Scottish Offshore Wind Strategic Investment Assessment

An independent report to the Scottish Offshore Wind Energy Council

SOWEC
Scottish Offshore Wind Energy Council

About this report

This Strategic Investment Assessment (SIA) of Scottish offshore wind opportunities is led by Professor Sir Jim McDonald, Principal and Vice Chancellor of the University of Strathclyde, with the support of an Executive Committee, Working Group and Project Team.

This independent assessment has been commissioned by the Scottish Offshore Wind Energy Council (SOWEC), a partnership between the Scottish public sector and the offshore wind industry. SOWEC's vision is of "an offshore wind sector that plays to Scotland's strengths, delivering jobs, investment and export opportunities in line with the UK Sector Deal as a key part of the path to net-zero."

The SIA sets out recommendations and investment priorities to scale up Scottish capacity and capability necessary to deliver a step change in the ability of Scotland's supply chain to grow and win offshore wind work. This includes:

- A summary of the status of the offshore wind supply chain in Scotland
- Map of future deployment and consideration of the current status of the offshore wind supply chain in Scotland, determining the supply chain and technology barriers and opportunities both domestically and globally, which provide longevity to the industry in Scotland
- Scenarios of potential economic impact associated with varying levels of investment
- Recommendations for immediate action through investment, including detailing means to support investor confidence, to support the industry in Scotland and to maximise economic value.

This assessment is published in line with the commitment of the Scottish Government to "set out a Strategic Investment Assessment, as we seek to better support the offshore wind supply chain." [i]

Published August 2021

Lead Author: Maf Smith (Lumen Energy & Environment)

Project Team: Joss Blamire, Rob Spice and Louise Wheeler (ITPEnergised)

Economic Analysis: Tom Quinn and Gavin Smart (ORE Catapult)

With additional thanks to ORE Catapult's Floating Offshore Wind Centre of Excellence; Scottish Enterprise; Highlands & Islands Enterprise, BVG Associates, ; Ironside Farrar and QMPF for providing access to expertise and relevant materials and to the many organisations and individuals who participated in study consultations or provided expertise and information.

Front Cover Image: Beatrice Wind Farm courtesy of Beatrice Offshore Wind Limited

Foreword

Our global energy system is in transition. As a nation which has been at the forefront of energy engineering, innovation and exploitation since the industrial revolution, this rapid shift in how we produce and consume energy as we address the real and present impacts of climate change is a significant challenge for Scotland. But of course, it is also an opportunity. This energy transition has been described as a "national mission" for Scotland, and offshore wind must play a major role.

This independent assessment looks at how best to support and grow a Scottish supply chain able to prosper and win work from a future pipeline of projects by focusing on what strategic investment is needed to capture these opportunities. There are no easy routes to success, so instead we need to be clear about priorities and how we organise and collaborate to maximise our chance of success.

Our particular focus is a coming pipeline of floating offshore wind projects. Floating offshore wind is a new industry, and Scotland looks set to be one of the first countries across the globe seeking to build at scale. Scottish learning can be sent around the world to address a growing global market. But that can only happen if Scottish companies play an important role in these early projects.

Our main ambition is that we nurture an active partnership between industry and government to foster better ways of working collaboratively that then help create an ecosystem into which investment into Scottish yards, ports and companies can be made in time to bid for and win high value work.

To build this partnership and support investment, the offshore wind industry needs to act first. It must recognise that the status quo will not deliver the value Scotland needs. Offshore wind needs to learn from other industries and look to collaborate. Taking this strategic approach gives us the opportunity to secure a bigger prize - a successful and sustainable Scottish supply chain able to win offshore wind work at home and abroad. Collaboration can better nurture Scottish based companies which are properly capitalised, well-resourced with excellent facilities, properly trained and truly competitive.

The proposed industry actions need to be matched by the UK and Scottish Governments. While the bulk of investment needed will come from the private sector, without government action and ambition, other ports in other countries may still trump Scottish aspirations by getting there first.

The value of offshore wind to Scotland is huge, yet Scotland will remain a small market in this growing global industry. Scottish success in offshore wind therefore cannot be taken for granted. So to succeed we must be better organised, and work as partners to build success here at home. Communities and companies across Scotland will benefit from this and indeed our energy transition and continued climate leadership will depend on it.

Scotland has a significant asset base currently in its business leaders and company base, strategic plans to address the growing international floating offshore wind market, ports and other facilities. By taking a collaborative approach to create a Port Cluster with complementary capabilities and capacity, Scotland will be better placed to attract national and inward investment, build a strong and competitive floating offshore wind supply chain, position us competitively within a large-scale global opportunity and secure the economic benefits of being seen as an international leader in this area.

Time though is of the essence, meaning it is vital that the offshore wind industry and government take on board the recommendations of this Assessment and focus action on their delivery.

Professor Sir Jim McDonald

Table of Contents

1. Executive Summary

Offshore wind is a young industry. It has been only 30 years since the world's first offshore wind farm was built at Vindeby in Denmark, 20 years since the UK's first offshore wind turbines were erected at Blyth, and 10 years since Scotland's first offshore wind farm, Robin Rigg in the Solway Firth, began operation. In that time the industry has truly come of age and is now at the heart of Scottish, UK and global action to transform and decarbonise our energy system.

This energy transition means rapid growth in low carbon technologies like offshore wind, other renewables, green hydrogen and carbon capture use and storage which will displace traditional activity in oil and gas. Ensuring a just transition has been described as a national mission for a fairer, greener Scotland. Part of this mission will be ensuring that we make the most of opportunities in offshore wind to support future prosperity in Scotland.[ii]

A Strategic Investment Assessment

This Strategic Investment Assessment (SIA) looks at what investment in capacity and capability will be necessary to deliver a step change in the ability of Scotland's supply chain to grow and win offshore wind work. It is an independent assessment, led by Professor Sir Jim McDonald, with the support of an Executive Committee and a Working Group.

This independent assessment has been commissioned by the Scottish Offshore Wind Energy Council (SOWEC), a partnership between the Scottish public sector and the offshore wind industry. SOWEC's vision is of "an offshore wind sector that plays to Scotland's strengths, delivering jobs, investment and export opportunities in line with the UK Sector Deal as a key part of the path to net-zero".[iii] More information about the SIA is set out in Annex A: About the SIA.

Looking back to look ahead

Looking ahead there is a clear pipeline of new Scottish offshore wind farms. 2.3GW of offshore wind capacity is in operation or under construction and a further 2.9GW consented. Up to 10GW of new projects are set to come out of the ScotWind leasing round. Each future GW will require 21,000 FTE job years (on average 700 full time jobs per year) to support development, construction and operation. Capturing an increasing proportion of this activity is vital for Scotland. That though requires focus and prioritisation.

Our assessment is confident for the future of offshore wind in Scotland. But over the last 10 years Scotland has delivered only one-tenth of projects forecast back in 2010. This means missed opportunities, though it is important to be clear that the overriding cause of this has been project delay and cancellation, not lack of focus on Scottish supply chain development.

Looking ahead though we see a large pipeline and better market conditions, giving us confidence in the future market. However, business as usual cannot be an option. UK and Scottish Ministers and the wider supply chain are clear that more ambition is required, and we have more experience and knowledge to draw upon. Leading industry players want to do more but are constrained in what they can do when acting alone.

The UK Government wants to see industry increase UK content from just under 50% to 60% by 2030.[iv] In Scotland, Ministers have made their ambitions clear, and are using the ScotWind leasing process to require projects to demonstrate best practice in supply chain engagement and to submit regular supply chain development statements.[v]

Looking ahead, we see rapid growth of offshore wind across the globe. This means that Scotland is only a small offshore wind market. Come 2030, Scottish capacity is forecast to be only 5% of the global total. In such a global market, Scotland facilities and suppliers will need to be world-class if they are to win work from offshore wind companies. This requires a shift in our mindset: Scotland's goal needs to be getting in shape ready to win a share of a domestic pipeline, as a springboard into this global market.

This SIA sets out recommendations that if delivered by industry and government will be transformative in how Scotland grows a world class supply chain active in offshore wind both at home and across the globe. Our focus is growing capability and expertise so that Scottish yards and Scottish based companies can win work in manufacturing and fabrication, and that Scottish subsea and engineering expertise is able to transition effectively from oil and gas into offshore wind.

To deliver higher ambition and secure greater benefit for Scotland from future offshore wind projects, effort is needed to build a more supportive ecosystem that enables earlier engagement between Scottish suppliers and the global wind industry, and which deepens relationships. Confidence and better outcomes can be built through strong partnership working between industry and government. A particular need is for industry to learn from oil and gas and other sectors to establish more collaborative models capable of securing inward investment outcomes that cannot be made on the back of an individual project's requirements.

This Assessment is clear that the primary responsibility for action is the offshore wind industry. It must come together and work in a more collaborative way, both to help focus activity and investment in Scottish ports, but also to facilitate more meaningful engagement between Scottish suppliers and tier one manufacturers and installers.

It is appropriate for Government support to be conditional on the development of this partnership approach. But Government also needs to be under no illusion as to the scale of infrastructure investment required and its role helping underpin investment ahead of the offshore sector's ability to contract with ports and suppliers so that Scottish infrastructure will be available when required.

Government needs to recognise that as part of its National Mission to build a fairer and greener Scotland it will need to support the development of new infrastructure through co-investment so that investment happens at the right time.

While the bulk of infrastructure investment needs to come from the private sector, public support will also be necessary. Government needs to understand the competitive nature of inward investment. Other countries are also active trying to secure anchor tenants and establish other ports as world class facilities. If industry is successful in establishing an effective collaborative framework, it would be appropriate for the Scottish Government to utilise a portion of the estimated £890m income from ScotWind leasing to support ports and Scottish supply chain development. As the UK Government has supported ports in Humber and NE England to help embed UK supply chain ready to serve current (fixed) offshore wind projects, it will be appropriate that it also looks at how to use equivalent funding to secure UK capability in floating fabrication at Scottish port locations.

Summary of Recommendations

Recommendation One: The offshore wind sector's priority must be the establishment of a collaboration framework focused on building confidence amongst Scottish ports, so that required investment is brought forward in time. The immediate priority of such a collaborative framework is supporting the creation of a Scottish Floating Offshore Wind Port Cluster

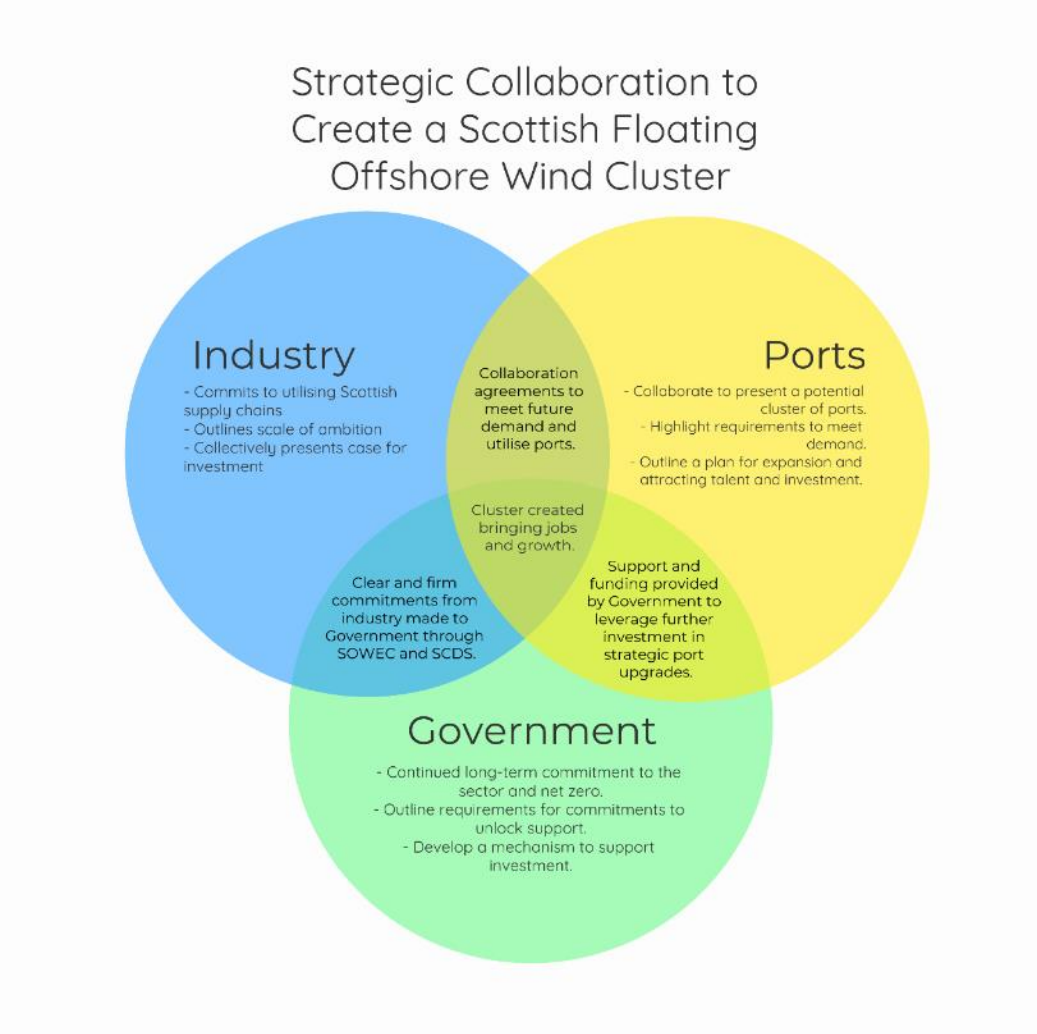
Without access to sufficient high quality port space, Scotland cannot hope to attract critical activities like manufacturing and may even be limited in the proportion of staging and assembly work that can be secured around the build out of Scottish projects. Focused effort is needed to bring fabrication and manufacturing of floating platforms into Scotland. To do this Scotland needs a world class port facility of sufficient size in the right location.

To enable this, offshore wind developers first need to work to identify port needs via a collaborative framework, which can then build port confidence and investment. Government support to underpin this industry effort will then be required.

We recommend bringing ports together to "move the fence" beyond their immediate boundaries. Doing this creates a Scottish Floating Offshore Wind Port Cluster suitable for floating platform fabrication and manufacture. An effective Cluster means multiple ports working together to provide capacity and capability required by industry but not available in a single location.

After commencing work to support investment in platform fabrication and manufacture, industry should then use its collaborative framework to help underpin other necessary investments, either growing out activities from the identified Cluster, or supporting engagement with a wider network of Scottish ports.

There are a wide range of significant activities and opportunities for floating offshore wind including further inward investment of component fabrication; turbine staging and assembly, moorings and anchors as well as ongoing operations and maintenance. Such activities can be based in a range of Scottish ports. While we recommend concentrating activities such as platform fabrication, space requirements for these different elements of offshore wind work means there are opportunities for many ports in Scotland to supply into future Scottish offshore wind projects, creating employment and economic activity.



A Collaborative Framework approach needs to work as follows:

1. SOWEC industry members to explore appropriate models and lessons from other sectors for adopting a collaborative framework in advance of ScotWind leases being awarded
2. Successful ScotWind leaseholders to be encouraged by SOWEC, industry and Crown Estate Scotland to participate in this collaborative framework
3. The priority infrastructure investment for this framework should be floating platform fabrication and manufacture. This Assessment is clear that this can best be done through a regional focus, investing in a Scottish Floating Offshore Wind Port Cluster
4. Once engagement between suitable ports and industry is underway, lessons should be learnt from this initial use of a collaborative framework and necessary adaptions made.
5. The collaborative framework should then be used to support wider engagement between the offshore wind sector and port providers, to help build the investment case for other inward investment in offshore wind component manufacture, as well as to support investment in necessary assembly facilities.

Scotland's enterprise agencies will need to play an important facilitation role to make this Collaborative Framework effective, but it is right that wider Government support is conditional on industry action. Used effectively this framework is seen as the best route to help bring forward investment in necessary port infrastructure to give ports and supply chain time to get ready for a future pipeline.

Once this Assessment settled on the priority of floating platforms as the priority investment opportunity, work then turned to using available evidence and industry input to consider suitable port capacity and capability.

As our analysis demonstrates, the Cromarty Firth emerges as the most suitable location in Scotland for platform fabrication and manufacture, with the two ports of Invergordon and Nigg acting as the focus of effort to secure platform fabrication and manufacture. These ports have sufficient capacity available or close to being ready as well as suitable quayside facilities for construction and movement of floating platforms. The wider Cromarty Firth offers space for wet storage of platforms and close access to many potential ScotWind sites. Close to these two ports sits the mothballed Ardersier port site, which could in future be made a part of this Port Cluster. Ardersier would need significant development and must resolve dredging and access but does offer the potential for large scale concrete platform manufacturing if these challenges can be overcome.

However, it will be for industry to follow this recommendation to establish a Collaborative Framework, and first scope out in more detail sector requirements re. fabrication and platform assembly, and to then engage suitable ports or groups of ports. If UK and Scottish Government funding is required to support investment in such a Cluster a more detailed set of criteria for funding will need to be developed to define the characteristics of a Floating Offshore Wind Port Cluster, and we recommend that Government makes use of this report in drawing up the requirements of a Cluster.

As noted above, a collaborative framework could have wider application. While this Assessment has identified platform fabrication and manufacture as a priority which requires a focus on building a regional port cluster, we wish to build a strong ecosystem across different locations in Scotland, with different ports and regions winning work both in supply chain and manufacture, assembly and in operations.

Around the Scottish coastline sit several ports also active or suitable for securing further offshore wind work, either as supply bases, for assembly or to support manufacturing and fabrication of other components. On the east coast Aberdeen South, Montrose, Dundee, Leith and Energy Park Fife/Harland & Wolff rightly all see offshore wind as an opportunity for high value manufacturing, assembly and R&D. To the west Arnish, Hunterston and Kishorn offer sites that could supply Scottish projects as well as future English, Welsh or Irish projects, while to the north different Orkney and Shetland ports offer deep water locations suitable for floating offshore wind assembly or as maintenance sites. These ports can be confident of securing offshore wind work and could either be brought into a Port Cluster, as volume requirements grow, or be supported by industry's collaborative framework and the better partnership working between the wind industry and government envisaged by this report.

Recommendation Two: Support Scottish suppliers and get them ready to bid for and win work

The working of the CfD process creates built in advantages for market incumbents so can make it hard for new entrants to break into the market. To address this specific support is needed to support Scottish suppliers get ready to bid for work. The offshore wind industry can help this by taking responsibility for opening up contracting activity, and in particular ensuring tier one contractors work with the Scottish supply chain. Government can help Scottish-based EPCI expertise in oil and gas transition into offshore wind.

Recommendation Three: Celebrate and sell Scottish success

If Scotland is to attract investment to build a successful Scottish Floating Offshore Wind Port Cluster, there is a need to better tell the story and build up Scotland's reputation for high quality engineering and sub-sea expertise. Scotland needs to be active selling Scotland as a leading floating wind market and as a market that can support other global markets as they embark on energy transition.

Recommendation Four: Plan for future growth and the next generation of innovations

While offshore wind is a mature technology, the market is still evolving and needs to innovate to stay competitive. However, more needs to be done to think more clearly about how the market in Scotland supports innovation in offshore wind and across the different stages of technology readiness. More support and focus are needed to allow near-commercial technologies to grow and succeed.

Recommendation Five: Plan for energy transition and a future of far-from-shore, mixed-use energy projects

Energy transition means that the distinction between offshore wind and oil and gas in Scotland will begin to blur, so we must also look ahead so that policy and regulation keeps up with the shape and needs of future projects.

Our three priority supply chain groups

Moving from 50% UK content to 60% content will not be easy. Increasing Scottish content by an equivalent amount will be harder still, as analysis by BVG Associates for SOWEC demonstrates[1] Scotland must therefore prioritise activities around where opportunity and the chances of influencing better outcomes are greatest. We have identified three priority supply chain groups for industry and government to partner and support.

Our first supply chain group are the Tier One suppliers seeking manufacturing locations. These suppliers will consider investment in Scotland. But first, Scotland needs to ensure it has suitable port and yard facilities able to compete with alternate locations across Europe and to attract such activities. Significant investment is needed to achieve this because these tier one companies require facilities adjacent to quayside with sufficient space and load out capability. Investing in these facilities will enable both marshalling and assembly and manufacturing and fabrication in Scotland.

Effort in Scotland should be focused on Tier One component providers that supply to developers and OEMs (though Scotland should keep an eye on opportunities for direct investment by OEMs themselves, and proactively continue discussions to understand their future needs). Priority needs to be given to supporting fabrication of floating platforms (steel and concrete), but also other components including cables and towers.

Developers and their EPCI (Engineering, Procurement, Construction and Installation) contractors have a critical role here to support investment in facilities able to manufacture platforms as well as cables and other critical components. OEMs have a role in supporting such investment by acting as anchor customers.

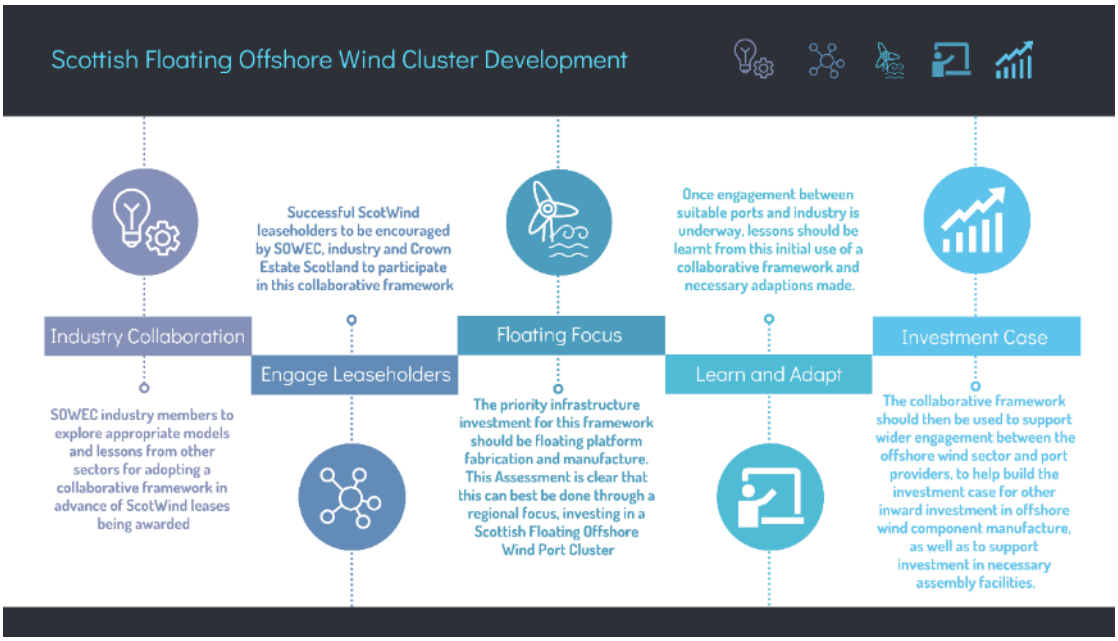
To support this first supply chain group, **our report's primary recommendation relates to the establishment of a *Scottish Floating Offshore Wind Port Cluster*** *that can focus on* floating platform fabrication and manufacture as well as assembly and large component manufacture.

