has some of the best wind resources in Europe and globally. Despite early progress in offshore wind in Ireland, the wind industry has developed almost exclusively onshore in the past 20 years, taking advantage of the relative ease of construction and enabling cost-effective development of small to medium projects. The SEAI Wind Atlas illustrates the wind speed at a height of 100m across Ireland and offshore. Wind projects at development locations onshore can avail of wind speeds of approx. 7 m/s, relatively high in global terms but substantially lower than the wind speeds offshore, where wind speeds are observed in excess of 10 m/s.

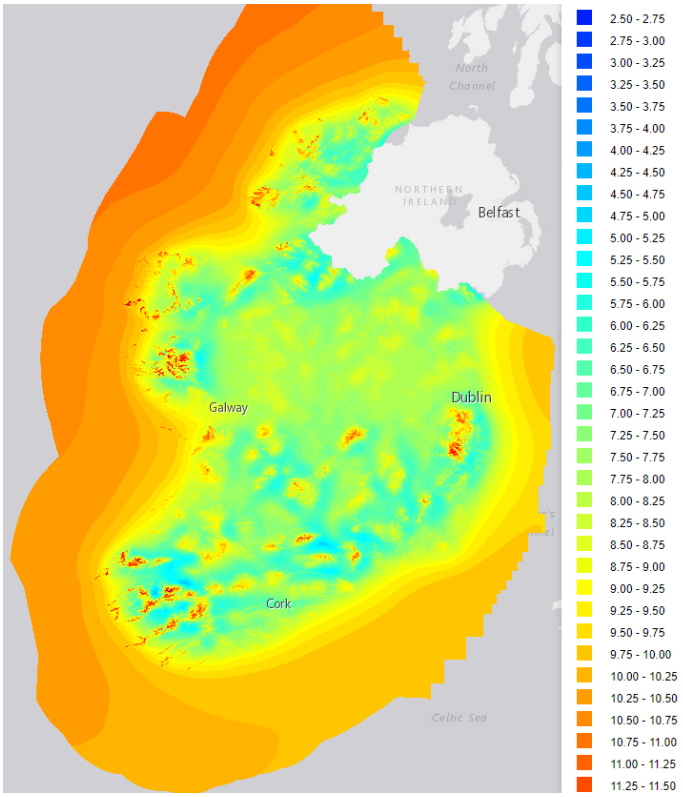


Figure 1: SEAI Wind Energy Resource Map

In addition, there is a significant difference in the wind resource between the East coast of Ireland and wind speeds observed offshore in the Atlantic Region with wind speeds approximately 1 m/s higher in the Atlantic Region.

The wind power is a function of the cube of the wind speed so even relatively minor increases in wind speed can deliver significant increases in the energy captured and, as a result, increased revenue to the project developer.

The improved wind resource found offshore, and especially far offshore at typical floating offshore wind sites is demonstrated by historical capacity factors, the measure of the energy captured as a percentage of the nameplate capacity of the turbine or windfarm. In Ireland the capacity factor recorded for onshore wind in the 5 years up to 2019 was 28.3% [1]. In contrast the Hywind floating offshore wind project in Scotland delivered a capacity factor of 56.8% in the past 12 months [2]. Improved capacity factors are expected in FOW projects generally. If this trend is repeated in Ireland, it would indicate substantially greater returns for offshore projects can be achieved.

Existing Wind Projects

Ireland has abundant wind energy resources, with installed capacity of more than 4.3GW in the Republic of Ireland. In addition, there is approx. 25MW installed capacity of offshore wind at Arklow Bank.

The Atlantic region accounts for more than half of the wind energy generated in Ireland, as of July 2021. The existing distribution of wind energy in Ireland is shown in Figure 2 with a breakdown of wind energy between each of the counties and sub-regions in the Atlantic Region and the remainder of the country.

Onshore wind projects in the Atlantic Region which have been successful in the two Renewable Energy Support Scheme (RESS) auctions are also included.