Our analysis also highlights a clear **"least-regret" option** to support bringing an additional **22Ha** of capacity on-line via this Port Cluster would deliver **£1.5bn of GVA** benefit to Scotland from **floating offshore wind platform fabrication**. Further investment in fabrication capacity at Scottish ports could increase this economic benefit to £4.5bn.[2]

While this report is clear over the need to prioritise industry effort so that we can cluster activities, for this work to be successful Scotland needs to facilitate investment in a wider port network, with different ports around Scotland's coastline playing to their strengths.

---

[1] See Chapter 3 for more details on our current baseline and opportunities for future jobs growth.
[2] See 6.1 on port development scenarios for fabrication.



The second group of companies that need support are an existing and active SME group of engineering companies focused on the subsea market. Many of these companies are successful in maritime and oil and gas. However, they have struggled to gain access to offshore wind or secure the right opportunity.

The quality, breadth of service and scale of these SMEs needs to be world-class so that Scotland creates a sector that can deliver across more key supply chain components. If the SME sector is not successful in also supporting developments, suppliers will have less interest in utilising the ports, even if they are upgraded.

SOWEC needs to draw on related work [vi] to ensure tender processes ensure these companies learn about opportunities and are ready to bid. But most important funding and support is needed to transition existing Scottish contractor and EPCI capability focused on oil and gas into offshore wind.

Our third and final group are suppliers in new and emerging markets. Our particular focus is supporting companies that supply into the rapidly evolving floating market. For example, Scottish anchor, mooring and shipping companies active in oil and gas can be supported to transition into floating offshore wind, and crane companies active in onshore wind and other civil engineering can be supported to bring forward investment in suitable crane capacity for onshore and quayside crane work. Such activities will be particularly important for future assembly work at ports across Scotland.

Moving beyond the status quo

A critical point of this assessment is that business as usual will not deliver transformative outcomes, so we must move beyond the status quo in delivering this next generation of Scottish offshore wind projects. To do this a new partnership between industry and government is required.

This partnership approach is embodied in SOWEC, with an industry leader and Government Minister acting as co-chairs, but it needs to be present in the day-to-day working of offshore wind.

It is for the offshore wind industry to initiate this change and to demonstrate it can work together in a different way to better support supply chain growth. Above we have set out how a Collaborative Framework can help underpin earlier investment in necessary port infrastructure.

However, there is a second area we want to see more concerted industry action. Developers need to acknowledge that the CfD process works against bringing new supply chain entrants into the market. Our assessment agrees with the majority view in the developer community that it is right to leave the CfD structure broadly unchanged, so that future auctions select projects that best manage risk and complex infrastructure delivery in a low-cost way.

The quid-pro-quo to this is that developers must address the consequence of this, supporting new entrants to gain a foothold in the market. This report recommends the focus of this activity should be helping bring Scottish engineering and marine companies together with EPCI contractors and Tier One suppliers so they can assist in the energy transition, particularly by utilising and adapting Scotland's oil and gas expertise.

Kincardine installation,
courtesy of BOURBON

2. Offshore wind in Scotland

2.1 Development pipeline and potential

The Scottish Government's 2050 vision for energy in Scotland is to develop a 'flourishing, competitive local and national energy sector, delivering secure, affordable, clean energy for Scotland's households, communities and businesses', and to reduce emissions to achieve climate change targets to reduce Scotland's emissions of all greenhouse gases to net-zero by 2045.[vii]

Scotland currently has six operational offshore wind farms with four in construction or pre-construction. An additional three sites have consent and a further six are at different stages of development and consenting.

Based on the Scottish Government's Sectoral Marine Plan,[viii] Crown Estate Scotland is currently reviewing applications for seabed leases for the new ScotWind leasing round.[ix] ScotWind aims to deliver up to 10GW of offshore wind, which will see the Scottish capacity increase to 17-19GW. The Scottish Government's Offshore Wind Policy Statement aims for 11GW of this to be delivered by 2030.[x]

Looking beyond 2030, to achieve a decarbonised energy system in line with targets, offshore wind will need to play a much bigger role in not only displacing current electricity use, but also in displacing the need for other forms of fossil fuels such as the electrification of heat and transportation and through production of clean hydrogen. For example, National Grid ESO's 2020 Future Energy Scenarios includes the potential requirement for 24GW of offshore wind capacity dedicated solely to hydrogen production.[xi]

Actions taken now will have an impact on Scotland's ability not only to reach these targets but also to ensure that Scottish businesses have an opportunity to be closely involved in the sector, scaling up as developments increase and creating employment opportunities and positive economic impacts to communities across the country.

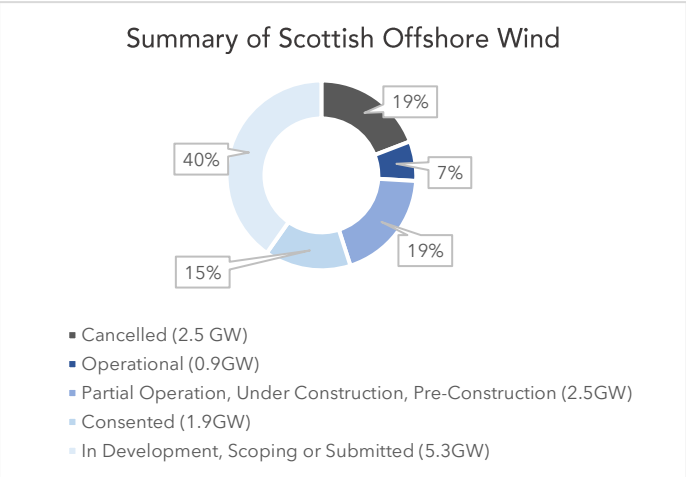
Furthermore, as Scottish firms develop and serve domestic markets, there is an enormous potential for these businesses to export goods and services to meet the needs of the rapidly growing global marketplace, working alongside global developers and suppliers.

2.2 Supply chain background

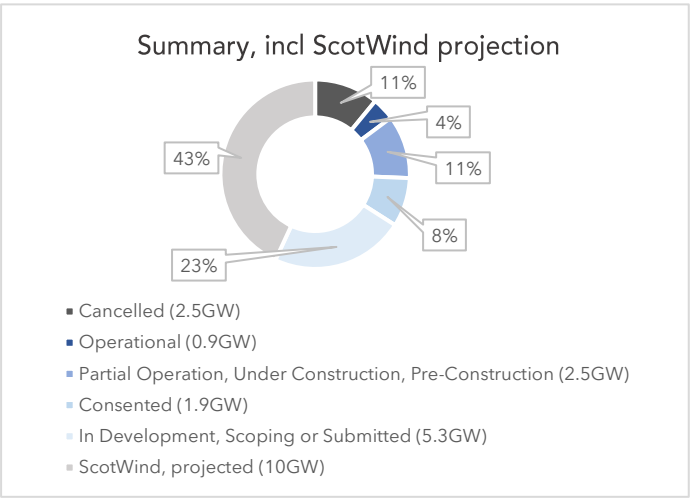
Scotland has a rich heritage in offshore engineering, manufacturing and development and has thousands of people currently employed directly in the offshore wind sector or in other industries, such in oil and gas and subsea sectors, that have skills that can be transferred to or already apply to the development of the offshore wind sector.[xii]

The offshore wind supply chain in Scotland supports the development, build, operation, maintenance of projects. In terms of project development in Scotland the offshore sector is well supported by professional, legal and financial services companies that can deliver the necessary support to the sector, and to be able to grow to meet future demand. However, there is always room to expand the potential reach of these businesses as offshore wind becomes more of a focus for the renewables sector and to expand a healthy level of economic activity and contracts into other parts of the economy.

Figure 1: Breakdown of Scottish offshore wind projects

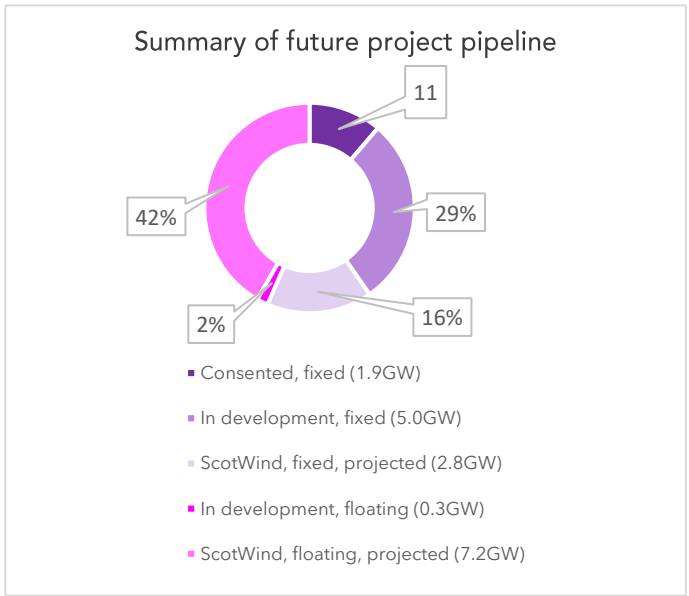


Top: based on known projects, there are 10GW of projects in operation or under development. 2.5GW has been cancelled or due to be decommissioned, equivalent to the amount under construction or in pre-construction. Operational capacity only represents 7% of this capacity, showcasing the future potential based on known projects alone.



Centre: adding in projected capacity expected via ScotWind highlights the higher volume of future capacity that comes into play. 10GW of additional projects via ScotWind would represent 43% of Scottish capacity and is 10x greater than the amount of existing capacity.

For a full list of known Scottish projects see Annex B: Scottish offshore wind projects



Bottom: looking at future projects alone, the growth and importance of floating offshore wind becomes clearer. Of this future pipeline, floating offshore wind could represent 44% of projects. Data here highlights projects which are consented or in development or projected based on assumptions over the split between fixed and floating offshore wind of future ScotWind leases.

ScotWind split between fixed and floating based on ORE Catapult analysis. See xxii.

2.3 Comparing past ambition with our current reality

This independent review is not the first undertaken about how to develop and grow offshore wind in Scotland. In 2010, the Offshore Wind Industry Group (OWIG), an earlier equivalent of SOWEC, published its own route map to 2020.[xiii]

Here in 2021, it is instructive to return to this and review what success we had in delivering against these previous aims.

2.3.1 Ambitions

In 2010, Scotland forecast rapid growth of its offshore wind sector. In February 2009 The Crown Estate issued exclusive rights to nine consortia to develop 6.4 GW of offshore wind power in Scottish Territorial Waters (STW) and in January 2010, it followed this up with the announcement of the UK Round 3 licensing programme for up to 32GW across nine offshore wind development zones including the Forth and Moray zones which together totalled 4.8GW.

Based on the high levels of ambition at the time OWIG reviewed the actions needed to maximise success and made use of four scenarios commissioned by Scottish Renewables and Scottish Enterprise which set out four potential growth trajectories ranging from an ambitious scenario of £7.1bn value by 2020 and 28,377 jobs, to a low scenario of only 224m in value by 2020 and under 1,000 jobs.

Alongside this, Highlands & Islands Enterprise and Scottish Enterprise jointly set out investment plans for required port infrastructure in two Scotland-wide National Renewable Infrastructure Plans. These N-RIPs set out investment priorities for ports and manufacturing hubs of £223m and estimated that this would support up to 5,180 jobs[3] and create an annual economic impact of up to £294.5m year on year. [xiv]

2.3.2 Actual Progress

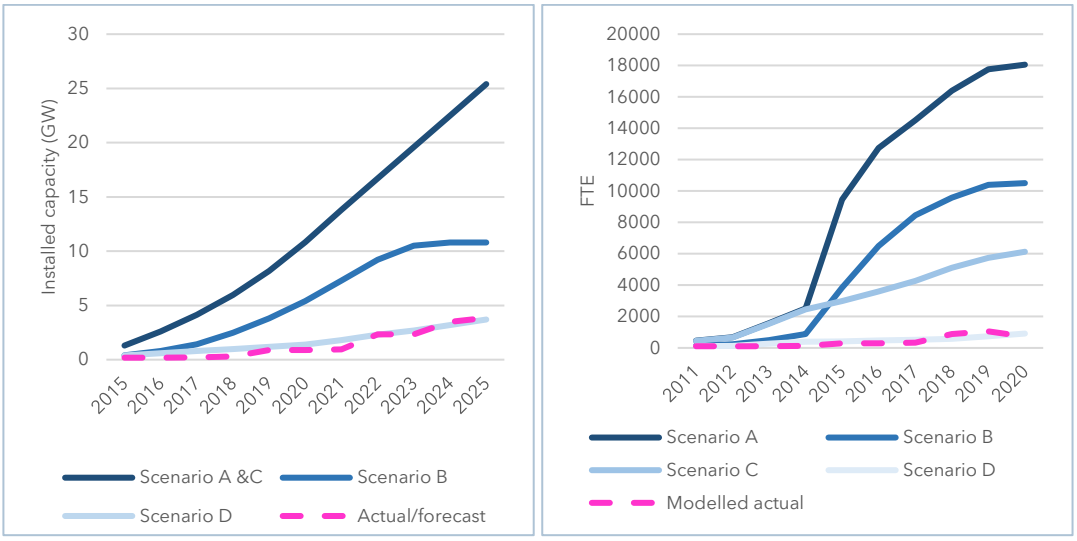
Analysis in Figure 2 by ORE Catapult for this project highlights that the actual level of GW (left) delivered in Scotland was just below the worst-case scenario developed in 2010. Therefore expected employment (right) was significantly lower than expected and slightly undershot the low benefits set out in the most negative scenario.

This original worst-case scenario was described as follows:

> *With so much activity across the UK and Europe, supply chain resources are drawn to near-shore sites first, leaving the bulk of Scottish generation undeveloped or lagging to post-2020. Much of the equipment and installation resource is brought in from outside of Scotland and economic benefits are largely unrealised. The industry only grows* ***to £224m in value*** *by 2020 and* ***additional jobs created fail to reach 1,000****.*

[3] Employment figures were based on bottom-up assessment of a mix of component manufacturing occupying the space identified as required and based on benchmark employment numbers of then existing component manufacturing facilities elsewhere (OEMs etc). They were gross figures and excluded direct and indirect multipliers.

Figure 2: 2010-2020 Scottish Offshore Wind Scenarios vs Actual (GW - left, FTE - right)



Unfortunately, this low achievement scenario describes the market conditions that Scotland has experienced with delays to projects leaving Scotland delivering low capacity while other markets have developed and embedded supply chain capability.

Looking back at industry forecasts at the time we can see how over time ambitions have fallen and forecasts revised downward. Our analysis of industry[4] forecasts for offshore wind deployment since 2010 are set out in Figure 3. This shows the scale of ambitions for what today's installed capacity would be versus what was delivered. A decade ago and up until 2012, expectations were that Scotland would have over 10x the amount of installed capacity that we see today. While forecasts between 2014 and 2016 were adjusted downwards, only after 2017 did industry forecasts shrink to reflect today's reality of projects delivered.

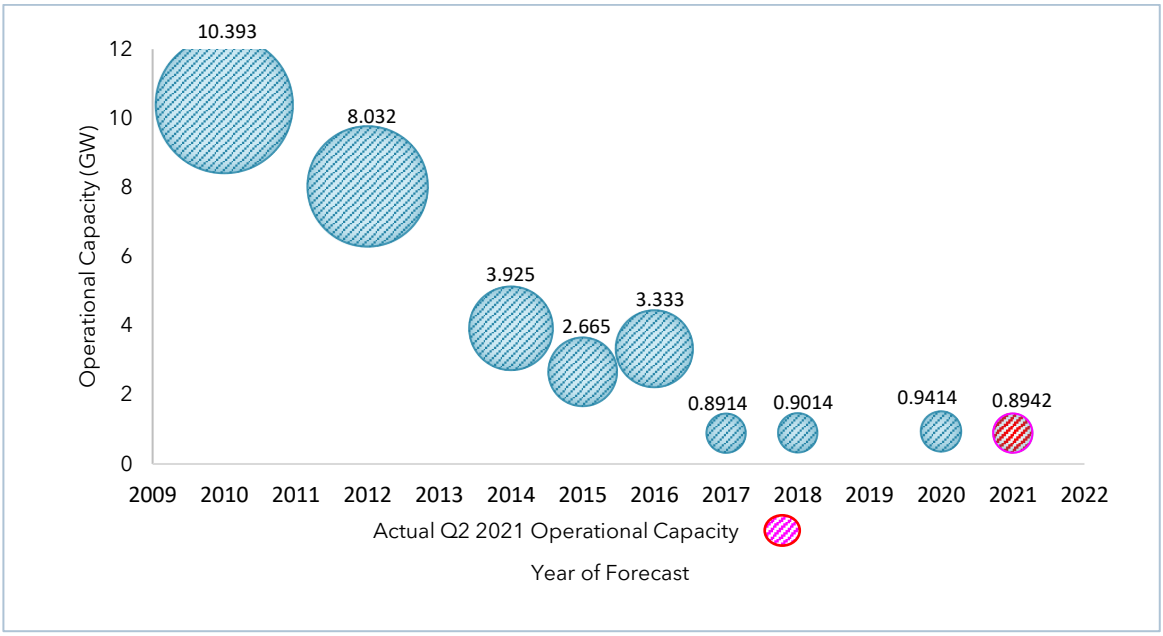
2.3.3 Reflections and lessons learned

The above analysis charts industry forecasts from OWIG and RenewableUK. It shows that Scotland has delivered to just beneath the low scenario envisaged back in 2010. 2010's OWIG forecast that poor delivery of projects would directly relate to a low number of FTE jobs has unfortunately proven accurate.

The accurate correlation between low GW delivered and low FTE generated shows clearly that that most significant reason that Scotland has yet to secure significant supply chain activity are delays and cancellation which have held back sector growth. Of the 10.3GW proposed via the Scottish Territorial Waters (STW) and Round 3 leasing programmes, as well as sites out of these formal rounds, only 892MW has been delivered. This is ten times less than envisioned back in 2010.

[4] Data gathered from successive RenewableUK Project Timelines documents

Figure 3: Forecast Operational Capacity by 2020 vs 2021 Actual Delivery



Scotland's offshore wind sector has seen planning and legal delays as well as delays in projects securing support under the UK Contract for Difference regime, owing to competition for the CfD and concerns about higher Scottish costs (particularly transmission charges).

Early industry estimates did not account for the relative cost effectiveness of projects in England versus Scottish projects, and the need for everyone to compete on a level playing field regarding the CfD.

However, activity is now finally beginning to accelerate. 2,948GW of offshore wind projects are now in construction and a further 1,942MW has consent.

Delays in Scottish projects have understandably held back the Scottish supply chain from gaining critical early experience to then use in winning work in the rest of the UK market or abroad.

Hindsight is easy to deploy. Foresight is harder but it is important to be clear about what a look back to 2010 aspirations tells us about supply chain growth.

- First, without project delivery there cannot be supply chain growth. As other work reviewed in this report shows, while Scotland has benefited from work in the projects that have come to fruition, the delays to securing a reliable pipeline have put Scotland behind. This delay cannot be allowed to happen again, though importantly our sector consultation shows high confidence in this new pipeline.
- Second, the offshore wind market is very, very competitive. The last decade was one focused on rapid scale up and rapid cost reduction. Insufficient thought was paid to the relative competitiveness of the Scottish supply chain, and what actions might be needed to increase this competitiveness.
- Third, pipeline delays stymie investment. Port investment was held back as forecasts were revised down. However, there are many positive examples of work secured in the offshore wind projects that have been delivered, particularly around the Moray

Firth and the Beatrice and Moray East projects, as well as proactive work by several ports to secure investment and win work from previous and current offshore wind projects. Private investment to sites like Nigg and Dundee has ensured that work has come to Scottish ports and valuable experience gained.

Since OWIG's 2010 work and Government's N-RIP programme, the offshore wind industry has grown up. It is now a mature sector that is at the heart of UK energy policy and industrial strategy. The knowledge base around offshore wind is strong. A look back at the important work around OWIG and N-RIP shows the importance of planning ahead. Today, we must plan again and be ready to invest and work to support the pipeline in delivering at scale.

Today focus is on building cost-effective projects and managing risks, while scaling up and moving onto more challenging sites, as found in Scotland. There are also opportunities to capture the next generation of floating projects, a new industry, where Scottish businesses will have less of an experience deficit against other markets and where strategic interventions now could have a major impact.

2.4 The global offshore wind market & the wider energy transition

2.4.1 Growth to 2030

The UK has been a leader in the delivery of offshore wind and remains the world's largest wind market and is forecast to retain a position as one of the world's biggest markets out to 2030.[xv] Scotland remains an important regional market within the UK. While Scotland has been slow to develop compared to projects in England and Wales, over the coming decade Scottish projects are expected to make up approximately 40% of the market.[xvi]

However, even as the Scottish market grows, in comparison to other markets, and the overall global market, it remains a relatively small opportunity. What is more, this global market is one dominated by international players who can leverage significant expertise to manage risks, secure funding and develop clusters of projects under large framework agreements. These developers face calls for local content in multiple markets. They can respond to these demands only where they find a competitive supply chain able to be nurtured and grown.

At end of 2020, 35GW of offshore wind was in operation around the globe, with the bulk in a small number of western European markets or China. By 2030, GWEC projects 234GW in operation, meaning eight-fold global growth in only ten years. For context, the 11GW target within Scotland's Offshore Wind Policy Statement represents less than 5% of global installations.

2.4.2 Growth to 2050

Later this year, the world's leaders will meet in Glasgow to hopefully come to a shared agreement on how to deliver the commitments made in the Paris Agreement to limit the impact of climate change to 1.5°C. To do that needs a radical transformation of our economy. Nowhere is this transformation so big than in the energy sector.