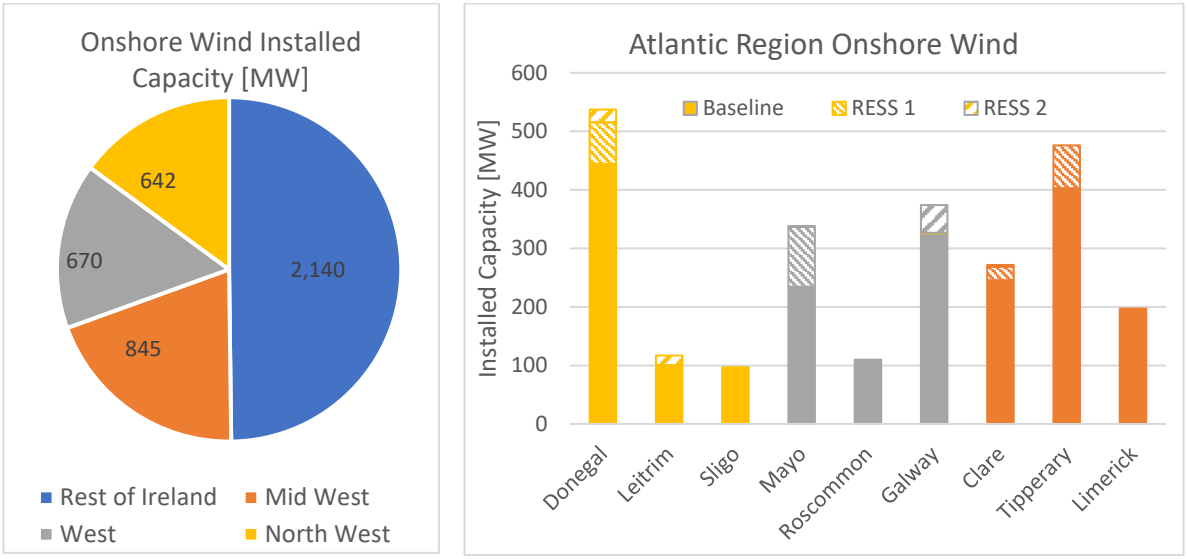


Figure 2: Distribution of Onshore Wind Capacity in Ireland including successful RESS 1 and 2 projects [R]

Government Targets

The Joint Oireachtas Committee on Climate Action published its cross-party report in 2019 entitled: Climate Change: A cross-party Consensus for Action, detailing recommendations including a target for 70% renewable electricity in Ireland by 2030. The 70% target was formally adopted in the Government's Climate Action Plan and increased to 80% in 2021, including:

- 8GW of onshore wind capacity, and
- 5GW of offshore wind capacity.

The target of 8GW of onshore wind capacity by 2030 represents an almost doubling of existing wind capacity. However onshore wind faces a number of challenges not least planning with proactive stakeholder engagement and policy revision likely required to enable successful delivery of the targets. The projects announced under the RESS 1 and RESS 2 auctions illustrated in Figure 2 indicate there is significant additional capacity required to meet the onshore target.

Of the 5GW of offshore wind contained within the 2030 targets, 3GW is expected to be delivered on the East coast of Ireland with the remaining 2GW delivered on the South coast in the Celtic Sea, and on the West coast.

The Programme for Government 'Our Shared Future' aims to take advantage of the "at least 30 GW of offshore floating wind power" off the Atlantic coast by 2050. Irelands Offshore Renewable Energy Development Plan (OREDP) outlines the possibility of 27 GW of floating wind in Irish waters (7GW of which is on the West Coast).

Pipeline Projects

Almost 40GW of offshore wind projects are in development in Ireland of which more than 10GW are in the Atlantic Region, and nearly 4GW of schemes given "relevant projects" status to allow fast track development. In early 2022 the first six commercial scale offshore wind projects off Ireland were declared. Five of these projects are in the Irish Sea, with just one on the West Coast of Ireland, the 400MW Sceirde Rocks projects off the Galway coast.