Forecasts show that offshore wind deployment will continue to accelerate beyond 2030. The Ocean Renewable Energy Action Coalition[xvii] is projecting 1,400GW by 2050, and recently the UN's International Renewable Energy Agency (IRENA)[xviii] and the IEA[xix] both forecast approx. 2,000GW by 2050 as part of global effort to remain in line with a 1.5°C climate pathway.

2.4.3 A global energy transition

In 2018, renewables provided only 6% world energy use (including 25% of electricity). However, the UN's International Renewable Energy Agency (IRENA) forecasts that by 2050 62% of global energy will be renewable. 90% of electricity will be renewable. Wind and solar become the fuels of this future and swap places in terms of scale and hierarchy with oil and gas.

Importantly this global shift sees offshore wind important in a much larger group of markets, opening up new opportunities to offshore wind experts. Also, as costs fall, it is expected that floating offshore wind will grow as a percentage of this market.

In our consultation it was repeatedly stressed that the aspiration for Scotland must be to get suppliers to a point where they are competitive, so that aspirations for local content are sustainable. But of course, given the global market growth expected over the next thirty years, it is clearly the pragmatic course of action as well. Scottish suppliers have struggled to win export work in offshore wind, or even to compete for work from English or Scottish projects. But this can and has to change.

Hywind Scotland,
courtesy of Equinor

3. Scottish baseline and future jobs growth

3.1 UK and Scottish content baseline

An important source of information for this Assessment has been the SOWEC commissioned baseline of Scottish and UK content[5] conducted by BVG Associates.[xx]

This work helps baseline what has been achieved to-date and clearly highlights the challenges and opportunities for the Scottish supply chain in growing Scottish (and UK) content. The baseline shows most success in securing work in operations and maintenance, but also some aspects of installation as well as development. Scotland currently provides no or very little content into turbines, foundations, cables, and most aspects of installation.

The rose diagrams below (Figure 4: Scottish content in UK offshore wind, in UK and Scottish only projects) set out these content levels graphically, highlighting the contribution of different phases/components to overall lifetime value, as well as the relative success in securing Scottish content.

3.2 UK and Scottish content baseline

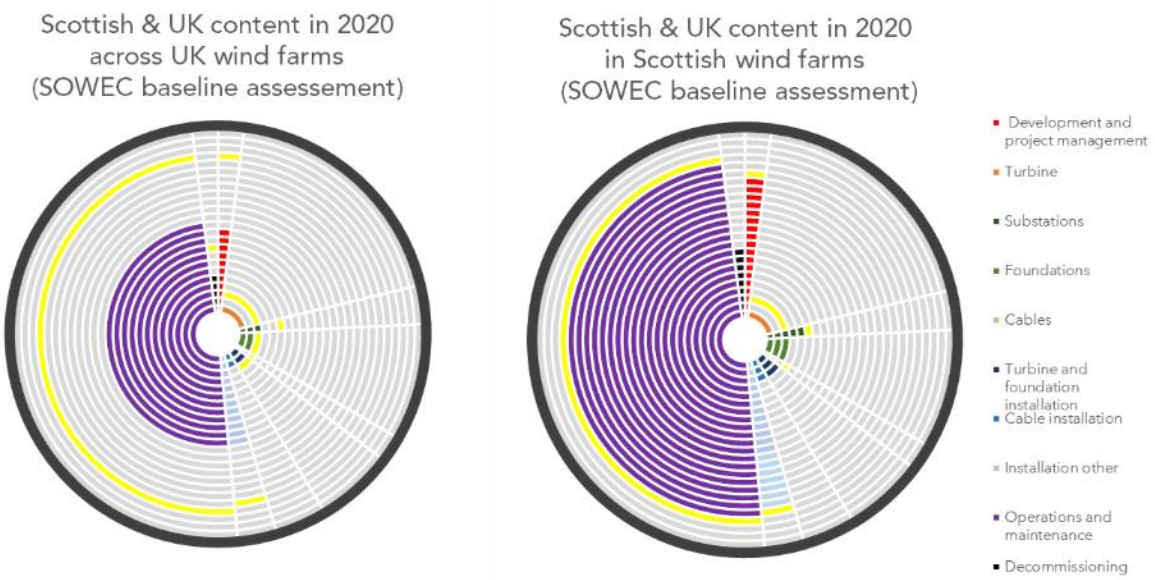
After calculating a baseline for SOWEC, BVG Associate looked at options for growing Scottish and UK content to meet higher content ambitions and prioritised a few options for inward investment or supply chain growth capable to grow UK and Scottish content. BVG Associates then mapped the number of investments that would be needed to achieve either a 55% UK/22% Scottish or 60% UK/24% Scottish Content figure. They estimate that up to 15 new manufacturing facilities will be required in the UK and estimated that up to 6 of these could be in Scotland. Scottish priorities were as follows:

- Turbine tower manufacture
- Floating foundation manufacture
- Jacket foundation manufacture
- Substation platform manufacture (x2)
- Substation foundation manufacture.

However, worth noting is that BVG Associates concluded that if a company first decided to invest into the UK and then looked at potential UK sites, in many cases there was not a compelling reason why a company would choose a Scottish location over a non-Scottish UK location. Scotland needs to be aware that while it is a location of growing importance within the UK wind market, Scottish locations remain in competition with other UK locations, as well as continental providers.

[5] This SIA has benefited from access and engagement with SOWEC and the BVG Associates team. Publication of this work is expected in due course after review by SOWEC.

Figure 4: Scottish content in UK offshore wind, in UK and Scottish only projects



Above: rose diagrams showing Scottish and UK content based on overall lifetime value. Each different colour segment shows levels of Scottish content. The relative size of each segment shows overall contribution to lifetime value. Movement from the centre to the outside shows success of Scottish suppliers in capturing a % of this segment of market (centre = 0% Scottish content, black circle = 100%). Yellow bars highlight equivalent UK content where different.

Left: BVG Associates baseline data for modelled UK wind farms. This shows Scottish content of 25% for all projects modelled. The most significant value stems from development (38%), installation, other (42%) and O&M (43%). As can be seen Scotland has secured very little value from turbine, balance of plant or installation work.

Right: baseline date shows content of modelled Scottish wind farms. This shows Scottish content of 44% and overall UK content of 48%. As in the overall UK picture, there has been little Scottish success in securing contracts from turbine, balance of plant or installation work.

Overall: this data shows that for Scottish wind farms, Scottish suppliers are successful at winning work in the O&M and installation (other) elements over suppliers from elsewhere in the UK. This highlights the importance of provision of services and expertise adjacent to a wind farm in the O&M phase. But there are currently low levels of UK content, and lower levels of Scottish content in turbine, balance of plant and most parts of installation.

3.3 ORE Catapult - economic impacts

As part of this assessment, ORE Catapult conducted GVA modelling to estimate the value of future offshore wind projects to Scotland.

Using published statistics,[6] analysis of estimated jobs and GVA in the sector for Scotland now and in 2030 for historical projects, projects in construction and value and jobs from future leasing rounds was carried out.

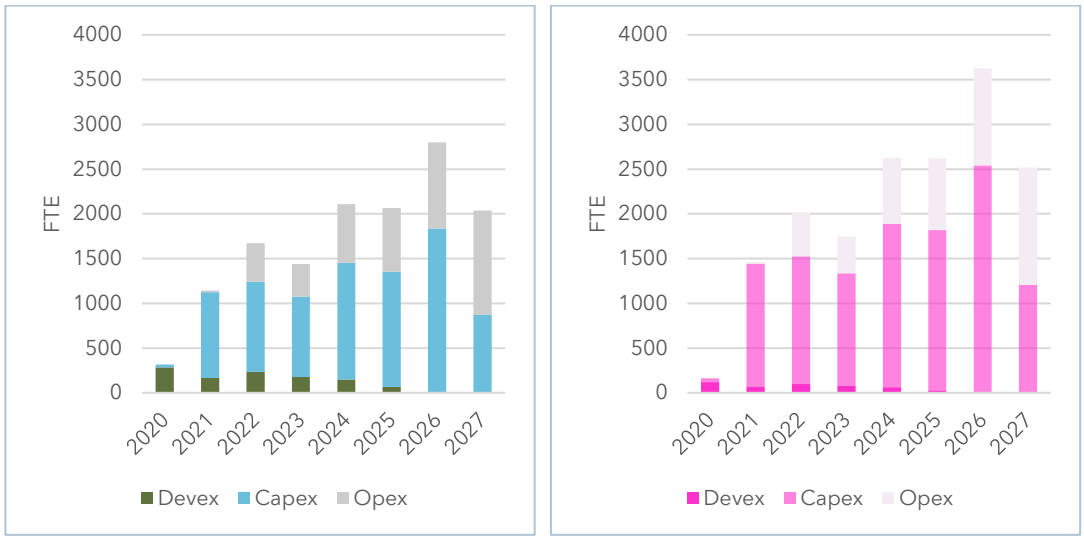
3.3.1 Economic impact of projects in construction

It is estimated that there is a combined 4.8GW of Scottish capacity is either in construction or set to be installed in the near term. Combining the ORE Catapult cost model and BVG Associates local content assumptions, total Scottish spending in the period 2020-2027 is estimated to be £2.9 billion (out of £13.2 billion total spend for these projects), comprising £2 billion capex (out of £11.9 billion total), £780 million opex (out of £970 million total), and £150 million in devex (out of £230 million total).

This level of expenditure results in an average of 1,700 direct FTE over the period, and 2,100 indirect and induced FTE (

Figure 5).

Figure 5: Scottish employment benefits (left - Direct FTEs; right – Direct & Indirect FTEs)



3.3.2 Economic impact of ScotWind leasing round

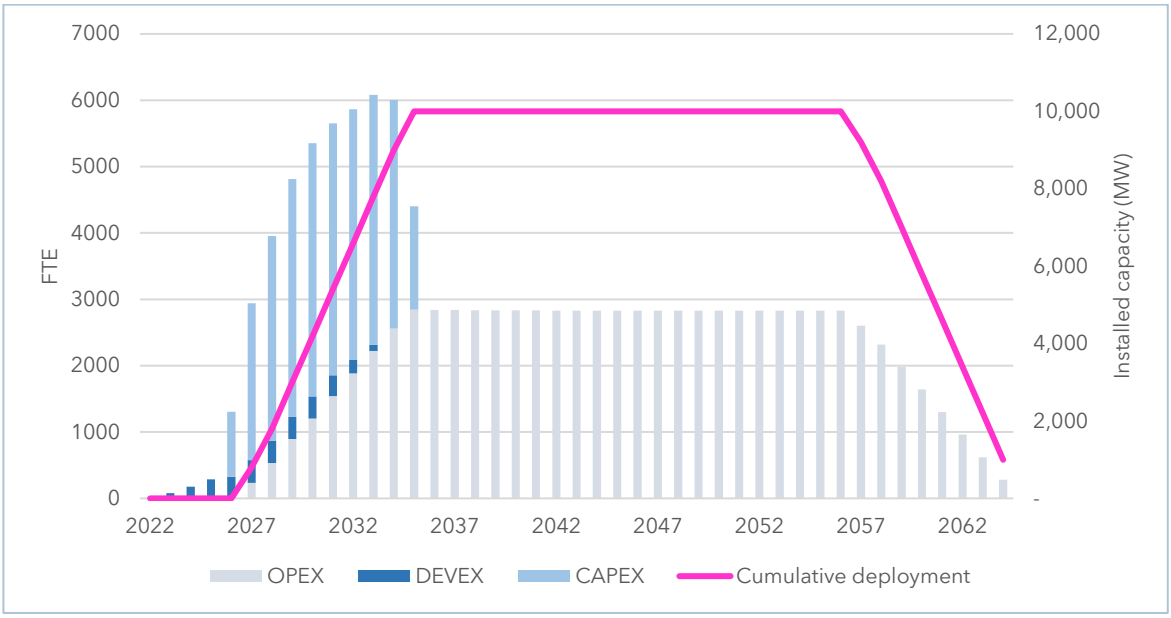
ORE Catapult then modelled future content and economic impact coming out of the current ScotWind leasing round Over the lifetime of these new windfarms it is expected a total of 118,000 direct FTE years of employment will result. These jobs are weighted to the

[6] Including the recent OWIC report on 'Offshore Wind Skills Intelligence' and the SOWEC commissioned BVG UK and Scottish content baseline roadmap, along with in-house ORE Catapult knowledge

near term (Figure 6), with total Scottish jobs peaking at 6,000 in 2032/33, when several projects are under construction alongside O&M jobs approaching a plateau.

Following the development and construction phases, O&M jobs are expected to remain flat at just under 3,000. Decommissioning or repowering jobs may extend the jobs profile as windfarms reach end of life, but these have not been considered for this analysis.

Figure 6: Scottish jobs created from 10GW of ScotWind installed capacity

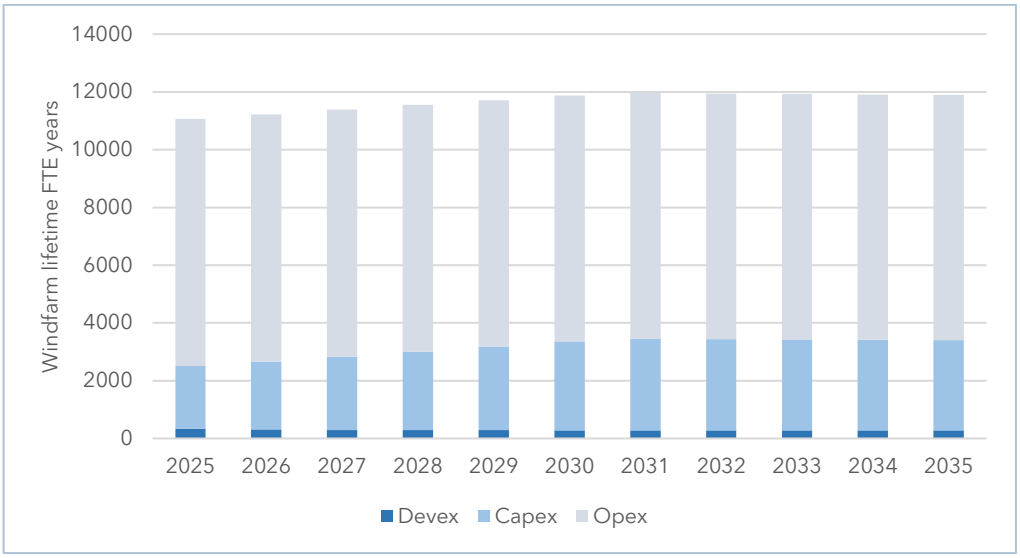


3.3.3 Future development

A 1GW wind farm deployed in Scotland after 2025 is expected to generate between 11,000 and 12,000 FTE years in Scotland. Most of these FTE years (71-77%) will be in operations and maintenance and exist to service the wind farm once operational (over a ~30-year lifespan). This equates to around 285 FTE jobs each year. Data is shown in Figure 7: Scottish FTE years over a 1 project lifetime, by year commissioned.

This analysis is very sensitive to local content. It also shows that while opex is forecast to provide the most jobs in Scotland, there is little future upside compared to the start of the forecast period as local content is assumed to be >80%. The largest gains can be made in capex with higher local content. Increasing Scottish share of capex would also provide the biggest employment benefits in the near term.

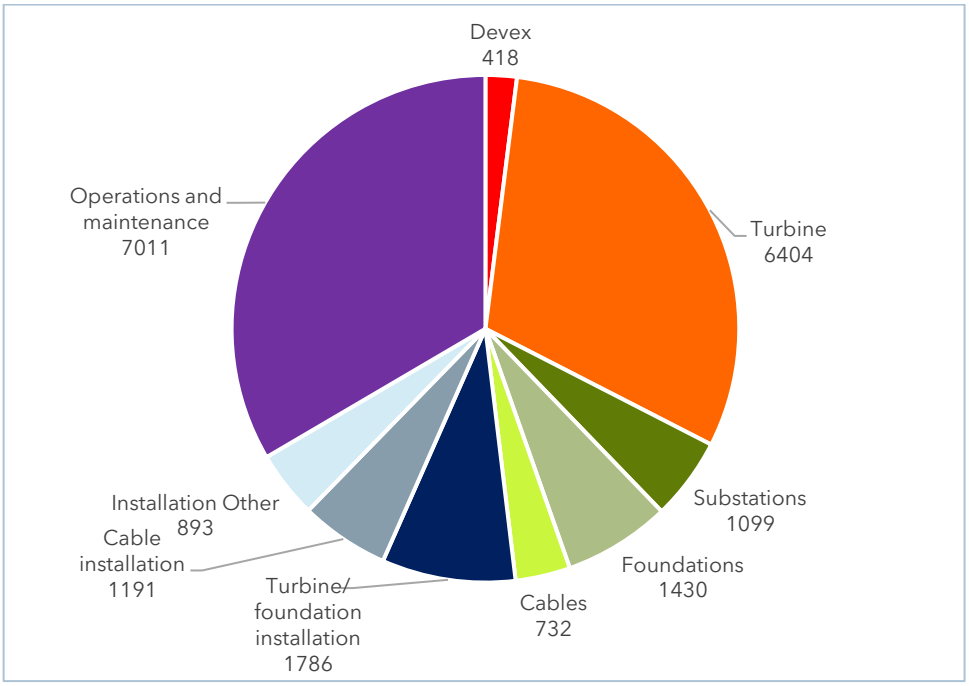
Figure 7: Scottish FTE years over a 1 project lifetime, by year commissioned



The model used this in this report estimates that a 1GW wind farm requires 21,000 FTE years to develop, build and operate. Approximately one third of these job years are in O&M over the life of the asset. Another third is estimated to be required for manufacturing of the turbine. This highlights the importance of developing manufacturing capabilities in Scotland to capture jobs to supply ScotWind developers. The data in

Figure 8 can be helpful in estimating the impact of an increase in local content e.g. a 1% (absolute) increase in turbine content adds ~640 FTE years.

Figure 8: Total FTE years required to supply a 1GW wind farm in 2030



Seaway 7 Strashnov carrying out installation work on Beatrice Offshore Wind Farm, courtesy of Seaway 7

4. Reviewing Scottish port capacity

4.1 Ports for offshore wind

In 2020 Crown Estate Scotland (CES) published its *Ports for offshore wind* report. [xxi] The report, delivered by Arup, concluded that while Scotland already has a strong and thriving ports sector, there are various steps that could be taken to maximise the future potential of Scottish ports to host the major offshore wind projects which are expected to come to Scotland.[7]

Relevant recommendations of the CES report include:

1. Scotland should collectively aim to increase large port capacity that is suitable for marshalling and assembly activities, acting as a key enabling action for growth of domestic manufacturing
2. Support strategic port planning for offshore wind
3. Encourage development of optimal O&M facilities.

The CES report highlights that Scotland has no major 'hub' port facilities of the scale present in other North Sea countries that offer marshalling/assembly alongside fabrication/manufacturing. Over the last ten years there has been significant investment into facilities such as Rotterdam, Vlissingen, Cuxhaven and Esbjerg in Europe, and there are also larger port facilities existing, or with investment planned, on the east coast of England than are available in Scotland.

The report identified a clear risk that successful build out of ScotWind may either be constrained or be led from outside Scotland without significant expansion of marshalling/assembly capacity, and foresaw a strong value case, given a more consistent stream of work ahead. The report also highlighted that marshalling/assembly should not be seen as a distinct opportunity to fabrication/manufacture. Provision of space suitable for marshalling/assembly can also attract fabrication and manufacture since prospective investors in fabrication/manufacturing facilities would logically be likely to favour locations with adequate port capability already available and there could be 'clustering benefits' for workforce and supply chain, as well greater efficiencies from sharing high-cost infrastructure.

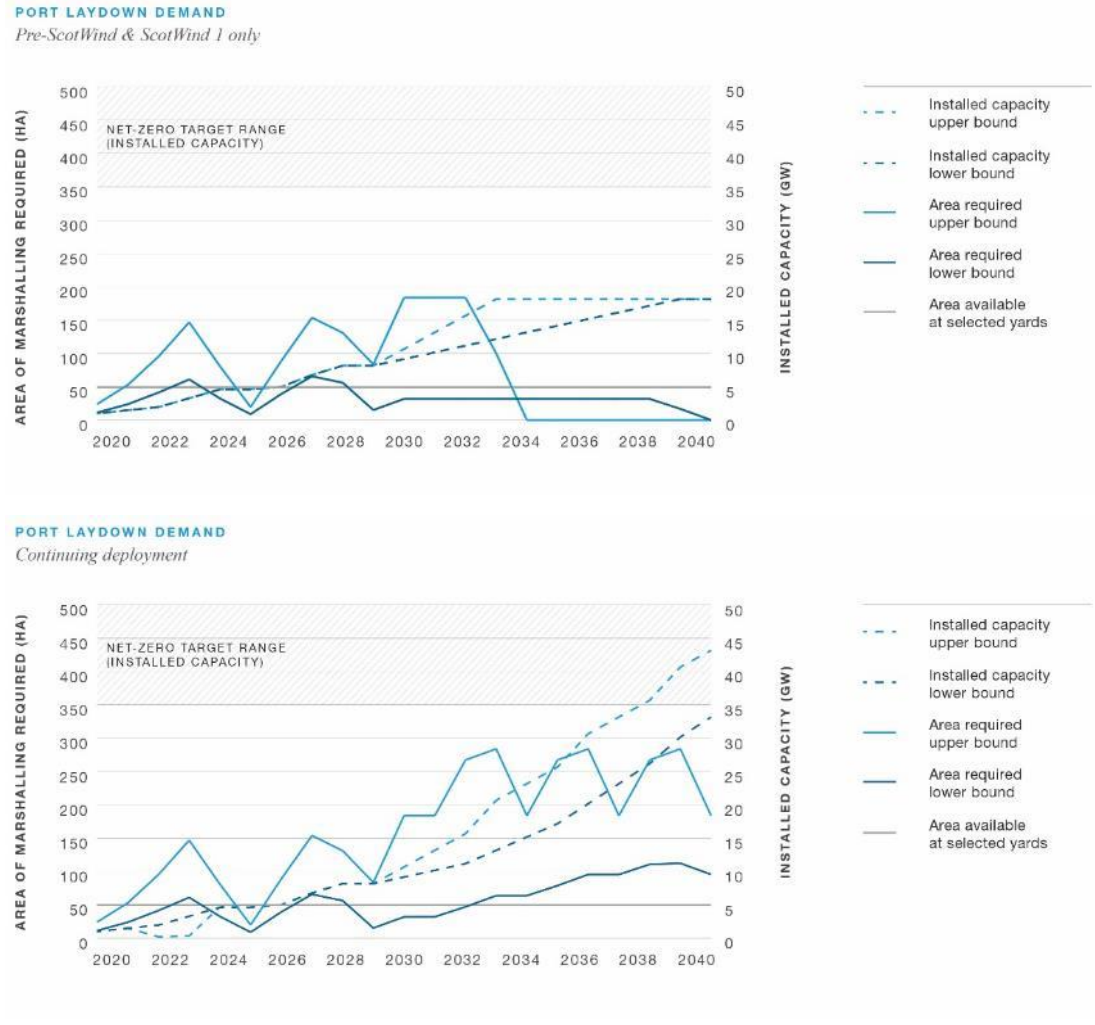
A study of demand showed a need for between 100 and 200 hectares of space suitable for marshalling/assembly facilities in Scotland to deliver ScotWind, and between 175 and 300Ha to support deployment beyond the current ScotWind leasing round. Today, Scotland has an estimated 50 ha available[8] in the six largest facilities in Scotland. This capacity gap is shown in Figure 9: Projected port onshore area demand for foundation and turbine component marshalling, and cumulative installed capacity of offshore wind in Scotland.