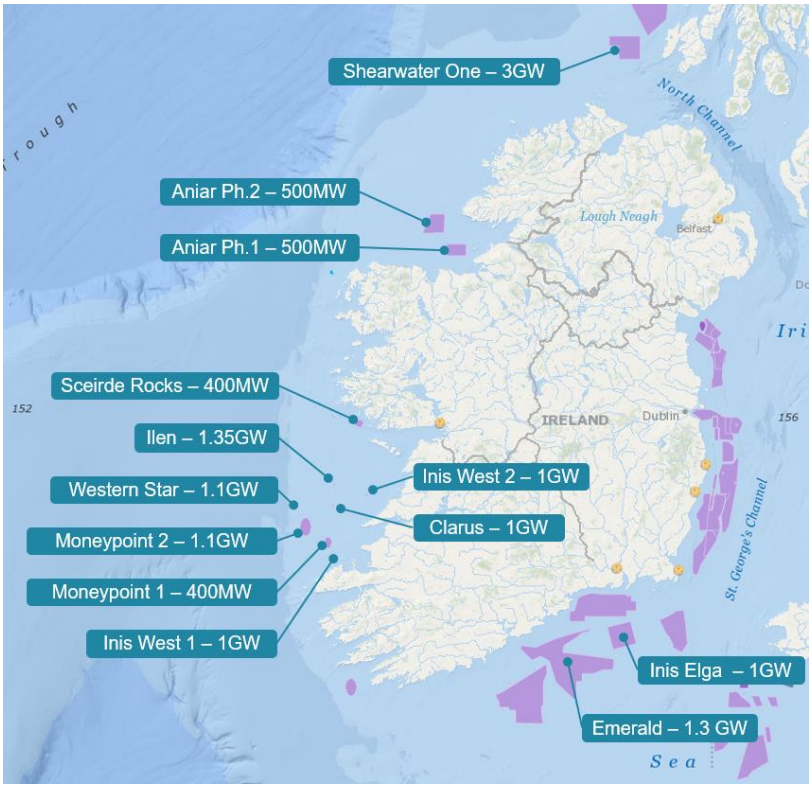


Figure 3: Atlantic Region Offshore Project Pipeline

The majority of Phase 2 projects in the Atlantic Region are focused on access to the Moneypoint grid connection, which is anticipated to become available from 2025, however they are competing for less than 2GW of grid connection capacity. These projects are located off the west Clare coast and will be developed using floating platforms due to the limitations on water depth for traditional fixed-bottom foundations. Currently there are at least

seven specific floating offshore wind farm projects in the Atlantic Region in the very early stages of planning.

Future installed FOW capacity may be related to upgrades in grid connection availability, or potentially production of Green Hydrogen as a vector fuel. Combined fixed and floating offshore wind projects are also planned off the Sligo and Donegal coasts in the North-West region and are at an early stage of project definition and planning.

Wind Build out Scenarios

In order to quantify the scale of the opportunity that the development of onshore and offshore wind offers to the Atlantic Region, this study examined the pipeline of declared wind projects, the Programme for Government [3], the Climate Action Plan 2019 [4] and 2021 [5], Eirgrid's 'Shaping Our Electricity Future' report [6] and an extensive list of academic and industry sources [7] [8].

Three build-out scenarios were established for the future development of wind energy in Ireland considering *Steady, Rapid,* and *Aspirational* outcomes. The projections are presented in Figure 4 and indicate that the offshore wind sector is set to overtake the onshore industry in the Atlantic Region within the 15-year period considered in the study.