---

7 Scottish Enterprise, Highlands and Islands Enterprise and Transport Scotland worked with CES in the development of the report, the detailed research for which was carried out by Arup.

8 This 50ha equals half of available area of Nigg, Invergordon, Dundee, Methil, Arnish and the under-construction Aberdeen South Harbour.

Figure 9: Projected port onshore area demand for foundation and turbine component marshalling, and cumulative installed capacity of offshore wind in Scotland



Source: Crown Estate Scotland (2020) Ports for offshore wind

A review of ScotWind marshalling/assembly requirements for the forthcoming ScotWind round and continuing deployment. Future demand is projected at between 175 and 300ha compared with an existing 50ha.

4.2 Manufacturing requirements from ScotWind

ORE Catapult recently published an updated prediction on requirements for foundations and cabling likely to flow from ScotWind delivery.[xxii]

On the assumption that 10GW of capacity is delivered through ScotWind, ORE Catapult predicts a demand for 21 monopiles, 157 jackets and 469 floating structures. ORE Catapult also predicts that a minimum of 659 array cables will be required and a minimum of 1,295km of export cable. In addition it highlights the need for dynamic cabling variants for floating sites as well as mooring systems and anchors. This projection highlights that the single largest opportunity in foundations lies in floating platforms.

4.3 Reviewing existing and future assembly and marshalling capacity

Scottish Enterprise, Highlands and Islands Enterprise and Crown Estate Scotland recently commissioned consultancy Ironside Farrar to assess current and future marshalling and assembly capacity in Scottish ports, building on the recommendations of the CES report. [xxiii] It identified 52ha of available capacity and a further 62ha of latent capacity available subject to additional site works and preparation. In addition, there is a potential further capacity of some 64ha that could be developed and a further 25-139ha of future capacity with the potential for development for marshalling & assembly.

The report groups ports into the following clusters:

- ***North-East Scotland Cluster*** *– Nigg, Cromarty, Aberdeen and Orkney are all well positioned relative to ScotWind Leasing Zones across the North Sea and Moray Firth and benefit from feasible long-term expansion options. There will be high demand for marshalling & assembly laydown area in these locations.*

  Expansion at Ports of Montrose, Fraserburgh, Peterhead pose challenges but could be realised to further boost cluster capacity or continue to play supporting role in accommodating displacement activity and wider offshore wind servicing needs.

- ***Forth & Tay Cluster*** *- Leith and Dundee are well situated in close proximity to North Sea Leasing Zones and boast existing capacity for marshalling & assembly as well as future expansion opportunities. The Cluster can also benefit from support and additional servicing functionality from Forth Ports wider portfolio at Burntisland, Rosyth, Methil, Grangemouth.*

- ***West of Scotland Cluster*** *– A wider West of Scotland Cluster between Hunterston, Kishorn and Stornoway could emerge to meet demand from Leasing Zones W1, N1-4 and explore potential export opportunities to Irish Sea offshore wind. Campbeltown and other west-coast ports may also provide additional support services (O&M) within this cluster.*

- ***Shetland Cluster*** *– Despite relative remoteness from ScotWind Leasing Zones, Lerwick and Shetland (Sullom Voe) have potential to expand ports with deep-water access which is well-suited to floating wind and could provide specialist functionality.*

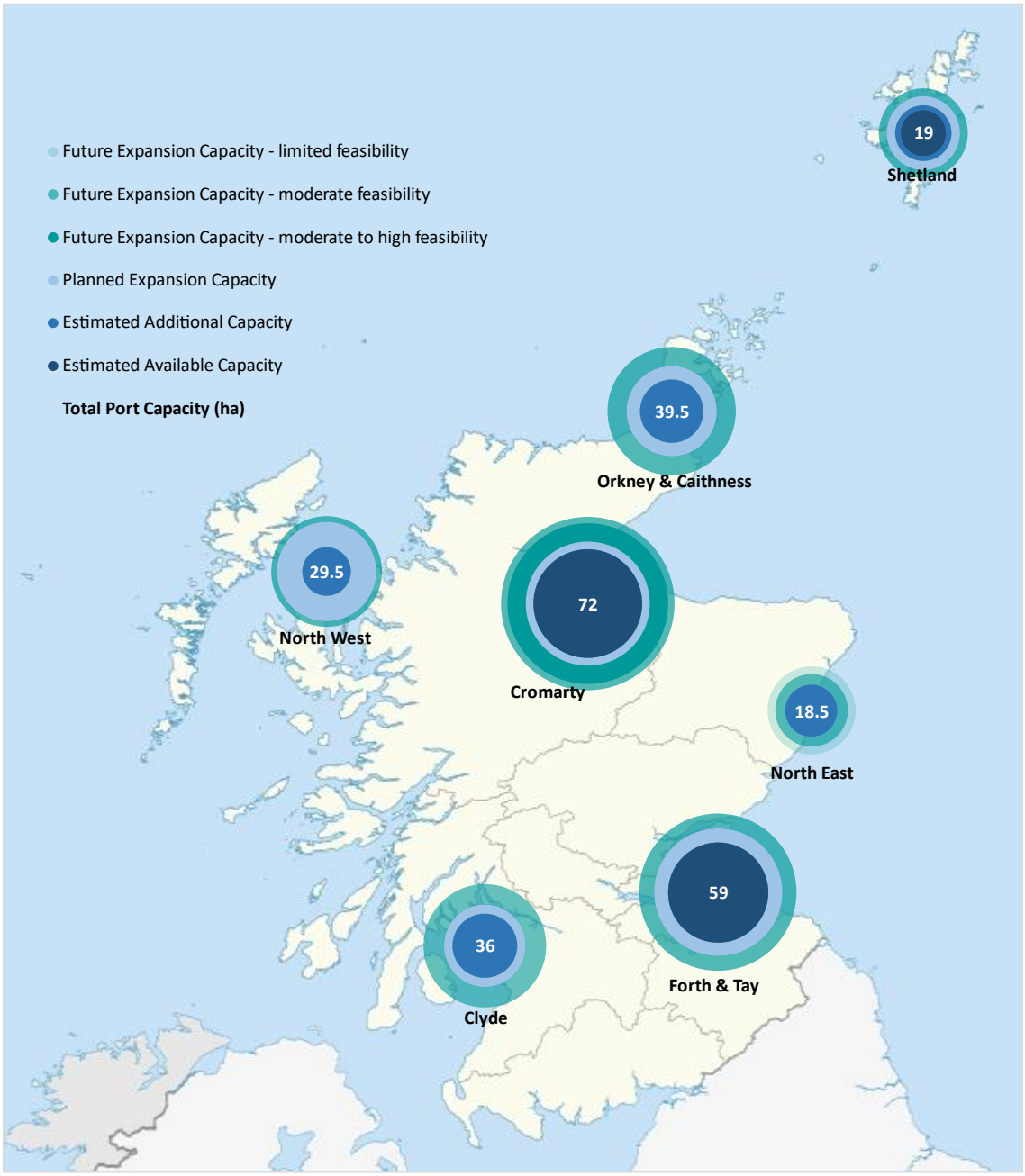
Ironside Farrar note that ""Optimising existing and future capacity should encourage both geographic 'cluster submissions' and 'port alliances' that deliver against the varied contract needs of industry (marshalling-assembly /pre-deployment services / storage- cabling /etc alongside skills, expertise, deployment track-record, relationships, etc."

Figure 10: Current & Potential Scottish Port Capacity available for offshore wind marshalling & assembly (existing port locations only) shows that a number of ports including those in the Cromarty Firth area and Forth and Tay have existing and planned capacity to support offshore wind marshalling & assembly. It is also worth noting that proposed port redevelopments such as Ardersier (110 Ha) [9] or new development

[9] Information on Ardersier proposals provided to the project team by HIE.

proposals such as the Scapa Flow Assembly Hub (200 Ha)[10] would offer additional site options for assembly and marshalling.

Figure 10: Current & Potential Scottish Port Capacity available for offshore wind marshalling & assembly (existing port locations only)



Data Source: Ironside Farrar

[10] Information on the proposed Scapa Flow Assembly Hub provided by Aquatera.

4.4 Assessing options for fabrication alongside marshalling and assembly

While the Arup/CES and Ironside Farrar reports are focused on space for marshalling and assembly, for ports with space suitable for fabrication, it could also be utilised for marshalling and assembly, though the former is likely to be the higher value activity.

To deliver a large pipeline of floating projects, developers and ports will need to work together and multi-port strategies should be expected. One benefit of a strategy that focuses on a Port Cluster is that a critical mass of activity can be created, which attracts further investment into participating or other ports.

While decisions regarding marshalling and assembly and individual components can take place on a unilateral basis, to establish capability and capacity to manufacture and fabricate platforms does require coordination to maximise success. As the focus of ScotWind will be floating offshore wind, priority needs to be given to port facilities suitable for component and platform fabrication alongside marshalling and assembly.

In support of this analysis, ORE Catapult has provided updated analysis of port capabilities to support floating substructure fabrication in Scotland. This builds on 2020 work by ORE Catapult looking at floating substructures, updated based on current understanding of Scottish port capabilities and future plans. This analysis assessed different ports to carry out the following activities:

- **Pre-fabrication –** Pre-fabrication of substructure components (steel or concrete).
- **Assembly –** Assembly of substructures using prefabricated substructure modules (steel or concrete)[2].
- **Wind Turbine Generator (WTG) staging –** Wind turbine staging and installation on substructures.
- **Mooring System Staging –** mooring line and anchor staging.

Ports were assessed using relevant information including characteristics such as:

- Navigational channel width, depth and ceiling (air clearance to bridges, transmission lines)
- Number of berths and their depth
- Maximum serviceable vessel length, beam and draught
- Available infrastructure – space (existing and for future development), road and rail access, cranes, dry dock
- Access to workforce.

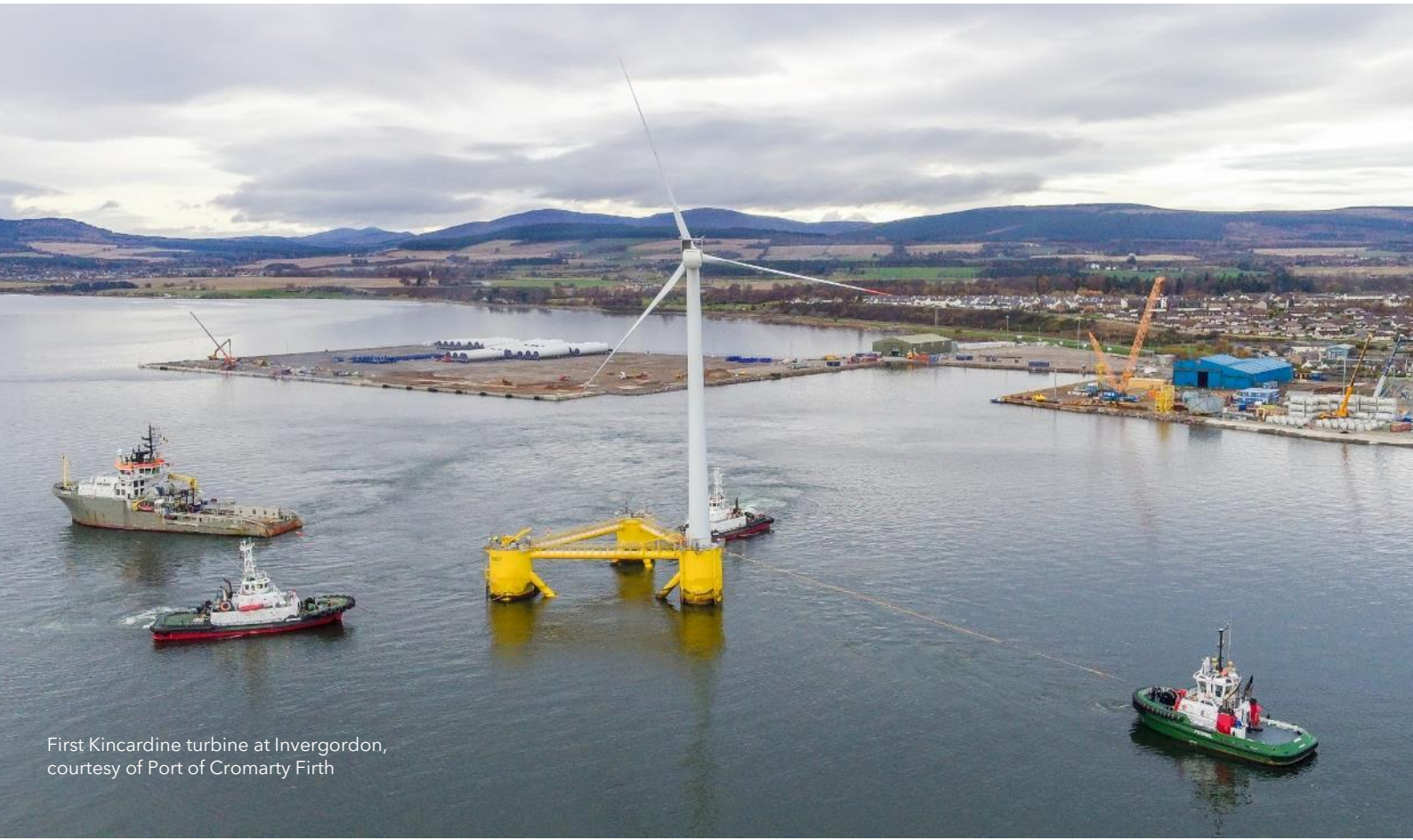
Ports were qualitatively assessed using a red, amber, green scoring system, where red = port does not meet the majority or all criteria; amber = port meets some of the criteria; light green = port meets most primary criteria, but additional development required; dark green = port meets majority or all criterial with little or no development required.

The resulting review of port capabilities currently, by late 2020s and if future investment plans are realised are shown below in Table 1: Port Assessment on Capability for Floating Substructure Fabrication.

Based on this ORE Catapult assessment, the SIA project team then screened the above Ironside Farrar analysis, to identify those Scottish ports with marshalling and assembly

capacity (existing and future plans) against capability to also support pre-fabrication and platform assembly. The result of this analysis is shown in Figure 11.

This screening highlights particular opportunities for floating platform fabrication at Nigg in partnership with Invergordon. Leith has fabrication capability though potentially constraints due to site restrictions. Hunterston requires investment to be made ready but offers a large site suitable for fabrication. Kishorn provides opportunities, particularly for concrete platforms given adjacent aggregate quarry.

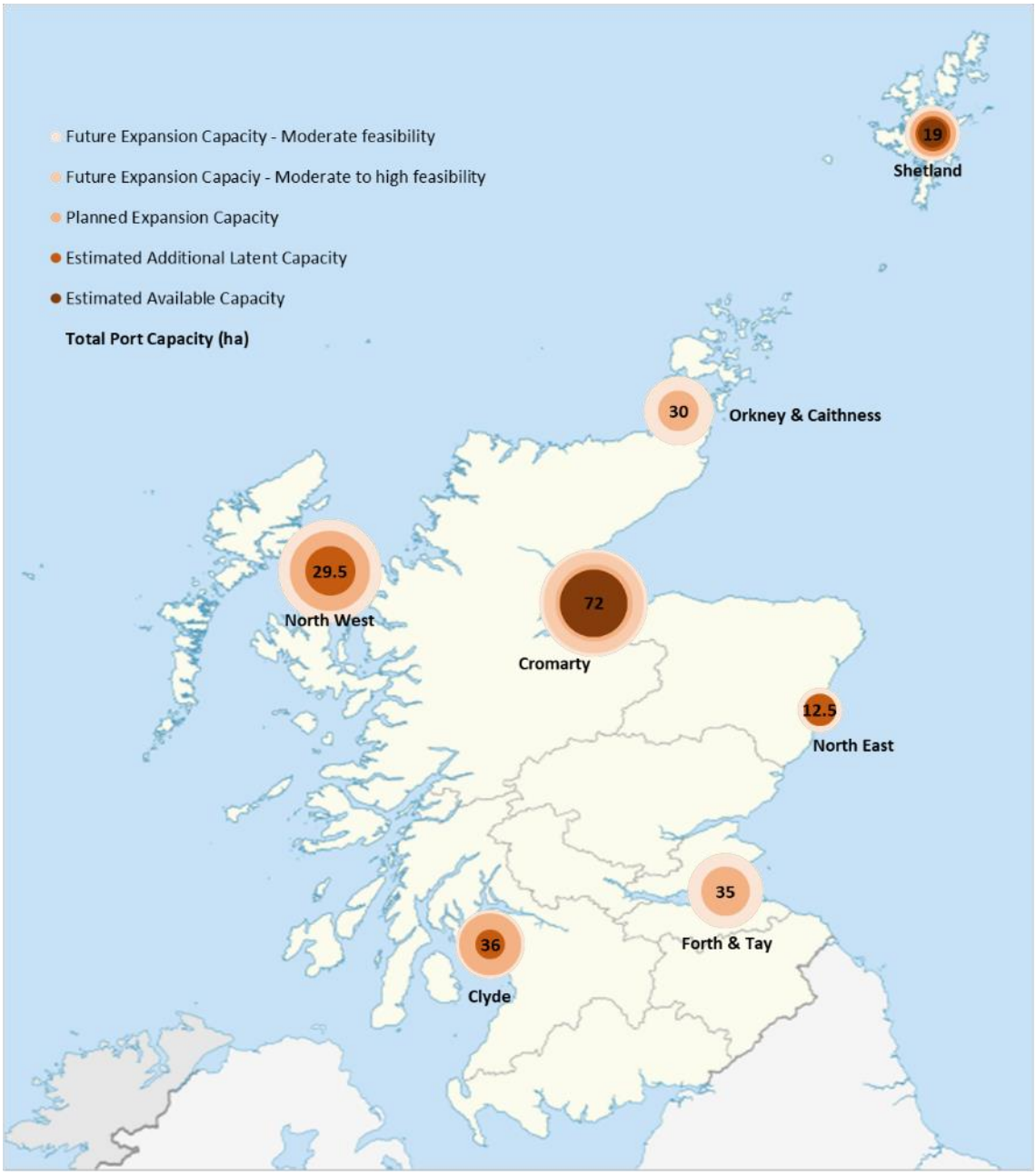


First Kincardine turbine at Invergordon, courtesy of Port of Cromarty Firth

Table 1: Port Assessment on Capability for Floating Substructure Fabrication

Port		Pre-fabrication	Assembly	WTG staging	Mooring staging	Comments
Aberdeen South Harbour	Currently	N/A				◦ Harbour is being constructed ◦ 12.5 ha quayside laydown area ◦ Access to workforce ◦ No marine licence for wet storage
	Late 2020s					
	With investment	N/A				
Ardersier	Currently					◦ Currently non-operational but under new ownership ◦ 105 ha of development space ◦ Marine licence in place for dredging and harbour wall construction ◦ Access to workforce ◦ Limited water depth
	Late 2020s					
	With investment					
Dundee	Currently					◦ Limited storage area ◦Access to workforce ◦Some previous experience with offshore wind incl. Kincardine 1 ◦ Limited water depth at entry to port ◦ £40 m investment to add additional wharf and storage space
	Late 2020s					
	With investment				N/A	
Energy Park Fife/Methil	Currently					◦ Former BiFab site now managed by Harland & Wolff as part of multi-yard strategy ◦ Access to workforce ◦Surrounding areas owned by SE - ~15 ha of possible expansion ◦Shallow quayside
	Late 2020s					
	Investment					
Hunterston PARC	Currently					◦ Currently non-operational & investment required ◦ Access to workforce and deep waters ◦ Large quayside laydown area (100+ ha) ◦ Large drydock ◦ Large wet storage area
	Late 2020s					
	Investment					
Kishorn	Currently					◦ Large drydock with consent to extend ◦ Quayside load bearing capacity (25-50 t/m^2) ◦ Large wet storage area ◦ Onsite quarry ◦ Consent to increase laydown area by 11 ha
	Late 2020s					
	With investment	N/A				
Leith	Currently					◦ £40m private investment announced ◦Limited storage space with narrow transportation corridors ◦Gated port, with proposed but limited docking space outside the gates ◦Access to workforce
	Late 2020s					
	With investment			N/A		
Lerwick	Currently					◦ Large wet storage area ◦ Plans for deep water quay (24m) and increased storage area ◦ Remote location with limited access to workforce
	Late 2020s					
	With investment				N/A	
Montrose	Currently					◦ The main chain and anchor base in Scotland ◦ Limited navigational channel depth and width for substructures and WTG ◦ 5 year Master Plan includes channel dredging to allow larger vessels
	Late 2020s					
	With investment	N/A				
Nigg Energy Park	Currently					◦ Existing fabrication capabilities with access to workforce ◦ Large wet storage area ◦ Quayside laydown area (24 ha) & large drydock ◦ Large additional laydown area by 2025 ◦ Proximity to many ScotWind Lease zones
	Late 2020s					
	With investment		N/A			
Port of Cromarty Firth (Invergordon)	Currently					◦ Ongoing expansion laydown area with additional 4.8 ha considered ◦ Large wet storage area ◦ Access to workforce ◦ Proximity to many ScotWind lease zones
	Late 2020s					
	With investment	N/A				
Port of Peterhead	Currently					◦ Narrow port entry (50m) limiting port to mooring and O&M activities ◦ Recently reclaimed 6 ha with 28 t/m^2 soil load bearing capacity ◦ No planned upgrades ◦ Proximity to many ScotWind Lease zones
	Late 2020s					
	With investment	N/A				
Scapa Deep Water Quay	Currently					◦ Proximity to many ScotWind Lease zones ◦ Large floating quayside capability planned for turbine assembly ◦ Large and deep (20-40 m) wet storage area (highly sheltered) ◦Limited access to workforce and housing
	Late 2020s					
	With investment					
Stornoway	Currently					◦ £49m secured in 12/2020 for some initial works. Required £66m which would include Phase 1 of deepwater port. ◦ 2017 Master plan has 3 phase deep water port near Arnish, which in total would give: 800 m quay (400 m a 10 m depth); 12 Ha laydown; RoRo terminal (convenient for WTG Nacelles) ◦ Possible synergies with H&W Arnish yard
	Late 2020s					
	With investment					

Figure 11: Current & Potential Scottish Port Capacity available for offshore wind marshalling & assembly *and* generally suitable for platform fabrication (existing port locations only)



Data Source: SIA project team based on Ironside Farrar assembly data and ORE Catapult port analysis

Figure 11: Current & Potential Scottish Port Capacity available for offshore wind marshalling & assembly *and* generally suitable for platform fabrication (existing port locations only) shows present and future capacity by region. The Cromarty Firth emerges as the primary location suitable for both assembly/marshalling and fabrication based on existing as well as additional capacity.