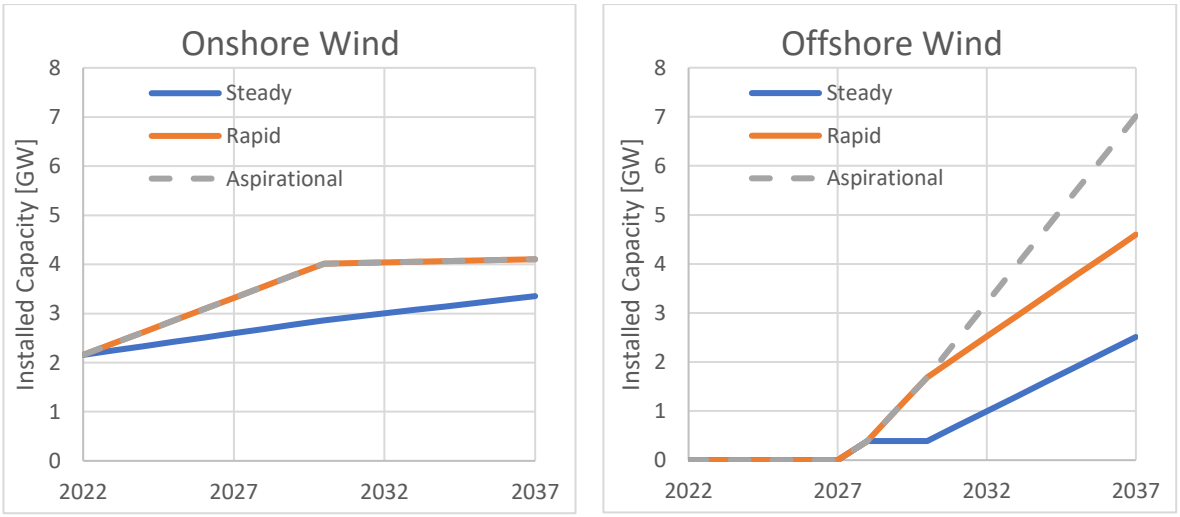


Figure 4: Steady Rapid and Aspirational Build Out Scenarios for the Atlantic Region

Economic Impact

The onshore wind industry in the Atlantic Region is already well established and in order to understand the potential growth from onshore to offshore wind it was necessary to determine a baseline of economic activity in the sector. It was estimated that in 2022 across the Atlantic Region there were a total 3,550 MW of onshore wind in construction, development or operation, of which:

- 930 MW is under development;
- 460 MW is under construction; and
- 2,160 MW is in operation.

A similar approach was taken to estimate ethe economic impact of offshore wind projects currently in development. The offshore wind sector in the Atlantic Region is in its infancy and there are no operational offshore wind farms off the west coast however there are project proposals such as Sceirde Rocks, which are in the development stage and generating economic activity.

A longitudinal economic model was developed to estimate the current activity and to account for future wind activity across each of onshore, fixed offshore and floating offshore wind segments. The results of the longitudinal model for the baseline (current year) and projected economic impact are presented in Table 1 for the Rapid build out scenario. It is estimated that in the Rapid build out scenario the combined GVA of onshore and offshore wind in the Atlantic Region will be €2.85bn to 2037.

Table 1: Onshore and Offshore Wind GVA by Region - Rapid Scenario

Region	Onshore GVA [€m]		Offshore GVA [€m]	
	2022	to 2037	2022	to 2037
Northwest Region	8	110	1	460
West Region	16	200	4	610
Mid-West Region	21	270	2	1,200
Atlantic Region	45	570	6	2,300
Republic of Ireland	199	2,600	85	13,100

Not all of this spending takes place within Ireland, as turbine components, for instance, are imported. For example, in the baseline onshore wind case the total spend across the Atlantic region, inclusive of any spending associated with developments not located within this area, was estimated at €110 million. This is equivalent to 14% of the total expenditure on the onshore wind sector in the Republic of Ireland in 2022. In general, each region is expected to secure between 15 – 30% of the capital expenditure of projects built in their area [9].