Not included in this analysis is the potential for redevelopment of the Ardersier site. While there is already a significant amount of capacity available within the Cromarty ports of Nigg and Invergordon, the Ardersier site could potentially add further to this, dependent on-site investment and priorities of the new site owners[xxiv] as well as dredging to ensure sufficient

water depth. The site has consent for some dredging but may need to consider licence to create a deeper channel, depending on platform size/depth.

5. Port requirements for floating offshore wind

5.1 Introduction

Floating offshore wind is a new way of deploying offshore wind. While deployment so far has been mostly single platforms or small clusters (Scotland is home to two of only three floating wind farms in the world), industry is expecting rapid scale up in a bid to commercialise the technology and bring costs down.

This rapid commercialisation presents significant opportunities as well as risks. All floating site developers and suppliers will need to grapple with the challenges of rapid scale up and cost reduction. It is worth spending some time on these issues to be clear about where Scotland should focus.

5.2 Platform foundation types

It is well known that there are many potential floating offshore wind platforms coming to market. Most of these have yet to be proven at full scale. Most companies are looking at semi-submersible platform types, but there are companies also looking at barge, spar, tension leg platforms and multi-platform options. Within this group of companies are different commercialisation strategies. Some wish to be platform manufacturers, some want to focus on development alongside project partners, while others will want to licence designs to manufacturing companies. These different approaches will impact applicability of different designs into the Scottish market.

Semi-submersible platforms utilise oil and gas technology, scaled and adapted for offshore wind. They are clearly the current market leader and are expected to be utilised in the first generation of large-scale floating schemes given that they are proven and certified.

Figure 12: FOW foundation types

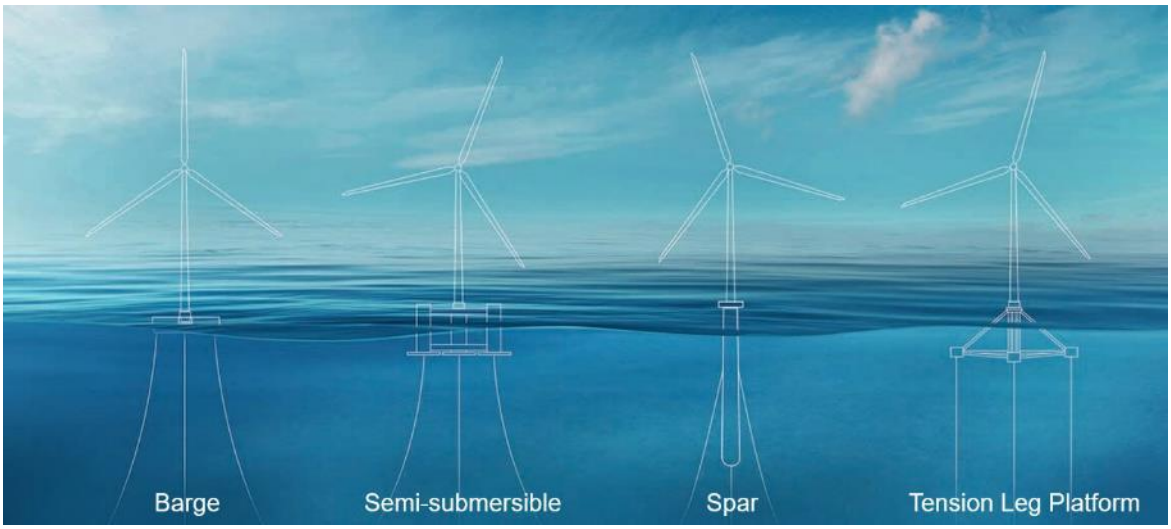


Image courtesy of DNV GL

5.3 Material and fabrication methods

Platforms can be made from steel or concrete or a hybrid of both. Semi-submersibles and barges can be constructed from steel (e.g. Principle Power's Windfloat) or concrete (e.g. Olaf Olsen's OO-Star, Saitec's Sath or BW-Ideol's Damping Pool). Spar technology can also utilise steel, concrete or a mix of both. Whichever platform is chosen, significant construction and fabrication areas are needed, as well as storage (including wet-storage – e.g. platforms moored in a deep sea-loch prior to turbine integration).

Broadly, semi-submersible steel platforms are seen as the most complex to fabricate. They require high-skilled fabrication but given demands to reduce costs and deliver at high volume, fabrication of these platforms will be a relatively low-margin activity. The current market focus is on the fabrication of platforms at a single site, rather than fabrication of different elements (e.g. pressure vessels) at one port before shipping for platform assembly, though this may be an option for some more simple platform types.

Concrete semi-submersible and barge type platforms are seen as less complex than steel versions. Concrete forming skills can be adapted from civil engineering. Concrete structures can be fabricated using several methods either in dry dock or on a quayside, prior to float out and assembly. As with steel platforms, significant construction area is required with a focus on availability of a large unrestricted land area to establish an assembly line type manufacturing process.

Spar or tension leg platform options could potentially be manufactured in different locations. While some spar platforms require deep water for turbine mounting, they can be manufactured on land and then floated out prior to assembly. Other platforms such as the Stiesdal Tetra concept are focused on industrialisation and offer the option of manufacture of steel components (e.g. by tower manufacturers) and shipping to a project location for assembly. The Tetra concept can be configured for semi-submersible, spar and TLP platforms.

5.4 Assembly and turbine integration

An advantage of floating offshore wind is the ability to carry out turbine integration at quayside or in more sheltered locations such as a firth or sea-loch, before towing out to site. This offers the opportunity to reduce construction delay and potentially save in construction costs, depending on vessel needs. This flexibility, however, will likely mean that developers are less constrained by location when choosing a site for turbine integration than they are for a fixed offshore wind site. While preference will be for local marshalling and turbine integration, cost and suitability factors will be relevant, and it may be that developers choose to carry out this work outside of Scotland and tow to site or choose a multi-port strategy (to manage construction and volume requirements as well as risk) and assemble at least a portion of projects outside Scotland. Experience from Hywind Scotland and Kincardine shows that this risk cannot be discounted.

5.5 How might the floating market evolve?

In looking at priorities for Scotland it is worth considering how the floating market will evolve. Different platforms coming to market indicates both the need for different platform technologies for different sea-conditions/depths, but also the extent of innovation in this emerging market.

Scotland must seek to develop capacity capable of delivering/supporting these potential floating variants and mitigate against risks of focusing on one technology or deployment method. A few important points emerge:

1. Steel semi-submersible technology requires new fabrication skills that do not yet exist in Scotland. Yards such as Nigg are investing in capability and working to form partnerships with early-stage floating projects so that they can learn and develop. Global Energy Group sought to work in this way with Hexicon for the Dounreay project[xxv] and is now doing the same with Simply Blue and Subsea7 on the Salamander floating demonstrator with platform company Ocergy.[xxvi] Global Energy Group has invested significantly in its site and has well regarded steel fabrication capability.
2. Scottish ports such as Invergordon and Kishorn are investigating options for concrete platform fabrication. Kishorn has a dry dock with planning permission to extend[xxvii] as well as co-located cement quarrying. Invergordon has invested in quayside development and has a partnership agreement with BM Ideol to investigate concrete hull serial manufacturing.[xxviii] Hunterston and Ardersier are potentially larger sites suited to concrete serial manufacturing, though require investment to bring them to readiness and Ardersier also must address dredging issues to provide sufficient water depth and access.
3. If the market evolves to tension leg platforms or to platforms suitable for secondary assembly, Scottish ports that offer scope for construction, concrete forming and secondary steel work will be able to secure a portion of work from fabrication and embed expertise. Sites with steel fabrication and tower expertise could supply platform components as well as act as a hub for platform assembly (as well as full turbine assembly). As reported in the media, plans are progressing for a state of the art, heavy tubular rolling factory at the Port of Nigg to make components for offshore renewables. Experience in tubular steel production can potentially be applied to this emerging floating platform model.

Reviewing the market significant opportunity, relevant expertise and suitable locations can be found across Scotland. However, investments should be made with a view to being strategic to ensure that they are ahead of and can react to a global market.

An important role that any Collaborative Framework can play is to help relevant ports focus on those platform technologies seen as most relevant to the Scottish market, and to assist them in prioritising engagement with the many different platform providers coming to market. SOWEC can play a valuable role helping ports make sense of this rapidly growing sector so that together industry and ports are able to come to a shared, informed view of floating market development.

6. Estimating the additional value of strategic infrastructure investments

To support this assessment, ORE Catapult were commissioned to review GVA and FTE potential benefits that could be secured with additional upgraded port capacity for assembly and fabrication.[11]

This work highlights that growing capacity and capability at Scottish ports is a critical component of securing added economic value and jobs from related manufacturing and fabrication activity.

The analysis is based on three different scenarios, the lowest of these being the ORE Catapult base case for development in Scotland alongside two scenarios developed by Crown Estate Scotland with Arup. There is little difference between the scenarios to 2030 (9 - 10.7 GW installed) while in the period to 2050 Scottish offshore wind is forecast to grow to 31.5, 48 or 63GW depending on the scenario selected. The headline figures from the analysis (Figure 13: Direct and indirect GVA) shows investing in assembly could increase the net present value (NPV) of GVA by up to £1.5 billion compared to our baseline (no investment) up to 2050. For fabrication, investment in port space could achieve between a £1.5 to 4.5 billion increase.

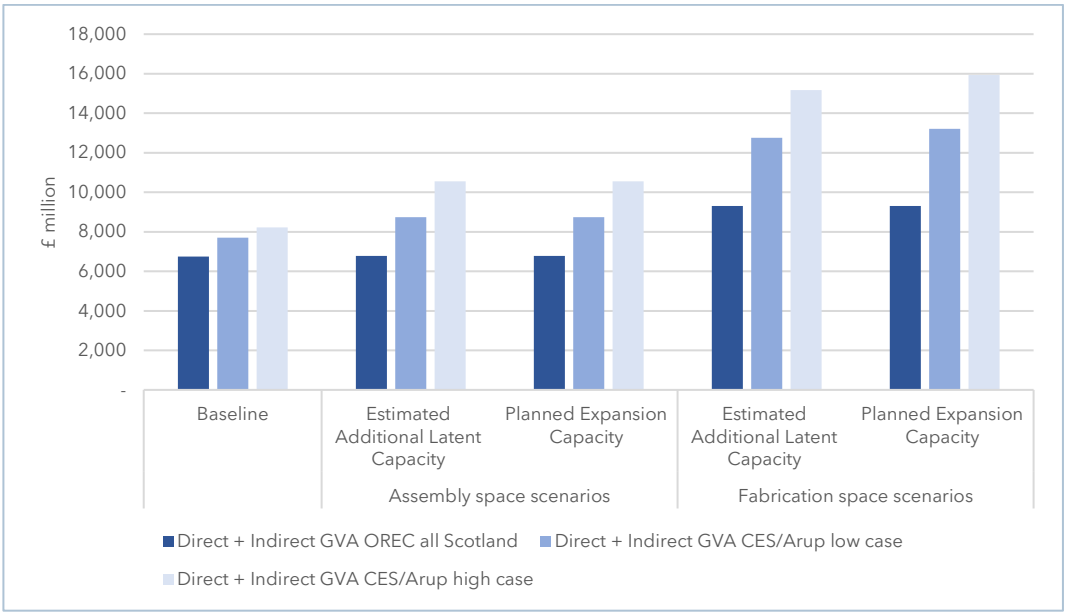
This assumes that all port capacity is developed to undertake these activities based on current estimated available capacity, estimated additional latent capacity, and planned expansion capacity. It also assumes that if ports are developed, they are immediately filled with work and so in general is an overestimation of what is possible. However, this analysis serves to provide us with useful information about the potential for the initial development of some of Scotland's ports and the marginal gains from doing so.

6.1 Port development scenarios

From the analysis it is possible to derive a 'least regrets' scenario for investment in port space to undertake upgrades to allow for additional fabrication and assembly. The 'least regrets' scenario shows high marginal added value for every additional hectare of Scottish port space, even under the least ambitious of the three different deployment scenarios used. Beyond this scenario, the analysis highlights significant additional potential from developing more land at Scottish ports, with gradually reducing marginal returns.

[11] The full methodology and outputs from this study can be found in Annex C. The analysis has utilised existing studies, including the recent Ironside Farrar assessment for Scottish Enterprise, HIE and CES. It assumes that this capacity is immediately available and would be fully utilised. The figures do not account for ports not winning work or other delays due to aspects such as lack of investment or staffing. Therefore, these figures should be used as a guide to potential rather than a predicted level of added value. However, it is useful to consider the outputs of this work to further understand the significant potential of the strategic investments as outlined in the key recommendations of this report.

Figure 13: Direct and indirect GVA



By highlighting the least regrets scenario, we are not recommending that Scotland should only develop a small block of additional port capacity, but that it needs to prioritise its rapid delivery. Without such capacity, inward investment cannot take place and supply chain growth will be constrained. However, such initial investment will build capability and economic activity, and could rapidly support and catalyse further activity which needs additional space. As such, we also highlight where additional value could be generated by developing more port space if available and if suitable collaboration is achieved and funding and support can be sourced.

6.1.1 Fabrication

6.1.1.1 A least regrets scenario for additional fabrication space

If 16 hectares of land were to be developed to accommodate this activity there would be significant additional added value regardless of the deployment scenario (Figure 14). The analysis shows that the direct and indirect value add to 2050 compared to the baseline would be £627 million rising to up to £722 million depending on the deployment scenario (Table 2: GVA for fabrication). This would also result in around 250 additional jobs supported on average every year (Table 3: FTEs for fabrication). Note that for fabrication jobs there will be more on average supported in the near term up to 2035.

Fabrication for concrete or steel semi-submersibles is only likely to be possible at a select number of ports given water depth required and space available, and only possible in any case with significant upgrades and development given the highly specialised nature of the activity. To achieve the figures noted here, there is a requirement for significant upskilling and investment to underpin these activities. It should also be noted that the activity will face strong competition in terms of price with other markets in Europe and the rest of the world.

Scenarios with more consistent deployment rates, rather than spikes in production in certain years, produce higher utilisation on average despite lower total deployment. The modelling shows that the NPV of GVA from the low, smooth "OREC all Scotland" deployment scenario which reaches 31.5GW by 2050 is actually higher than the NPV of

GVA from the higher, but much spikier "CES/Arup high case" deployment scenario which reaches 63GW by 2050. Therefore, considering the timings and deployment of sites may further increase value – further underlining the need for close collaboration among developers to maximise value to the supply chain.

Figure 14: Fabrication - marginal benefit per Ha

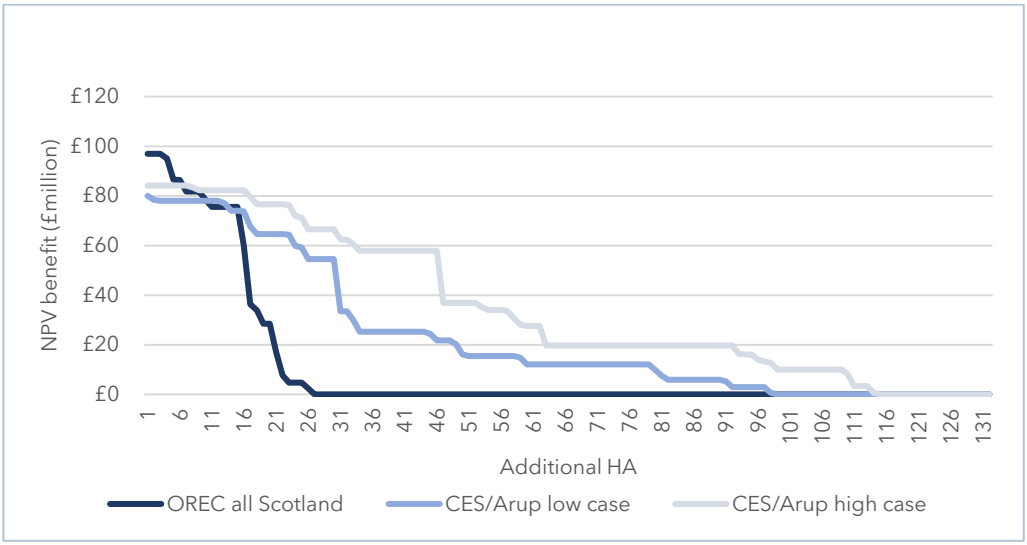


Table 2: GVA for fabrication

Adding 16 Ha for fabrication		Baseline (£m NPV)	Least Regret (£m NPV)	Difference (£m NPV)
Direct GVA	OREC all Scotland	£814	£1,128	*£314*
Direct GVA	CES/Arup low case	£781	£1,054	*£273*
Direct GVA	CES/Arup high case	£783	£1,075	*£292*
Direct + Indirect GVA	OREC all Scotland	£1,873	£2,595	***£722***
Direct + Indirect GVA	CES/Arup low case	£1,797	£2,424	***£627***
Direct + Indirect GVA	CES/Arup high case	£1,800	£2,473	***£673***

Table 3: FTEs for fabrication

Adding 16 Ha for fabrication		Baseline (FTE)	Least Regret (FTE)	Difference (FTE)	Period Ave (FTE)
Direct GVA	OREC all Scotland	10030	17477	*7447*	248
Direct GVA	CES/Arup low case	9965	17050	*7085*	236
Direct GVA	CES/Arup high case	9978	17543	*7565*	252

6.1.1.2 Fabrication requirements for more ambitious scenarios

Analysis shows that beyond the least regrets scenario, should an additional 46Ha of land for fabrication be developed, depending on the deployment scenario, direct and indirect GVA NPV would range between 1.5 and 3.3 higher than the baseline scenario of no investment while supporting approximately 275 to 650 additional direct FTEs every year. This is against the risk that deployment is in the lower end of these scenarios and therefore additional value from the development of further space may be marginal or potentially result in negative returns.

The economic potential for fabrication is clear based on the above analysis but there are still very significant uncertainties around the market and competitiveness of Scottish ports for this activity, that are not considered as part of this analysis. See Chapter 5 for more details on some of the requirements for a successful fabrication sector for floating offshore wind to understand more about these uncertainties.

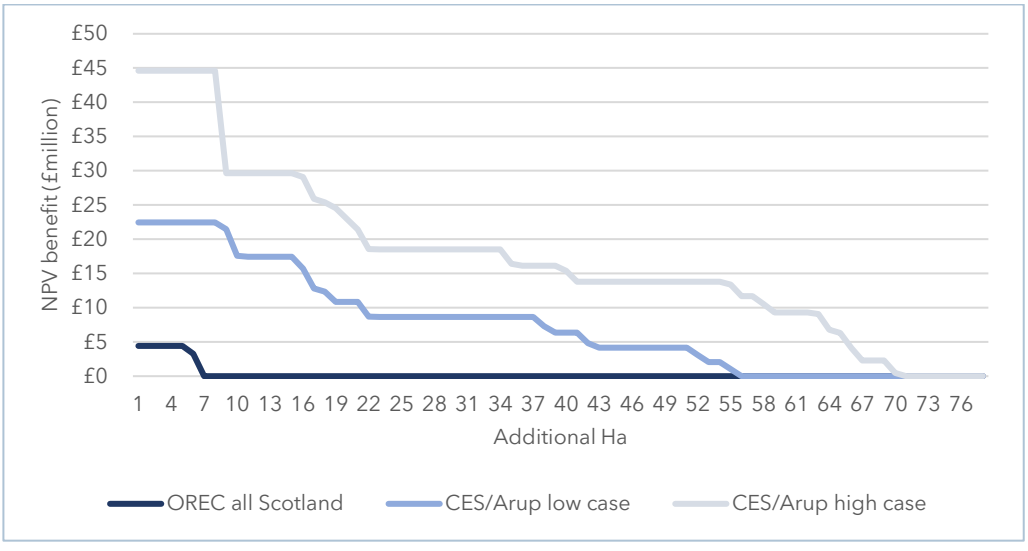
6.1.2 Assembly

6.1.2.1 A least regrets scenario for additional assembly space

For assembly, the differences in predicted deployment scenarios produce wide-ranging results in terms of added value when considering developing new port facilities and space for this purpose as the existing port facilities already provide space for a significant amount of assembly activity. However, when focussing on another 'least regrets' scenario we can calculate that a developed area of 6ha could produce added-value even if deployment ended up being on the lower end of current predictions (Figure 15).

The lowest added value in this case in terms of direct and indirect impact would be £25 million rising to £593 million. This would also result in up to 55 additional direct jobs supported on average every year (Table 5).

Figure 15: Assembly - marginal benefit per Ha



6.1.2.2 Assembly requirements for more ambitious scenarios

Analysis shows that beyond the least regrets scenario up to 2050 should an additional 34Ha of land for assembly be developed, depending on the deployment scenario, direct and indirect GVA NPV would range between £25 and £954 million higher than the baseline

scenario of no investment while supporting approximately 4 to 180 additional direct FTEs every year. For assembly jobs, averages can seem low for the OREC scenario, but it is the case that these average FTEs would be concentrated in the years up to 2040 and not spread out to 2050. This is against the risk that deployment is in the lower end of these scenarios and therefore additional value from the development of further space may be marginal or potentially result in negative returns. The economic case for additional assembly area is less clear cut than for fabrication given there is already significant space for assembly at ports in Scotland and because assembly space is only required for an individual project for a short period of time, so depending on volume of capacity being developed, assembly space can be reutilised effectively.