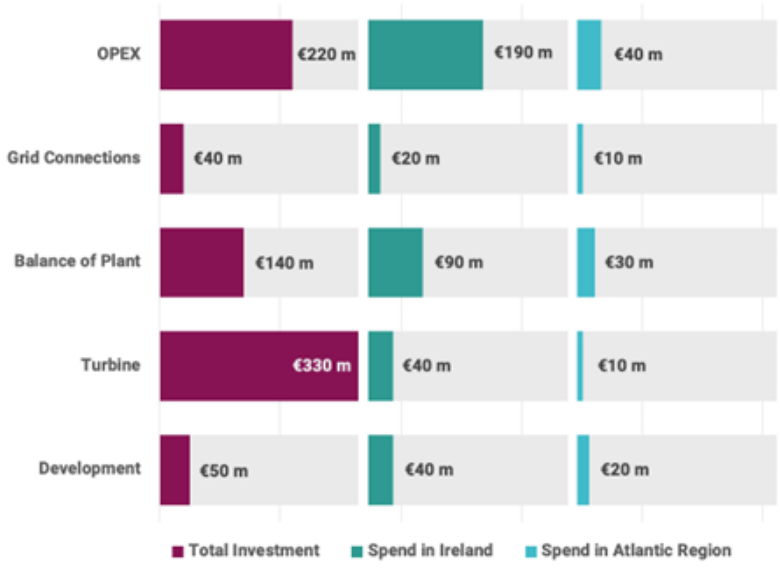


Figure 5: Spend in Ireland Onshore Wind Sector 2022

Employment Impact

Based on the levels of spending identified in Table 1, it was possible to estimate the direct employment supported over the period to 2037. This was done by allocating spending across each contract to the industrial sector of those businesses likely to be involved in its delivery. Spending by sector and area was then divided by sectoral Irish turnover per job ratios.

In addition to the direct employment supported by contracts for the development, construction and operation of onshore wind farms, impacts across the supply chain (indirect impacts) and from the spending of those carrying out the contracts (induced impacts) were estimated and are presented in Table 2 for the 'Rapid' build out scenario. The results indicate that in this scenario the wind industry can support 44,000 years of employment between now and 2037.

Table 2: Onshore and Offshore Wind Total Employment Numbers by Region (Direct, Indirect, and Induced) - Rapid Scenario

Region	Onshore Years of Employment		Offshore Years of Employment	
	2022	to 2037	2022	to 2037
Northwest Region	130	1,700	10	7,010
West Region	270	3,290	60	9,100
Mid-West Region	350	4,470	20	18,750
Atlantic Region	750	9,460	90	34,860
Republic of Ireland	3,460	41,390	1,240	160,690

Scenario Analysis

The economic impact of the wind energy sector varies significantly between scenarios. In the 'Rapid' scenario, the level of development and construction activity is front loaded, which creates a significant peak in employment in the late 2020s. This level of employment reduces in the 2030s as the level of development and construction activity is scaled back.

In the 'Steady' build out scenario, there is an expectation that the level of development and construction activities will be greater in the 2030s than the late 2020s. As a result, the level of employment in this scenario grows more steadily.

In the 'Aspirational' scenario, the significant level of activity that is seen in the 'Rapid' build out scenario to 2030 continues throughout the decade. This includes a significant proportion of floating offshore wind, which utilises the ports and supply chain in the Atlantic Region.

The estimated employment in the wind industry in the Atlantic Region is presented in Figure 6.

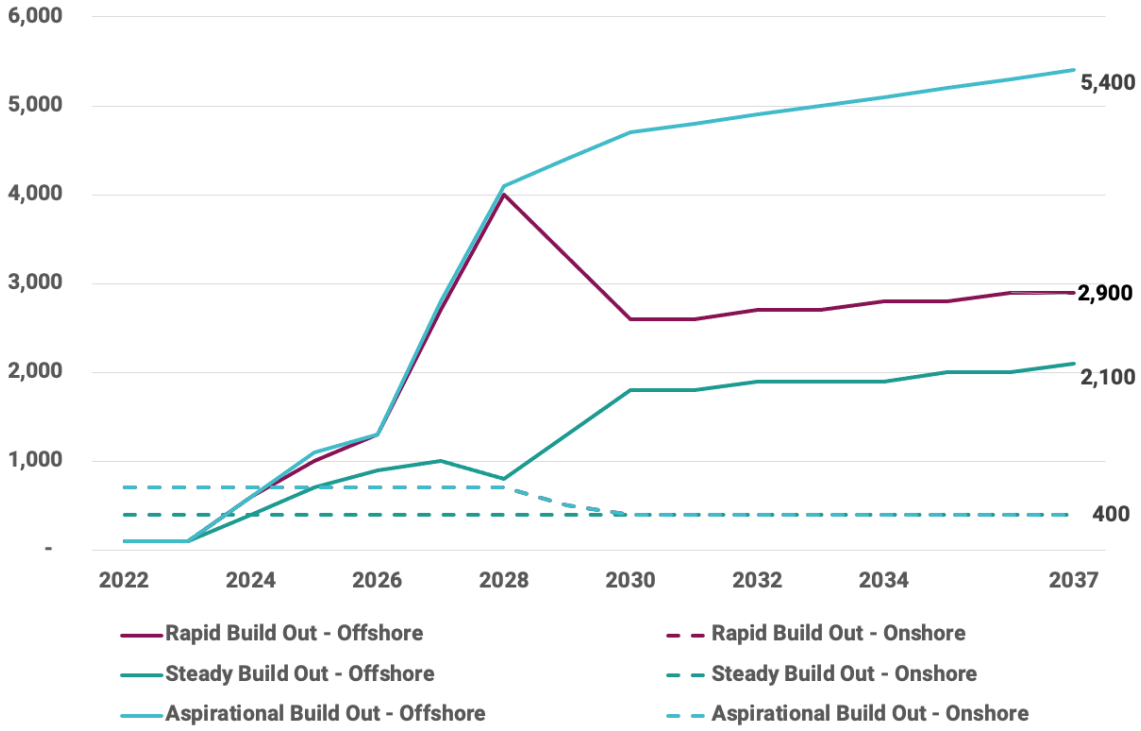


Figure 6: Jobs supported by the wind energy sector in the Atlantic Region

In all scenarios, the value and relative importance of the onshore wind sector declines. To meet the targets for 2030 set in each of the scenarios, the level of activity and employment in the offshore wind sector will increase significantly from 2024. Around this time, it is expected that the economic impact of the offshore sector will overtake that of the onshore wind sector in the Atlantic Region. The total employment in the onshore wind sector in 2037 in all scenarios is expected to be around 400 jobs. Therefore, by 2037 it is expected that there will be at least 5 offshore wind supported jobs for every 1 job supported by the onshore wind sector.

The differences in Gross Value Added in each sector are also driven by the offshore wind sector. As with employment, the level of economic activity in the region will grow throughout the 2030s. By 2037 it is expected that in the Atlantic Region the wind sector will annually generate:

- €170 million GVA in the 'Steady' build out scenario;
- €220 million GVA in the 'Rapid' build out scenario; and
- €400 million GVA in the 'Aspirational' build out scenario.

The cumulative impact of this difference presented in Figure 7 highlights the scale of opportunity that could be reached in each scenario.

Figure 7: Cumulative GVA in Atlantic region from Wind Sector, by Scenario (2022 – 2037)

Barriers to Delivery

The key barriers to successful delivery of the build out scenarios identified in this study are presented in Table 3.

Table 3: Barriers to delivery

Route to Market	**Grid Infrastructure** • Much of the grid infrastructure in the Atlantic Region is limited to 110kV. • Planned grid improvements to 5.7GW of wind capacity falls short of the 8GW target in the Programme for Government and Climate Action Plan. • There is a lack of visibility on grid development post-2030. Uncertainty makes development of onshore and offshore projects challenging, heightening the likelihood of delays or projects being abandoned entirely. • Grid capacity to support large-scale offshore wind developments extremely limited in the Atlantic Region with Sceirde Rocks and Moneypoint the only identified grid connections available. **Alternative Routes to Market** • Offshore wind ambitions exceed domestic demand – export markets are required to fully exploit the available wind resource. • Green Hydrogen is considered a key enabler to decarbonise the Irish economy for transport and as an alternative to natural gas for heat and power. • Economic viability and relative merits of green hydrogen, ammonia and other alternative fuels not established. • A national hydrogen strategy is required in tandem with offshore wind to deliver the required industrial capacity and capability.