Table 4: GVA for assembly

Adding 6 Ha for assembly		Baseline (£m NPV)	Least Regret (£m NPV)	Difference (£m NPV)
Direct GVA	OREC all Scotland	£958	£969	*£11*
Direct GVA	CES/Arup low case	£1,146	£1,286	*£140*
Direct GVA	CES/Arup high case	£1,263	£1,521	*£258*
Direct + Indirect GVA	OREC all Scotland	£2,203	£2,228	***£25***
Direct + Indirect GVA	CES/Arup low case	£2,635	£2,957	***£322***
Direct + Indirect GVA	CES/Arup high case	£2,906	£3,499	***£593***

Table 5: FTEs for assembly

Adding 6 Ha for assembly		Baseline (FTE)	Least Regret (FTE)	Difference (FTE)	Period Ave (FTE)
Direct GVA	OREC all Scotland	12,047	12,152	105	4
Direct GVA	CES/Arup low case	15,274	16,008	734	24
Direct GVA	CES/Arup high case	16,923	18,567	1,644	55

6.2 Conclusions from economic analysis

The analysis highlights significant potential for added value from the development of ports and harbours for fabrication as well as assembly. A least regrets scenario of securing an additional 22ha of port space for Scotland to support additional fabrication and assembly activities in Scotland provides that opportunity at low risk, while developing up to 46Ha for fabrication and 34Ha for assembly still shows strong returns that could be achieved from a world-leading industrial base being developed in Scotland.

Most critical for Scotland is space for additional fabrication. Our analysis shows that the economic benefit of this activity is greater. As such there are clearer benefits in supporting

additional fabrication over assembly for more ambitious deployment scenarios. However, this does not factor in the greater challenges and higher cost of securing fabrication activity.

Focusing this fabrication and assembly activity in a single location or nearby group of ports would be most likely to support clustering benefits, and to help offset investment risk as land developed to support fabrication can also be utilised for assembly activity if not fully utilised.

Finally, it needs to be noted that this analysis is effectively a best-case scenario of the economic benefits to Scotland from providing additional capacity to support fabrication and assembly activities. Without additional capacity supply chain growth will be constrained. The reverse is not necessarily the case. Additional capacity creates the opportunity, but also critical is the ability of Scottish ports to win this work and compete with a global market, and below we set out recommendations for actions to support Scottish ports and the wider supply chain to maximise their chances of success.

Cromarty Firth with Nigg in foreground,
looking toward Invergordon,
courtesy of Global Energy Group

7. Recommendations

To address barriers to growth it is important to focus on the critical areas that can make the most difference. To scale up Scottish activity in offshore wind, we need to be ambitious at the same time as being realistic about where Scotland has advantages.

Our approach is to recommend a focus on three supply chain areas:

- Tier One suppliers seeking manufacturing locations. Priority needs to be given to supporting fabrication of floating platforms (steel and concrete), but also other high value components including cables and towers.
- Scottish SME companies active in engineering, marine and subsea markets
- Suppliers in new and emerging markets, particularly supporting companies supply into floating offshore wind.

There are challenges in all these areas, but of course opportunities too.

Our report has five recommendations for SOWEC. These are strategic recommendations that are required to make the systematic changes needed to upscale Scottish supply chain activity and are built on the experience of our Working Group and Executive Committee and informed by wide stakeholder and supply chain consultation. A summary of consultee views is included within each recommendation as well as in Annex D: Summary of consultation responses.

Our primary recommendation relates to the use of a Collaborative Framework to support earlier infrastructure investment in Scotland. The first priority should be supporting the establishment of a *Scottish Offshore Wind Port Cluster* to enable floating platform fabrication and manufacture. Supporting this first recommendation are four supporting recommendations covering: tendering and supply chain relationships; selling Scottish success abroad; scaling support on sector innovation; and preparing for wider energy transition.

These recommendations need to be the responsibility of SOWEC, with industry and the Scottish Government working together on their delivery. They will also need to wider engagement of UK Government, the UK Offshore Wind Industry Council as well as academia and other support bodies and stakeholders.

A partnership approach is needed if we are to grow Scottish success in offshore wind and be ready for the coming scale up in offshore wind activity around Scotland's coastline. Without such an approach we risk maintaining the status quo. This means that we fail to build capacity and capability in Scotland so that only small supply chain wins are possible, while the major contracts continue to be delivered outside of Scotland. Individual developers and tier one suppliers cannot fix this unilaterally, though all have a role. Government cannot solve this with funding or support programmes or even with rules and processes put in place along leasing and auctions. A joint approach can, though it will take commitment and effort to succeed.

7.1 **Recommendation One:** The offshore wind sector's priority must be the establishment of a collaboration framework focused on building confidence amongst Scottish ports, so that required investment is brought forward in time. The immediate priority of such a collaborative framework is supporting the creation of a Scottish Floating Offshore Wind Port Cluster

Our primary recommendation in this report is focused on mechanisms to secure the required port infrastructure to deliver a next generation of Scottish offshore wind projects. Without access to sufficient high quality port space, Scotland cannot hope to attract critical activities like manufacturing and may even be limited in the proportion of staging and assembly work that can be secured around the build out of Scottish projects.

Offshore wind is a maritime activity and is organised around ports. So, supporting Scottish ports and yards grow their offer is our first area. This is the "what" of our primary recommendation. We recommend effort is put into supporting a Port Cluster focused on floating platform fabrication and manufacture. Floating offshore wind has large space requirements, and there is clear value in looking to cluster different fabrication and manufacturing activities in support of floating offshore wind delivery.

As well as activity within a port cluster, different Scottish ports can also expect to win work or act as a location for assembly, manufacturing, O&M and as a base to support research and innovation. All this activity can be better supported by an effective collaborative framework, created and led by the wind industry.

As well as seeking to define how a collaborative framework will work, as well as what activities need to be focused in a Scottish Floating Offshore Wind Port Cluster, we also set out the roles of government and industry in supporting creation of a hub. This is the "who" of our primary recommendation. We have set out specific roles for different players and have sought to be as specific as possible in identifying specific governments, agencies, and tiers of industry.

7.1.1 Consultation feedback summary

There was clear feedback from over half of those consulted that a lack of strategic investment in Scotland's ports, yards and wider supply chain was a major barrier holding back development of the sector.

The difficulty for individual businesses to invest in the near term against uncertain development timelines and already established overseas competition meant that consultees thought that large strategic investments would be required to allow Scotland to maximise the opportunity from offshore wind. Consultees noted that some form of dedicated public funding would be required to unlock private investment in this area.

1a. SOWEC industry members to explore options for sector coordination with a Scottish Floating Offshore Port Hub and other Scottish ports. An alliance model offers a framework for delivering large-multi disciplinary projects, and a means to build longer term cooperative arrangements between developers, ports and suppliers.

Scotland has several port and yard locations suited to offshore wind. Many of these ports are investing ready to grow offshore wind activity. They need to have confidence to invest ahead of time and be ready to meet demand.

Our recommendation is that Scotland's focus should be creating or growing facilities able to support both fabrication/manufacture as well as marshalling/assembly. The former offers more longer-term benefit to Scotland as it helps foster economic activity over a longer time and better supports clustering effects.

There is a risk that if developers continue to engage unilaterally with ports, with all discussions covered by non-disclosure agreements, it will be difficult to build a sense of momentum and raise our ambition over the type of infrastructure investment needed.

In comparison to larger ports in Europe, Scottish ports are smaller. However, by developing a Hub model, ports can work in partnership to provide world class facilities to the offshore wind industry ready to meet demand. This partnership approach will only work if industry commits to work in partnership to help ports plan for expected demand. Government then needs support port upgrades and enhancements ahead of use. This then helps these ports secure necessary investment. While at larger continental ports such as Esbjerg, site users can "move the fence" and share port space as needed, Scotland's approach needs to be thinking beyond the offer and constraints of individual ports. We need to "move the fence" to go around multiple ports, with partnership in place to share work and be able to offer the wind industry the capacity and capability required.

In our consultation, port providers were clear that the potential volume of work coming to Scotland can create opportunities for all, and all expressed confidence for the future. But the challenge is that while each individual port may see success and attract investment, this activity is unlikely to radically change the outcome in terms of work coming to Scotland.

The focus for inward investment into the *Scottish Floating Offshore Wind Port Cluster* should be supporting ports to attract (a) floating platform fabrication as well as (b) co-location with assembly and staging activities for project build out, and (c) manufacture of other critical components such as towers.

To bring a Scottish Floating Offshore Wind Port Cluster into existence will require collaborative effort. The first steps need to be taken by industry. Developers and tier one suppliers need to explore options for partnership working, learning from alliancing models in oil and gas models. Figure 16: Steps to establish a Scottish Floating Offshore Wind sets out the five steps to establish the Port Cluster.

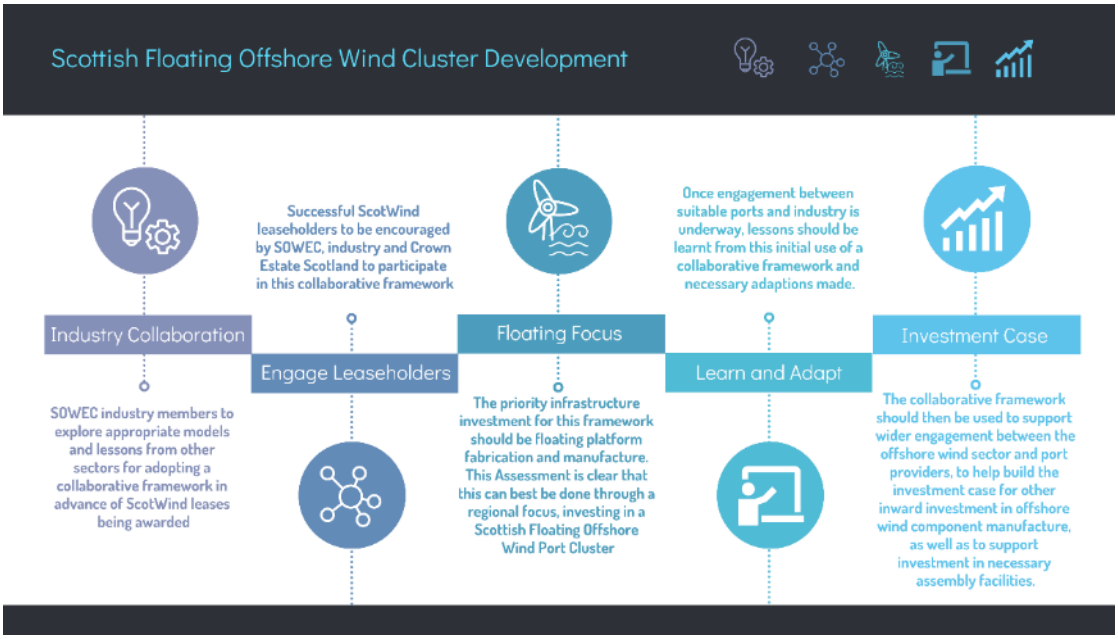
The focus of a partnership or alliance structure needs to be supporting investment in yard capacity so that fabrication of platforms is possible in Scotland, and that yards have the capability to compete. Without industry working to bring such a partnership approach into being, ports investment may be delayed or scaled down. Equally, Government can only be expected to invest in ports *if* industry has first enabled investment through collaboration.

The developer, OEM and Tier One contractor community need to lead activity to agree the scale of requirements and priorities for inward investment. Industry also needs to collectively work to confirm the demand coming in the next ten years.

After this, a collaborative framework needs to be developed and ports invited to sign up and participate. In our discussion with ports and industry we have seen examples of port collaboration. This collaboration tends to be specific to individual contracts and opportunities. However, if the offshore wind sector can provide a clearer framework, we see a clear incentive for ports to work collaboratively over the longer term. We have confidence that in this model different port operators can play to their individual strengths, winning work and helping catalyse investment and a clustering effect.

If this model can be used to underpin investment in Scottish floating platform fabrication and manufacture, then it should also be used to support wider investment in other manufacturing activities at the different ports active in offshore wind.

Figure 16: Steps to establish a Scottish Floating Offshore Wind Port Cluster



A Collaborative Framework approach needs to work as follows:

1. SOWEC industry members to explore appropriate models and lessons from other sectors for adopting a collaborative framework in advance of ScotWind leases being awarded
2. Successful ScotWind leaseholders to be encouraged by SOWEC, industry and Crown Estate Scotland to participate in this collaborative framework
3. The priority infrastructure investment for this framework should be floating platform fabrication and manufacture. This Assessment is clear that this can best be done through a regional focus, investing in a Scottish Floating Offshore Wind Port Cluster
4. Once engagement between suitable ports and industry is underway, lessons should be learnt from this initial use of a collaborative framework and necessary adaptions made.
5. The collaborative framework should then be used to support wider engagement between the offshore wind sector and port providers, to help build the investment case for other inward investment in offshore wind component manufacture, as well as to support investment in necessary assembly facilities.

Scotland's enterprise agencies will need to play an important facilitation role to make this Collaborative Framework effective, but it is right that wider Government support is conditional on industry action. Used effectively this framework is seen as the best route to help bring forward investment in necessary port infrastructure to give ports and supply chain time to get ready for a future pipeline.

7.1.2 A Regionally focused Floating Offshore Wind Port Cluster

The focus of offshore wind activity is in an area of the North Sea from the Forth and Tay up to the Shetland Isles, though there are several sites in the west or north of Scotland. Existing reviews of port capacity and capability highlight that many of the best sites to support offshore wind are clustered around this primary development area.

This report is clear that that Scotland should prioritise effort to build capacity and capability able to support assembly and fabrication as well as fabrication. Industry requires a cluster located near to future floating offshore wind sites, and has capacity for assembly, marshalling and fabrication, as well as sheltered water for platform wet storage nearby. Capacity should be available or easily made available through investment. While it will be for industry via a Collaborative Framework to broker agreement with a group of ports, and for the UK and Scottish Governments to establish parameters for any funding support, this independent Infrastructure Assessment sees the Cromarty/Moray area as the most suitable location for a Scottish Floating Offshore Wind Port Cluster.

This is the case with or without the development of Ardersier as a port, though if that port is developed it drastically increases available land for use, particularly if there is market demand for large scale concrete platform production.

Our analysis of the potential GVA that could flow through a Port Cluster focused on floating platform fabrication as well as marshalling and assembly highlights a clear no-regrets case for ensuring an additional 22Ha is made ready. Additional capacity is available in the Cromarty Firth at Nigg and Invergordon.

7.1.3 Sector roles and responsibilities in supporting port infrastructure investment

While we have focused on the creation of a Port Cluster to support floating offshore wind growth, we recommend wider use of collaborative framework, so that other ports can be engaged re. supporting the wider needs and of Scottish offshore wind projects. This approach aims to create an environment in which there are opportunities across Scottish ports. Different ports will be able to provide services and components into this main hub, as well as direct to developers, OEMs, and other contractors.

Near to Cromarty and proximate to several ScotWind sites, Orkney ports and Aberdeen South are also looking at opportunities in offshore wind. The recently announced investment into Aberdeen South for an Energy Transition Zone[xxix] highlights the potential role of this new harbour facility in wider energy transition, supporting research, innovation, and manufacturing for offshore wind.

Further south on the East Coast, we have noted the investments and commitments being made by Forth Ports. Its investment into Dundee will enable that port to provide marshalling and assembly facilities to future offshore wind farms on the east coast and the site could potentially be used as a base for other supply chain activities. In Leith, the newly established Offshore Wind Port Hub[xxx] offers deep water access and works as a location for

supply chain investment and sits across the water from the revived Fife yard now under the management of Harland & Wolff. The Forth and Tay has the opportunity to also supply into fixed as well as future floating markets in NE England.

On the west coast, Hunterston, Kishorn and Arnish (also managed by Harland & Wolff) are well located to provide services to western and northern ScotWind sites, and potentially into a future Celtic Seas floating market. Ports such as Montrose are focused on chain and anchor provision and with support will be able to transition this expertise into floating offshore wind.

While this report necessarily looks at how to focus activity to create the conditions we see as necessary to bring floating platform fabrication to Scotland, we see that the frameworks we have identified can therefore support this wider set of activities and required investments across a wider group of Scottish ports.

To support investment both at a Port Cluster and more generally at different Scottish ports, it is worth being clear as to relevant roles of the sector both

- Developers need to lead with SOWEC (with OWIC support) coordinating agreement on a suitable collaborative framework and lead associated discussions around their requirements for a Port Cluster.
- Developers also have a responsibility to help encourage their supply chain to engage, though of course the benefits of using a collaborative framework will need to be self-evident. Developers can also use such a Framework to support shared investment in marshalling and assembly as well as operational bases and maintenance hubs that helps strengthen different ports to build an investment case. Developers have an interest in ensuring ports can support construction and operation so will consider appropriate investment here.
- Developers can also act as anchor customers for fabricators and suppliers of key components. However, developers will not be able to fund or financially support efforts to secure inward investment in manufacturing.
- OEMs may have a role using a Collaborative Framework as well as using a Port Cluster, investing directly in manufacturing or assembly. Our focus here is their role in supporting inward investment of their major providers – e.g. tower manufacture. Like developers they can also underpin investment, for example acting as an anchor customer for relevant components such as towers.
- Other Tier One suppliers for cables, floating platforms and jackets can support a Port Cluster by using it as a base or contracting with relevant yards. Given competition to establish in other locations outside Scotland, inward investment support is likely to be also needed.

Table 6: Breakdown of potential port activities and relevant industry roles below sets out the different potential offshore wind activities requiring port space. Some activities such as O&M are location dependent. Others are influenced by location, such as assembly, but not wholly dependent. Other activities such as location of fabrication are not location dependent, so depend on other factors if they are to be developed in Scotland.

While the offshore wind industry can create the demand that underpins the investment case for a Port Cluster, there are limits to what industry itself can fund if Scottish projects are to be successful. While the bulk of funding needs to come through private sources via the ports themselves, the UK and Scottish Government can play an important enabling role

through co-investment and financing if required. We recommend that the UK and Scottish Governments take on board our recommendations and look at options for funding directly or via competition this Port Cluster.

It has been estimated that the Scottish Government will be receiving up to £860m[xxxi] via ScotWind leasing payments from successful projects. This income is not included within the calculation of the Scottish block grant. Government has a wide policy agenda and is responsible for deciding how best to allocate this funding.

However, our report is clear that if industry acts and demonstrates through partnership working that it can create more transformative approaches to supporting Scotland's supply chain, then it will be in the interest of Scotland for the Scottish Government to use a portion of this income to support this work. Our economic analysis clearly highlights the benefits to Scotland from growing Scottish capacity and capability for fabrication and assembly focused on floating offshore wind.

7.1.4 Supporting Actions – defining the Port Cluster:

- Government needs to support industry action to establish a *Scottish Floating Offshore Port Cluster*, including co-financing any necessary consenting activity to help accelerate port readiness. This should be done with ports sector and government involvement.
- A *Scottish Floating Offshore Wind Port Cluster* can bring wider opportunities and aid wider Scottish investment. There will be opportunities for other ports in providing specialist elements such as anchors, cables and moorings, as well as a wider requirement assembly and staging and for operation bases and maintenance hubs. Crown Estate Scotland could also play an important role in investing in this next tier of locations and facilities.
- While focus on a *Scottish Floating Offshore Wind Cluster* represents the best route to maximise value to Scotland by securing fabrication and manufacturing, there will be a need to identify other ports to provide assembly and staging to support more local project build out and to help manage peaks in activity.

Table 6: Breakdown of potential port activities and relevant industry roles

What	Fabrication and manufacturing facilities	Construction (staging and turbine integration)	O&M
Where	Not location dependent, though local content requirements will encourage investigation of local option	Ideally located close to the wind farm but is dependent on suitable large facilities.	Ideally located close to the wind farm.
Challenges	Scottish yards may be able to deliver work, though will need to invest in specialist equipment and/or facilities to be able to compete on price/quality	Scottish ports tend to be smaller. With growth in floating offshore wind option of wet storage of platforms and "wet mounting" may be available	Developers will need to assess use of CTVs, SOVs and helicopters. While CTVs most suited to near to shore ports, SOVs likely to be used further from shore. In more hostile environments, SOV strategies will likely need to be rethought.
Lead company	Yard or manufacturer -.eg of floating platform; jackets; cables; towers	Developer(s) (through its dedicated project company	Developer(s) (through its dedicated project company
Contracting party	Dependent on component. Primarily EPCI, Tier One contractor (e.g. platform provider)	Developer or EPCI	Developer or EPCI
Role of developer	Acting as anchor customer to build supplier confidence. Encouraging suppliers to engage on local content	Port engagement and selection of port. Developer prepared to invest in this element of project	Port engagement and selection. Developer prepared to invest in this element of project
Comments	Developers will go to the market to secure key components. Securing manufacturing into ports will deliver more longer-term economic activity than assembly	Staging and assembly facilities closer to site helps de-risk project construction and minimises vessel transit time. For floating staging can be further away from site than for fixed	ScotWind leasing includes several far from shore sites, some in more difficult sea conditions. SOVs likely to be predominant service mode. Developers will seek to maximise remote operation and minimise crew time etc as technology allows
Specific floating offshore wind issues	The market for floating platforms is still in its infancy. There are a lot of platform models, but few have been demonstrated commercially. Given risks, developers are likely to have lead role in platform specification. Platform providers will need to contract construction/ fabrication activity to yards and fabricators. Different manufacturing techniques will require different facilities, from large yards to covered premises to dry docks. Providers are also looking at options such as floating dry dock use.	Floating offshore structures are large and will need storage and/or transfer to assembly facilities. It is likely that wet storage will be used, so ports able to offer loch moorings ahead of turbine integration will have an advantage. Storage and assembly may happen at different port locations and could be done at quayside (with onshore cranage) or in loch (e.g. on floating assembly bases or with floating cranes or jack up barges).	General operation and maintenance of floating turbines is likely to be done at sea as for fixed offshore wind. However, major repairs and servicing later in a project life could happen on quayside or in more sheltered loch locations. This could mean opportunities to provide maintenance facilities as well as hubs to support day to day operation and maintenance.

1b. To ensure a Collaborative Framework can deliver infrastructure investment, Scotland's enterprise agencies and SOWEC will need to play an important coordination and facilitation role.

Leadership to establish a Collaborative Framework and a Scottish Floating Offshore Wind Port Cluster must come first from the private sector, beginning with work by offshore wind companies to establish a cooperation framework that can give confidence to relevant ports. In support, Scotland's enterprise agencies can play an important facilitative role.

We see a role for Scotland's enterprise agencies in coordination and more explicit use of information that will emerge from ScotWind as well as existing projects to amalgamate and publish information on levels of demand and priorities for Scotland. For example, understanding a set of timelines for expected delivery of projects and/or balance of plant requirements will help suppliers plan, and give them confidence to put necessary investments in place. A critical issue is likely to be managing peaks and troughs in the manufacture and assembly of floating offshore wind platforms, given high levels of activity here in Scotland as well as other parts of Europe later this decade and into the 2030s.

7.1.5 Supporting Actions – building confidence

- Scotland's enterprise agencies to be given an explicit role to "respond" to Outlook statements produced as part of the ScotWind Supply Chain Development Statement process. These periodic responses should seek to aggregate project activity and likely timescales and highlight investment priorities.
- Scottish Development International and Department for International Trade activity should support efforts to build a Scottish Offshore Wind Port Cluster through associated marketing effort and sector engagement. A priority focus should be inward investment engagement with floating platform fabricators.
- Consideration is needed on how Scottish ports can marry offshore wind forecasts with demands from other sectors including oil and gas and defence, as having a port sector able to service multiple industries offers the best route to economic sustainability.

1c. Any investment focus needs to be on investing ahead of time so that Scotland builds its capacity and capability to deliver offshore wind work. Investment vehicles such as the Scottish National Investment Bank are currently not able to do this, so either need to be supplemented, or refocused.

Offshore wind projects are complex and capitally intensive infrastructure projects. They take several years to go from inception to deployment. Local content requirements for projects will sit with the project developers, but they and the rest of the supply chain are constrained by the working of the Contract for Difference regime that means contract certainty comes late in the day and close to project delivery.

This has a potentially big impact on ensuring that port capacity and capability is in place so that yards and other supply chain players are ready to bid, or that inward investment can be secured in anticipation of contracts.

Ports can secure investment, though the source and type of funding will depend on port type and project type. Scotland has trust ports, local authority ports and private ports that

will have different priorities and routes to securing investment. All though will be able to consider direct balance sheet investment, direct borrowing, leasing, or equipment and asset finance.

However, the mismatch in timelines could mean either ports are disinclined to invest their own funding or cannot borrow money owing to lender concerns about risk. A critical issue is how to mitigate these risks so that investment into Scottish ports can be made in time to make a difference.

Scottish Enterprise, in partnership with Highlands & Islands Enterprise and Crown Estate Scotland, recently commissioned specialist adviser QMPF to look at investment models suitable for offshore wind.[xxxii]

QMPF engaged with port owners and the offshore wind sector as a strategic investment for them, but that there were risks and barriers to investment including timing, contract length and general project economics.

QMPF concluded that while investment can come from private sources, "given the potentially specialist nature of some of the investment associated with fabrication and marshalling, it may also be appropriate for some of this facilitation to come from the private sector", including:

- Strategic planning to aid future visibility into what associated infrastructure is needed (for example programme visibility, pooled investment, and links to the ScotWind process)
- Credit enhancement to make investment more attractive to private sector investors.
- Other facilitation, including provision of gap funding and tax benefits to complement private sector investment.

QMPF went on to consider different funding and support programmes. These could include the UK Guarantee Scheme, UK Export Finance, bond insurance and other facilitation and guarantee structures.

In this report we have also been looking at these issues and particularly how industry and government can provide greater certainty on infrastructure requirements, and options for supporting investment in anticipation of demand.

Through our consultation, ports, OEMs and manufacturers highlighted the importance of visibility, commitments of developers, and support to invest in anticipation of demand.

The funding source raised regularly by consultees was the Scottish National Investment Bank. Formally launched in November 2020, SNIB is a "a mission-led development investment bank for Scotland, wholly owned by the Scottish Ministers on behalf of the people of Scotland" established to operate commercially, and which is operationally independent from government. SNIB invests "in Scottish business, projects and communities to deliver environment, social and financial returns for the people of Scotland."[12]

[12] The Scottish National Investment Bank, see https://www.thebank.scot/about/. Accessed 15/07/21

However, at present SNIB funding is only available *if* the Bank can see a reasonable volume of orders in place and a reasonable prospect of securing sufficient volumes of work. This is a requirement that ports cannot fulfil. However, without investment they cannot win orders.

Investment must be made *in anticipation* of an order book. This means putting in place a funding model so ports can invest ahead to build necessary port capacity and sector capability to a standard and scale required by the offshore wind industry.

SNIB funding ought to be able to solve this paradox. Government needs to consider how to utilise industry support via an alliancing model, backed with grant or direct investment as a means of underpinning SNIB or other commercial lending.

At a UK level, there has been effective sector engagement and investment to support manufacturing in offshore wind located at ports in Humber and Teesside via its offshore wind manufacturing investment programme.[xxxiii] This support has been aimed at securing manufacturing to support a known pipeline of projects. When the ScotWind process is finalised and bidders announced, there will be a new pipeline of projects, with an expected focus on floating offshore wind. Our analysis highlights the investment case and benefit from securing floating offshore wind platform fabrication. The UK Government should consider options for future funding support to embed UK platform capability by supporting a Scottish Floating Offshore Wind Port Cluster.

7.1.6 Supporting Actions – securing investment

- Investment needs to be led by the private sector. Investment will come primarily from private investment in ports directly and will need to be led by ports themselves. The offshore wind industry can support this investment and provide assurances, for example as an anchor tenant.
- The UK and Scottish Governments also need to play an important role as investor, particularly to help underpin an investment case prior to expected offshore wind activity. The Scottish Government needs to look at how best to supplement or refocus SNIB funding, so that it can play a role in port investment.
- The UK Government should assess options for supporting port investment linked to floating offshore platform fabrication and manufacture, given Scotland's significant floating offshore wind resource, and the expected importance of floating offshore wind to delivering net zero.
- The Scottish Government should assess making a portion of the estimated £860m ScotWind leasing revenues to support investments in ports, workforce and equipment needed to deliver a new generation of offshore wind projects.
- As well as supporting investment in a Scottish Floating Offshore Wind Port Cluster, there will be requirements to invest in manufacturing capability of existing or new entrants to the Scottish market. To compete on cost, Scottish fabricators and manufacturers will need to invest in automation and high-grade equipment so that higher costs can be offset by more efficient processes.

Recommendation Two: Support Scottish suppliers and get them ready to bid for and win work

In our consultation with Scottish supply chain, access to tenders and contract opportunities was an issue raised repeatedly. Tender processes around offshore wind are necessarily rigorous. Equally, the impact of the CfD process creates advantage for market incumbents so can make it hard for new entrants to break into the market. As a late starting market this will disproportionately impact Scottish based suppliers looking to move into offshore wind.

The UK Government has now finalised its position on UK supply chain plans. As part of securing a CfD a developer will need to submit a supply chain plan for Government to review. If a supply chain plan does not meet relevant criteria such as supporting sufficient UK content, projects can have CfD payments withdrawn subject to successful reapplication via a revised supply chain plan.

The Government wishes to use this process to drive UK content up to a level of 60% across a project's lifetime. **We are clear that such frameworks are important to build supply chain confidence and are helping ports and larger supply chain companies secure investment.**

However, UK content rules cannot and must not work in isolation, as the result will be poor-value offshore wind projects, delivered by a complacent supply chain unable to compete in the global offshore wind market.

7.1.7 Consultation feedback summary

In our consultation with Scottish companies, particularly at the SME level, there has been a clear frustration that contract opportunities are often not open to tender or generally made available.

Collaboration was a consistent theme of discussions with consultees. Almost half of those consulted noted that a national, strategic, and coordinated response between all stakeholders was the only way to develop the sector effectively. Consultees also noted that dedicated Government funding would be required. This suggests a coordinated conversation with all participants in the sector to best focus on where any public funding is required to unlock private investment and action.

The ongoing work of Scotland's enterprise agencies and other public funding supporting industry clusters were all seen as positives by consultees, but it was suggested these initiatives could be more focussed on strategic collaboration to help trigger strategic investment. We were given many examples of proactive developer and OEM attitudes of work to enable and support Scottish content, but also examples of local providers not able to bid for opportunities or get in front of companies at the top of the supply chain.

Several consultees highlighted the huge potential for offshore wind to be a focus of the energy transition, given the subsea and oil and gas expertise already existing in Scotland. The existing clusters and programmes such as Fit 4 Renewables that are publicly funded were praised by many consultees with a desire for these to be extended and for more funding to be provided to them to expand their reach and impact.

In terms of Tier 1 suppliers, consultees noted the need for Scottish businesses to work with and become invaluable to such suppliers to increase their own workload and order book – this includes being taken overseas with these more global suppliers and winning work elsewhere after delivering good work in Scotland. The more work that can be done to

increase communication between Tier 1 suppliers and the rest of the emerging supply chain, especially companies looking to transition, the better.

SOWEC has been looking at options for opening tender processes via PQQ platforms and a shared industry tender process.[xxxiv] We see a strong rationale for industry to support development of such platforms for pre-qualification and tendering, as well as look at options for standardising contractual terms. Such processes would be welcomed by suppliers in lower tiers of the supply chain.

These processes can help to promote earlier conversations with new potential suppliers so that they are in a better position ready to bid. In addition to this, use of advisory and support services such as the successful Offshore Wind Growth Partnership set of programmes, and wider actions to deepen partnership working in the supply chain can support Scottish companies prepare better for bidding for offshore wind work.

7.1.8 Role of the CfD in shaping procurement opportunities

At its heart, the CfD is an instrument that drives competition and project rigour. It is a stage gate in the development of a wind farm that comes very late in the day. Award of a CfD is essentially the starting gun in the race to deliver a project, starting first with reaching final investment decision, then moving to pre-construction, construction, energisation, and final delivery.

This frenetic period is the wrong time to ask a developer, OEM or Tier One contractor to engage new entrants. As a result there is a need for Government and supply chain to be realistic about what changing the terms of a CfD can achieve. Other support is required from industry and Government in advance of this point to maximise opportunities for local success.

Throughout the consultation the issue of the CfD structure was discussed. A number of those we talked to called for changes to the CfD so that it could better account for local content. Proposed changes took two forms, either changes to the auction process so that local value could be used as part of the competitive bidding process or changing terms such as time from CfD award to final investment decision so that there is more time for supply company engagement.

We do not see these options as workable. They seek to complicate the CfD process and could potentially introduce unintended consequences. The CfD is a well-regarded financial instrument but giving it multiple objectives could make it confusing to use and so valued by financiers. Changing CfD terms is also seen as unhelpful. For example pushing out the timescale for delivery puts back activity, and may only provide more opportunities for developer negotiation, not wider engagement.

Our recommendation is that if we are to open up supply chain opportunities, we need to find mechanisms to bring forward and deepen discussions with the supply chain.[13] We particularly want to seek ways to support tier one companies engage earlier.

[13] For a more detailed discussion and analysis of these issues see SOWEC's Innovation Group commissioned ORE Catapult report on this issue.

Support is needed so that the sector can overcome constraints in tendering and sector engagement caused by the working of the CfD. These constraints are best described by OWIC as follows:

> "The Contract for Difference (CfD) mechanism which most UK offshore wind farms currently select to secure the price of the electricity they produce, influences the way in which offshore wind developers typically engage with the supply chain in the procurement process... Certain elements of this process are time constrained and influence the way in which developers engage with the supply chain…
>
> "Given the significant scale of investment in a typical offshore wind farm…[and] complexity of these large-scale procurement processes, it is therefore common for these to have been initiated some time before the CfD auction itself. At this stage, discussions are particularly confidential given the competitive nature of the auction process. As a result, whilst all procurement processes are confidential, the external communication a project may be able to share in this period (pre-competitive auction) may be further limited and this can in turn influence the type of supply chain engagement conducted in this time… Whilst engagement might be recommended between Tier 1 contractors and sub suppliers, the developer is not always in a position to identify these Tier 1 suppliers at the point in time where it would be most beneficial for sub-suppliers to be engaging in this way."[xxxv]

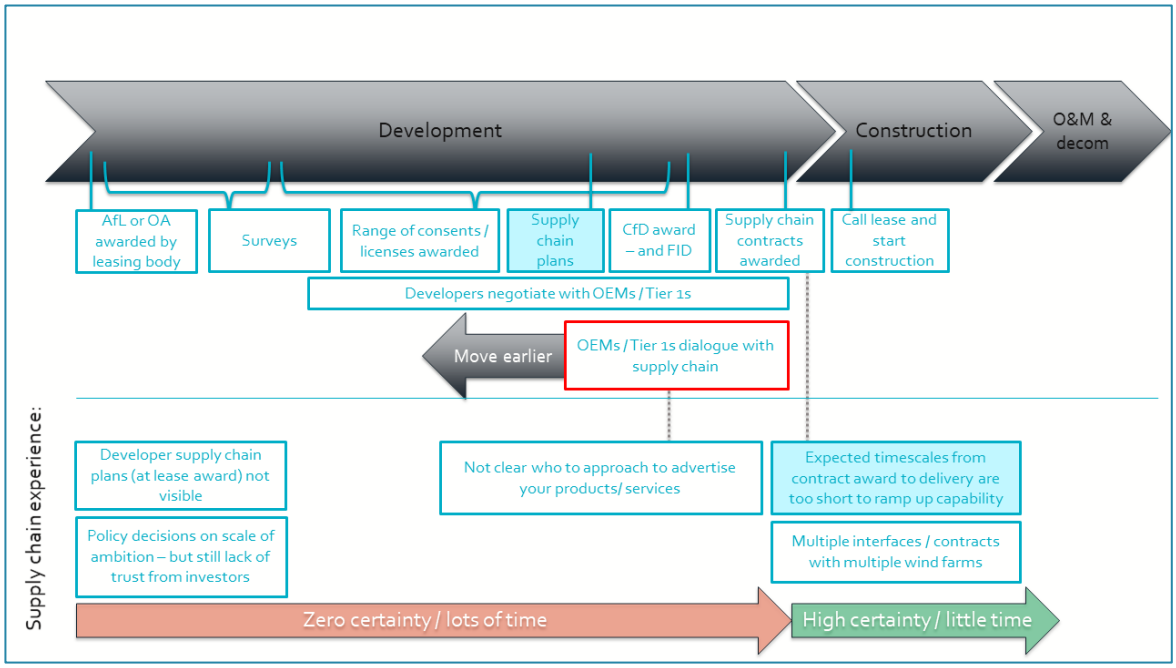
OWIC goes onto urge Tier 2 and 3 suppliers "to proactively engage with the Tier 1 supply chain regardless of known project contracts as it may not always be possible to widely advertise opportunities for sub contracts ahead of contracting."

The OWIC description above rightly highlights the importance of focusing efforts on opportunities and contracts which are the responsibility of Tier 1 suppliers rather than developers.

The need to bring forward engagement within the development timeline has been ably illustrated by ORE Catapult for SOWEC's Innovation Group[xxxvi], as shown in Figure 17: Current development timeline and need to move supply chain engagement 'to the left' below.

This report is clear that **the current status quo creates a significant hurdle for new suppliers into the market**. In our consultation developer members of SOWEC were clear that changes to the CfD could impact on project delivery. However, as the OWIC report highlights, developer members are also clear that current procurement practices are not working. This needs to change, and **SOWEC's industry members need to take responsibility for resolving this and taking forward delivery of this recommendation.**

Figure 17: Current development timeline and need to move supply chain engagement 'to the left'



Source: ORE Catapult (2021)

Developers do ask that Tier 1 contractors engage, but Scottish industry, support bodies like ORE Catapult and agencies can do more to offer programmes that help deepen the relationships and understanding between EPCI companies, other Tier one suppliers, and specialist Scottish providers.

Scotland (like the rest of the UK) has limited installer or EPCI expertise. This contrasts with oil and gas where there is significant contractor expertise with a world leading subsea sector clustered around it. With a recognition that we need to transition oil and gas activity to low carbon, effort is needed to support transition of this expertise and the associated supply chain.

Many of these Tier One suppliers are generally located outside of Scotland and the UK and have a well-established network of suppliers in continental Europe. The safe course for them will be to retain and utilise their pre-existing supply chain that they have built up over many years, so simply opening up tender processes may not be sufficient.

However, it was also pointed out by several consultees that a number of these companies are active in oil and gas and that much of the equivalent global contracting work is managed from NE Scotland, and our coming energy transition also means that it is vital we support these Scottish based teams to build their clean energy project expertise. If not this cluster of expertise will be lost over time.

A clearer focus and agreement between developers and tier one companies about how to engage and partner with Scottish subsea and other expertise is therefore needed.

Developers have a role in ensuring Tier One contractors open their contracting processes to expert Scottish suppliers. Developers can also support investment in Scotland by

encouraging Tier One suppliers and installers to utilise Scottish ports through forming delivery agreements with Scottish ports.

The work of OWGP and Subsea UK (and in particular its new Global Underwater Hub), programmes such as Fit4Offshore and enterprise agency programmes such as the Scottish Manufacturing Advisory Service can play an important role in help top tier companies find capable suppliers.

With the growth of floating offshore wind, there are opportunities to support growth of capability in floating offshore wind. Many of Scotland's existing engineering and subsea specialist SMEs have skills that will benefit the roll-out of floating offshore wind. This is also true of the Scottish based Tier One contractors active in oil and gas exploration and production activities across the globe. Helping this Scottish expertise transition into floating offshore wind needs to be a priority as part of a wider energy transition. We see that Government transition programmes such as the Scottish Government's Energy Transition Fund[xxxvii] and the UK Government's North Sea Transition Deal[xxxviii] can play a role supporting Scottish-based tier one contractors and wider Scottish subsea expertise play a leading role in the forthcoming scale up of floating offshore wind.

Finally, our consultation also showed a strong recognition of the role played by Clusters, an important part of the UK Offshore Wind Sector Deal, in supporting this work. But the Clusters in Scotland remain small, though they are already coordinating significant levels of activity thanks to the commitment of a small number of dedicated people. The Clusters need to be sufficiently funded by industry and staffed with senior personnel to be able to support activities in the ramp up to ScotWind delivery.

7.1.9 Supporting Actions

- Industry to ensure that Scottish Clusters to be funded sufficiently so that they can act as an effective route for engagement between Scottish companies and potential clients.
- Industry's Offshore Wind Growth Partnership and Scottish enterprise agencies to develop a support model specifically targeted at bringing Scottish suppliers into contact with tier one contractors. These contractors need support and encouragement to engage with and better understand relevant Scottish engineering and subsea capabilities.
- Scottish and UK Government to look at use of transition funding to support Tier One contractors with existing Scottish oil and gas offices to transition from oil and gas into offshore wind and other related low carbon sectors and to target inward investment funding that brings Tier One contractors into Scotland. Given the strong crossover in floating offshore wind and oil and gas expertise, there is a pipeline emerging through ScotWind that is too big an opportunity to overlook.

Recommendation Three: Celebrate and sell Scottish success

In our engagement with the Scottish supply chain, we regularly heard the view that Scottish industry had a perception problem. Suppliers talked about the reputation enjoyed abroad by specialist Scottish companies working in marine and oil and gas. But they also recounted discussions with offshore wind clients which began from a position of scepticism about the sector's ability to deliver.

If Scotland is to attract investment to build a successful Scottish Floating Offshore Wind Port Cluster, there is a need to talk up ambition and showcase expertise, ranging from innovative companies to the research and development capabilities of our academic sector.

With investment and high specification equipment, there is no reason that Scottish yards cannot be described and promoted as world class. Equally, experience in maritime and oil and gas sectors can support offshore wind growth both at home and abroad.

Scotland has excellent subsea, robotics, digital and high-value engineering companies who could help deliver a next generation of innovation into the installation and operation of wind farms around the globe. However, these companies also expressed considerable frustration that their expertise was often overlooked.

We therefore need to better tell the story and build up Scotland's reputation for high quality engineering and sub-sea expertise.

There is also a need to scale up our support for companies working abroad. The work of Scottish Development International was well regarded and repeatedly praised by consultees. We saw good examples of work by SDI to support Scottish companies understand and export into emerging floating wind markets in regions such as SE Asia.

However, while consultees noted SDI did good work supporting Scottish companies secure offshore wind work abroad, many see that the level of information activity and missions undertaken was still small in comparison to the work of other governments in other leading wind markets.

Scotland (and the UK) needs to learn from the success of other big energy markets such as Denmark and Norway. These countries use their export agencies or industry groups to offer early-stage market involvement in new offshore wind markets, helping their domestic supply chain win early-stage contracts. Given UK expertise in consultancy, engineering and development, there is a clear opportunity to scale up support offered particularly for floating offshore wind. If Scotland can support domestic expertise as well as inward investment, it can develop a clear international offer for floating offshore wind, replicating in part what has been achieved in offshore oil and gas.