Port Infrastructure	**Port Upgrades** • Ports are the key driver of economic activity in offshore wind. • Irish ports are in competition for contracts with the UK and European ports. • There are significant gaps between existing port infrastructure in the Atlantic Region and in Ireland, and the requirements to support delivery of large-scale offshore wind, particularly for FOW. • Port infrastructure is not currently available to support FOW platform construction and FOW turbine assembly, two areas with the largest potential for GVA in the region. • A number of ports have developed port masterplans to support offshore wind, but upgrades are of significant cost. Investment should be made based on National and Regional Port Strategy to ensure co-ordinated delivery of the necessary infrastructure. • If the delivery of port infrastructure is delayed, offshore wind projects in the Region may be constructed out of UK and European Ports with the opportunity for local economic development lost.
Policy & Signals	**Clear Signals** • Clear signals from government are essential to deliver the full potential scale of the wind energy industry in Ireland and the Atlantic Region • Specific targets for installed capacity of offshore wind post-2030 are required. Targets to 2050 exist but are not specific. • The offshore wind projects and infrastructure upgrades required are major projects of approximately 10 years' duration. The policy environment needs to be clearly signalled beyond a 10-year horizon to support investment. • Clear signals on a pipeline of wind energy activity in the Atlantic Region will enable port authorities to finance and commence upgrade works, project developers to develop construction schedules, and educational bodies and training providers to tailor courses and ramp up activity to support industry needs. **Industrial Strategy** • An industrial strategy aligned with clear signals on FOW build out would allow for the maximum capture of economic impact of FOW developments within the Atlantic Region. • The strategy should be delivered in tandem with a Regional Port Strategy and consider grid infrastructure upgrades, interconnectors, alternative fuels, innovative transmission, and storage technologies, such as high-voltage, direct-current interconnection, and green hydrogen. • FOW platform fabrication presents a massive economic opportunity for the Atlantic Region, accounting for approximately 30% of project CAPEX. • Additional components within a floating wind project may be suitable for production in Ireland if a clear pipeline of projects exists, including the manufacture of fibre ropes, building on existing supply chain capability within the Atlantic Region, and the opportunity to manufacture inter-array and export cables.

Recommendations

The scale of the challenges in addressing the structural gaps facing the wind industry in the Atlantic Region require a commensurate scale of response. Therefore, some of the key actions and recommendations to support the industry should happen at national level. Nevertheless, the study has identified specific recommendations actionable by public and educational bodies to support the growth of wind energy from onshore to offshore.

Wind energy, and particularly the scale of offshore wind projects, is widely discussed as a solution to Ireland's climate change commitments, but the opportunity presented by offshore wind can address a much wider array of challenges than climate alone. The projected scale of the industry and regional distribution of Ireland's wind resource mean that offshore wind can deliver significant employment in areas that are historically disadvantaged economically. This industry can deliver Ireland's energy needs and establish Ireland as an energy exporter. A national energy strategy is required to co-ordinate the grid, port, industrialisation, and policy requirements of the offshore wind sector, and to align national policies for maximum benefit.

Figure 8: Pillars of a National Energy Strategy

Lobby Government	• Develop a national strategy to co-ordinate wind energy activities including port, grid, alternative fuels, offshore wind and industrialisation strategies. • Provide clear signals on post-2030 capacity – provide a roadmap to 2050 Net Zero. • Upgrade grid in West and North-West to meet Programme for Government Targets. • Ensure FOW benefits are captured within ORESS process i.e. local content and capacity factor.
Enable Industry	• Identify opportunities in the offshore wind value chain for new industrial development in the Atlantic Region. • Identify supply chain ramp up opportunities in the Atlantic Region including SmartBay and AMETS. • Establish Route to Market through grid upgrades or alternative fuels.
Cluster Formation & Support	• Develop an Atlantic Region offshore wind port strategy to ensure investment in port upgrades is co-ordinated to deliver the industry's needs. • Provide cluster supports to attract relevant business activity within identified strategic ports. • Exploit synergies in the digital and data analytics domain between wind energy activities and established specialisations within the regions.
Educational Supports	• Raise awareness of offshore wind industry in the Atlantic Region to ensure there is a pipeline of students and apprentices to support the industry as it develops. • Develop new courses and centres targeted at wind energy sector, with a particular emphasis on FOW skills and expertise not currently offered by Irish educational bodies. • Progress mutual recognition of transferable skills to enable transfer of personnel from related industries.
Stakeholders & Planning Support	• Stakeholder supports should be made available to facilitate dialogue from project initiation through to operation between project developers and relevant stakeholders. • Planning Framework - Establish a supporting framework for the grant of planning permission for the construction of onshore substations and cable routes to ensure developers have clarity on the process to successful award.

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