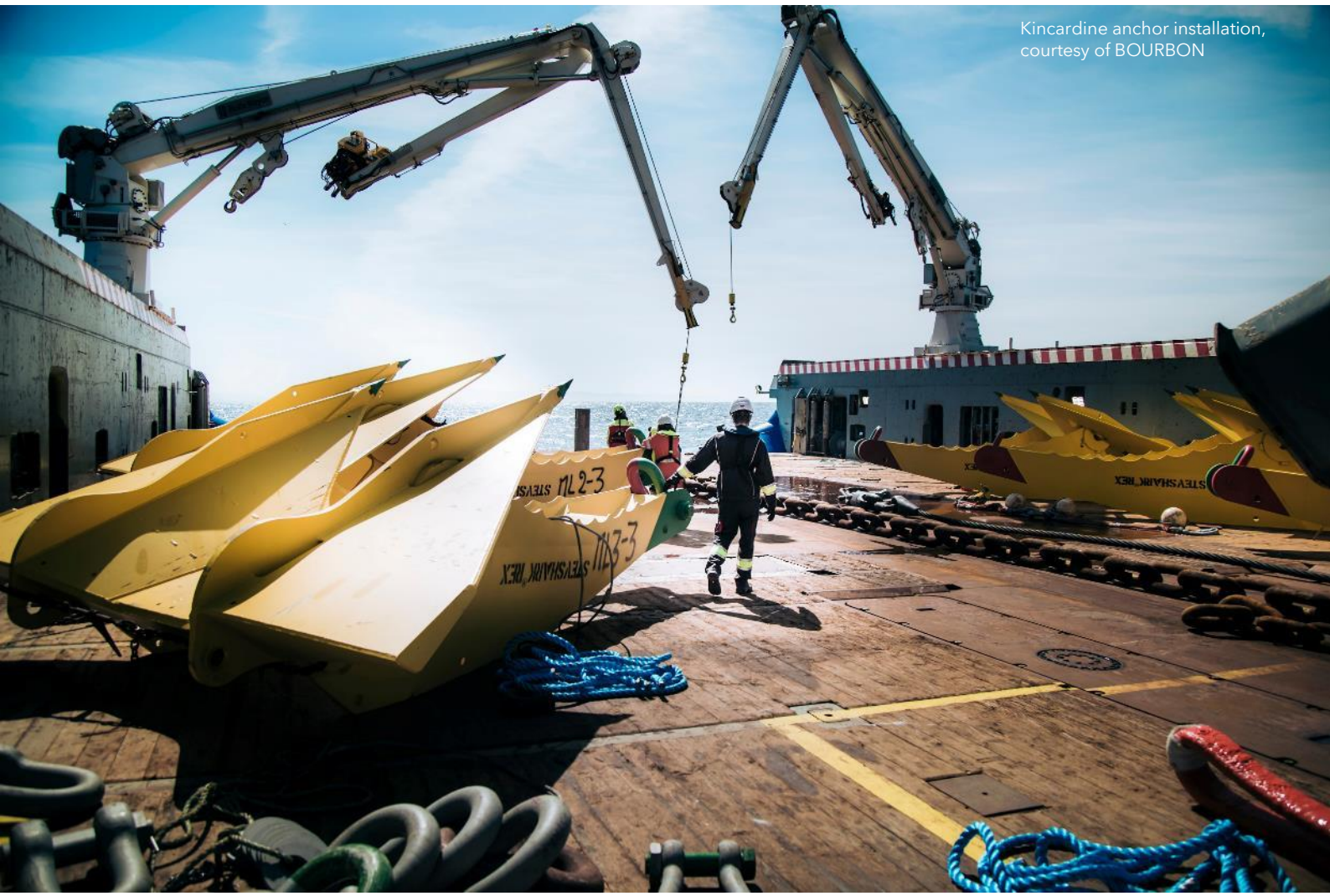
7.1.10 Consultation feedback summary

The consultation noted that exports would only occur in large numbers if Scottish business were able to initially compete in the UK and win contracts for Scottish developments. If successful at achieving the right price and quality domestically, the export market should be far more open. The support offered by organisations like SDI to help support businesses explore overseas markets was welcomed.

There was a specific call for the UK Government's Export Finance to be more accessible and for awareness to be raised about how it might be used for offshore wind companies in the supply chain and we note and welcome the recent partnership agreed between UKEF and ORE Catapult to promote UKEF work and service offer to the offshore wind supply chain.[xxxix]

7.1.11 Supporting Actions

- A step change in the level of activity supporting Scottish trade and engagement with new offshore wind markets is required. Scotland needs to respond to competition of other national trade agencies and groups in this space. Earlier engagement in new offshore wind markets, particularly for floating offshore wind, would help scale up export success.
- Global Scot is a well-regarded programme. Industry consultees asked for more focus on selling Scotland as a low carbon engineering powerhouse. A group of *Global Green Scots* – a wider low carbon energy diaspora – needs to be active across the globe selling this Scottish know-how, backed up by relevant Scottish Development International campaigns showcasing industry leadership in our energy transition.



Kincardine anchor installation, courtesy of BOURBON

Recommendation Four: Plan for future growth and the next generation of innovations

While offshore wind is a mature technology, the market is still evolving. Experience shows that mature markets need to continue innovating to stay competitive. Innovation will be needed to help as the world scales up delivery of offshore wind, and as we move to deeper and further from shore sites. Remote operations, data, robotics are all clear opportunities, but so too will be innovations in turbines, platforms, anchor systems and shipping, as well as manufacturing techniques and recycling.

However, the UK needs to think more clearly about how it supports innovation in offshore wind. The UK has a strong track record in supporting early phase innovation via our universities. It also has built respected institutions in its Catapults for applying innovation into commercial situations. But the UK struggles to support companies in mid-stages of technology readiness. This so-called valley of death remains a difficult part of any company's work bringing an innovation to market. Other countries have clearer support frameworks for supporting innovation at different stages of technology readiness.

In our sector engagement we have also seen strong support for initiatives already underway to support research and innovation in offshore wind, and in particular floating offshore wind. The work of bodies such as ORE Catapult, Carbon Trust (in particular it's Floating Offshore Wind Joint Industry Partnership which is co-funded by Scottish Government), the Net Zero Technology Centre (formally the Oil and Gas Technology Centre) as well as recent announcements such as creation of a centre of excellence at Aberdeen's Energy Transition Zone, all highlight the good work already underway to invest in efforts to support Scottish companies bring required innovations to market.

7.1.12 Consultation feedback summary

Consultees consistently said that Scotland should focus innovation effort on aspects that were innovative and of high value and that there should not only be a focus on large-scale fabrication. Several higher value, lower output manufacturers could have the potential to serve the Scottish market and become globally successful.

This also included a similar subset of respondents who saw floating wind as critical to the future of the market for Scotland with the idea that a focus on this more innovative technology would allow Scottish businesses to get ahead in a market which is still emerging.

7.1.13 Supporting Action

- In its forthcoming Innovation Strategy, the UK Government needs to prioritise innovation in offshore wind, as a specific low carbon technology, delivered across the technology readiness levels, from early-stage research in our universities through to its application by a broader range of companies. The UK has done more than any country to deliver a low-cost offshore wind sector. It can apply the same ambition to support innovation in offshore wind, particularly for floating innovation. However, the UK needs to have a clearer innovation framework that supports offshore wind innovation across different stages of technology readiness.

Recommendation Five: Plan for energy transition and a future of far-from-shore, mixed-use energy projects

Energy transition means that the distinction between offshore wind and oil and gas in Scotland will begin to blur, so we must also look ahead so that policy and regulation keeps up with the shape and needs of future projects.

Oil and gas and offshore wind have distinct regulatory and planning regimes. There has already been much good work from the OGA, Ofgem, BEIS and The Crown Estate to look at this issue,[xl] while the Net Zero Technology Centre and ORE Catapult are working jointly to support energy transition.[xli]

Energy transition has been described by the Just Transition Commission as a national mission for Scotland, and offshore wind will have a central role here. Consultees asked who would regulate projects that today may be oil and gas projects, but in the future might be green hydrogen, CCUS and/or floating offshore wind? Consultees also noted that in comparison to oil and gas where there is a single regulator, in offshore wind the regulatory environment has multiple actors playing different roles.

As offshore wind moves further from shore, it will be important that the regulatory framework is clear and transparent, and the Scottish and UK Government and the different regulatory bodies must avoid requiring energy developers and projects to have to work with different regulators on different project elements.

Devolution issues will need managing. The UK maintains responsibility for oil and gas licensing and regulation. For example, it is currently consulting on a new strategic environmental assessment process that will cover UK oil and gas and English/Welsh offshore wind sites. But the Scottish Government via Marine Scotland manages this process for offshore wind in Scotland.

Also relevant is how to develop different licensing requirements or leasing levels to support different types of offshore wind project. Within the ScotWind process developers can choose from three per MW lease fees (all have been recently raised after review). It remains to be seen if fear of competition means developers feel compelled to bid in at the highest level. In oil and gas leasing, different lease rates are set for more conventional vs pathfinder projects. In offshore wind projects might be in deeper waters or more hostile environments or need to utilise hydrogen production because of problems over transmission connection. Such issues will all incur greater costs. Leasing rounds, such as a future ScotWind 2 process need to look at how to better encapsulate and support these risks in pricing and lease arrangements.

7.1.14 Consultation feedback summary

Consultees experienced in oil and gas were clearly interested in energy transition and wanted to understand how the market would evolve. There was often comparison between the regulatory and commercial arrangements in offshore wind and oil and gas, with many seeing that offshore wind could learn from oil and gas experience. Many noted the presence of oil and gas majors in offshore wind and speculated how this might lead to adoption of oil and gas practices. Others wanted to understand the links to potential growth in hydrogen, CCUS and decommissioning.

7.1.15 Supporting Actions

- Scottish & UK Governments to ensure coordination re. the growth of further from shore offshore wind projects. Resolution on the appropriate regulatory model for such projects will be needed soon as the sector is already actively exploring hybrid models of development.
- It has not been the primary focus of this report, but it is recognised that action is required more widely across the renewable energy system to secure the opportunities available. These range from skills development to innovation support.

Siem Moxie (now Seaway Moxie) starts Hywind Scotland charter, courtesy of Siem Offshore Contractors / Seaway 7

8. Conclusions and next steps

Scotland has a proud maritime and industrial heritage, and in modern times has drawn prosperity from its oil and gas industry. Scotland has also looked to the emerging offshore wind industry as a route to prosperity, though growth has been slow in comparison to its original ambition.

Delay in growing Scottish offshore wind has frustrated Scotland's supply chain as well as other stakeholders who have noticed that rhetoric has not matched reality. However, with a defined set of Scottish offshore projects in or going into construction, as well as a new set of projects coming through the ScotWind leasing process, Scotland now has a reliable pipeline that it can use to build a world class Port Cluster for fabrication and manufacturing focused on floating offshore wind platforms, as well as providing world class engineering and marine expertise at home and abroad.

Realism is needed, however. Scotland will remain a small global market for offshore wind, even if offshore wind is vital for Scotland's successful energy transition. Success must come from focusing on what activities can best be done in Scotland and which Scotland can be world-class in delivering.

Our assessment is clear that there are opportunities within Scotland's grasp if an effective partnership is forged between the offshore wind industry, Scottish ports and Government. Each of these three partners must play a role, and we need to see collaborative frameworks emerge that mean we can rapidly move beyond the status quo.

This assessment is an independent report to SOWEC. SOWEC must now take responsibility for delivery of this report, its recommendations and actions. We see that the existence of SOWEC as a partnership between industry and government creates an opportunity for shared action, if trust can be built, and responsibilities shared. We are clear that the first steps here are needed by industry, but Government also needs to be clear as to the scale of work required.

Of course, SOWEC will have an opportunity to shape and develop this work, as some areas we have looked at themselves could necessitate further deliberation and discussion or study. But SOWEC needs to quickly commence work on the headline recommendation of using a collaborative framework to establish a Scottish Floating Offshore Wind Port Cluster.

To effectively deliver this report SOWEC will also need to look at its own resourcing, so that it has sufficient project management capability and support for delivery. This could come from members or Government agencies, but dedicated support will be needed to move these recommendations on at a necessary pace.

At the beginning of our report, we showed how Scottish ambitions from 2010 for offshore wind have not been realised. Today in 2021, we can build a different future, with an energy transition that is a just one, with offshore wind a leading part of this. All those we talked to in the consultation and preparation of this report are confident of this future, if industry and government demonstrate leadership, ambition and a clear-eyed understanding of the scale of challenge and reward ahead.

Annex A: About the SIA

Background

At the Offshore Supply Chain Summit in January 2020 SOWEC recommended to the summit attendees that an independently led strategic assessment of the offshore wind sector in Scotland be carried out with a focus on the supply chain and infrastructure.

The assessment has been led by Professor Sir Jim McDonald, Principal and Vice-Chancellor of the University of Strathclyde. Sir Jim is also President of the Royal Academy of Engineering; co-chair of the Scottish Government's Energy Advisory Board along with the First Minister and Chairman of the Independent Glasgow Economic Leadership Board. He is a Fellow of the Royal Academy of Engineering, the Royal Society of Edinburgh, the Institution of Engineering and Technology, the Institute of Physics and the Energy Institute.

Professor Sir Jim McDonald has been supported by an Executive Committee, Working Group and external secretariat.

Management and Coordination

Executive Committee

The members of the Executive Committee (EC) are as follows:

- Professor Sir Jim McDonald – Principal & Vice Chancellor, University of Strathclyde (Chair)
- Kersti Berge – Director of Energy & Climate Change, Scottish Government
- Jonathan Cole – MD, Iberdrola Renewables Offshore Wind Division
- John Evans – Chief Executive Officer, Subsea7
- Linda Hanna – Interim Chief Executive, Scottish Enterprise
- Roy MacGregor OBE – Chairman, Global Energy Group
- Gunther Newcombe, NewByrne Consulting
- Sarah Redwood – Director of Renewable Energy Deployment, BEIS
- Jim Smith – Managing Director, SSE Renewables
- Steve Wyatt – Research & Disruptive Innovation Director, ORE Catapult

Working Group

The Executive Committee has been supported by the following Working Group:

- Kirsty Adams – Senior Supply Chain Strategy Manager, Scottish Power Renewables
- John Casserly – Head of Procurement & Commercial Large Capital Projects, SSE
- David Curran, Deputy Director, Renewables, BEIS
- Adrian Gillespie – Chief Commercial Officer, University of Strathclyde
- Andy MacDonald – Director of Energy and Low Carbon Technologies, Scottish Enterprise
- Audrey MacIver, Director of Energy and Low Carbon, Highlands and Islands Enterprise
- Steph McNeill – Executive Vice President, Renewables, Subsea 7
- David Stevenson – Head of Energy Supply Chain, Scottish Government
- Julian Taylor – Executive Head of International Business, University of Strathclyde

The Executive Committee and Working Group have been supported by Work Group Lead Maf Smith of Lumen Energy & Environment, and a Secretariat from ITPEnergised led by Joss Blamire. Gavin Smart and Tom Quinn at ORE Catapult have provided economic analysis in support of the project.

Annex B: Scottish offshore wind projects[xlii]

Site	Developer	Capacity (MW)	Status
Robin Rigg	RWE Renewables	174	Operational
Hywind Scotland FOW	Equinor	30	Operational
Aberdeen Bay	Vattenfall	93	Operational
Levenmouth Demonstrator	ORE Catapult	7	Operational
Beatrice	SSE/Red Rock Power	588	Operational
Kincardine FOW Phase 1	KOWL	2	Operational
Kincardine FOW Phase 2	KOWL	48	Under Construction
Moray East	Ocean Winds	950	Partial Operation
Neart Na Gaoithe	EDF Renewables/ESB	448	Under Construction
Seagreen 1	Total/SSE Renewables	1075	Pre-Construction
Inch Cape	Red Rock Power	1080	Consented
Moray West	Ocean Winds	850	Consented
ForthWind	Cierco	12	Consented
Seagreen 1A	Total/SSE Renewables	360	S36 Submitted
Berwick Bank	SSE Renewables	2300	Development
Marr Bank	SSE Renewables	1850	Development
Salamander FOW	Simply Blue Energy/ Subsea 7	200	Development
Scotia Ventus	Univergy	500	Development
Pentland FOW	CIP	100	Scoping
Beatrice Demonstrator	SSE Renewables	10	Decommissioning Planned
Argyll Array	ScottishPower Renewables	1800	Cancelled
Islay	SSE Renewables	690	Cancelled
Dounreay FOW OWDC	DBD Systems	30	Cancelled
Dounreay Tri FOW Demo	Hexicon	10	Cancelled

Annex C: Ports study methodology

Gross value add (GVA) and full-time employment (FTE) was calculated based on three deployment scenarios – the lowest of these being the ORE Catapult base case, and two scenarios developed by Crown Estate Scotland with Arup.

There is little difference between the scenarios to 2030 (9 - 10.7 GW installed). In the period to 2050 Scottish offshore wind is forecast to grow to 31.5, 48 or 63GW. A lag was applied to this deployment to account for the time between fabrication, assembly and deployment in the Ironside Farrar study. We assume 55% of turbines are assembled in the year of installation, and 45% assembled the year before. A similar lag was applied to fabrication, with 60% manufactured a year in advance, and the remainder in the same year as installation.

Space requirements for assembly and fabrication were derived from different sources. For assembly, two assumptions were derived from recent work by Ironside Farrar that builds on the work of Arup for CES.

For our study work we have assumed space per GW dropping from 50-110 Ha/GW to 30-75 Ha/GW by the mid-2030s. This decrease in space required is due to turbine ratings increasing. We used the lower end of the range as a base assumption for assembly based on work conducted separately by ORE Catapult. For fabrication we have assumed 32 Ha/GW is required, again based on ORE Catapult analysis and work. This includes 16 Ha/GW for fabrication, and the same space required for storage of foundations. These space requirements were multiplied by the lagged deployment scenarios to estimate total space requirements.

To calculate GVA and FTE, ORE Catapult assumptions on the cost of assembly and fabrication in £/kW of capacity were used. Offshore wind components have been mapped against SIC codes, and GVA and FTE multipliers, as well as salary estimates used ONS data. By varying available space for fabrication/assembly, a range of capacities that could be supplied were calculated. This calculated the Scottish market share of Scottish projects. Direct GVA has been calculated assuming that 40% of spending is on capital and labour income. Direct & indirect GVA was calculated by using a Type I multiplier of 2.3. The labour/output ratio for foundations is assumed to be 14%. Scottish spending was multiplied by this ratio and divided by average labour costs to calculate FTE years.

Available space was calculated using a flat value across the forecast period (2020-2050). This over-estimates GVA and FTE slightly, as port improvements will take time to implement. The model does not allocate any value outside of the offshore wind sector. This means GVA and jobs may be understated. Finally, the model works on the assumption that available space will be used if there is capacity to be deployed. It does not make assumptions on the ability of Scottish ports to win this work. This means the GVA and job estimates are effectively a best-case scenario.

Annex D: Summary of consultation responses

Throughout the development of the report several critical barriers to the development of the supply chain in Scotland have been discussed and explored through the key stakeholder consultation process and reinforced by conversations with the Executive Committee and Working Group. The barriers identified have also been informed by existing reports highlighting some of the key challenges the offshore wind sector faces in Scotland and the UK.

The following barriers form the basis on which strategic recommendations have been developed. Although we recognise not all barriers will be addressed immediately by the key actions suggested in this report, this Annex ensures SOWEC and other stakeholders to have a broader view of issues raised to inform work and progress over the long term.

Strategic Investment

One of the critical factors impeding progress towards the development of a Scottish supply chain to support the offshore wind sector in Scotland, the UK and further afield is a lack of targeted, strategic investments in both infrastructure as well as wider supply chain businesses.

For ports infrastructure to support fabrication and other aspects of development and operations, there is recognition that this is partly addressed across the UK by the UK Government's investments announced in Humber and Teesside, as well as further potential funding through the UK Government's Port Infrastructure Fund. However, none of this funding is specifically targeted at Scottish ports where upgrades are required to realise the potential for activities such as marshalling and fabrication, particularly for new, innovative sectors such as floating wind.

Aside from the development of ports, there is also a need to strategically invest in the businesses that have the potential to develop and grow into world-class supply chain companies to help build the next generation of offshore wind projects in Scotland and potentially across the world. This could be in the form of investments to support the purchase of new equipment or vessels to be able to diversify from other manufacturing industries or from the oil and gas and maritime sectors. Finally, other businesses seeking to enter or develop in the offshore wind market also require a degree of support and investment to diversify their operations and workforce, even without the need for specific equipment or infrastructure.

Outside of commercial lending, there does not appear to be a clear route for businesses to seek support from the Scottish or UK Governments in the form of strategic investments or funding – whether for larger investments or support for diversification. There are various innovation and funding programs targeted at the low carbon sector, but nothing set up that is specific to the offshore wind industry and to SMEs looking to diversify or expand.

Skills and Training

Linked to investment in businesses is the need for the potential future demand to be met by a high-quality workforce in Scotland. Many SMEs highlighted that without further training and development, even if the investment in suitable infrastructure was in place, there would be a shortfall in skilled workers in offshore wind. This is also an immediate concern for suppliers who want to begin negotiating contracts in the nearer term for developments in future - they may not have enough certainty that the required workforce will be available in Scotland and lose out to external, established competitors.

The work of the Energy Skills Partnership was repeatedly referenced as an example of good practice, while consultees also highlighted the importance of supporting skills transition as part of wider energy transition.

There is potential to create jobs across different disciplines to service the development of sites as part of ScotWind and beyond and a huge opportunity for investment now in training programmes for young people and for those transferring from other sectors, particularly in oil and gas.

Strategic Engagement and Coordination

Another major barrier highlighted in the consultation process was a lack of coordination across the sector to plan for the development of Scotland's full offshore wind potential. This was noted for different aspects of the development of the sector including: the need for better coordination between developers to strategically invest in new facilities; the need for better communication between developers and suppliers regarding potential opportunities for work from developers and potential services on offer in Scotland from suppliers; and in general clear communication and agreement on the scale and direction of the sector in future to allow all businesses to plan and work together.

Targeted Regulation, Standards and Policy

Despite the identified potential of the supply chain in Scotland and the confidence in businesses to be able to deliver high-quality goods and services, the consultation process did reveal a sense that additional support would be required for Scottish companies in the form of regulations, standards and policies to kick-start the sector and allow them to compete with more established markets and exporters. Without efforts to encourage all avenues to increase local content, it will be easy for developers and Tier 1 suppliers to continue to use existing overseas suppliers without testing the services on offer in Scotland.

As things stand there is a clear steer regarding the desired level of 60% local content that can be expected in future offshore wind projects as noted in the UK Government's Offshore Wind Sector Deal. Despite this, there is no target in place for Scotland specifically and feedback has suggested that the mechanisms in place that can potentially intervene (such as the ScotWind leasing process or the CfD auctions) do not yet provide enough support to ensure that developers and Tier 1 suppliers fully explore using Scottish businesses in the supply chain.

As well as regulation to encourage local content, feedback also suggests that suppliers, particularly those diversifying and entering the market for the first time, would benefit from set standards, particularly in aspects such as manufacturing. Oil and gas businesses who are used to developing products to agreed global standards are in favour of this to allow for greater certainty and awareness about what it takes to enter the market.

Competition

Across the consultation process there was a clear signal from those interviewed how Scottish businesses could deliver high-quality goods and services to the sector. However, there was also a recognition that cost competitiveness was a critical issue. Part of this is due to the global nature of the sector and the need to compete against businesses in markets that are heavily subsidised and supported or those markets that have already begun to develop and supply the offshore wind sector. In other cases there is a sense that in some instances the high standards of pay and conditions expected in the sector in Scotland, were not found in some markets, leading to unfair competition, but also potential reputational

concerns for the sector if conditions were not upheld to high standards across the supply chain. Feedback suggested suppliers would want to ensure that all businesses come up to the standards expected in Scotland if they were to be part of the supply chain for Scottish projects.

Scottish businesses may struggle to catch up with businesses already operating in the sector or without intervention be at a disadvantage against others not operating on a level playing field. This leads to interlinked problems given Scottish businesses will continue to fail to pick up key contracts and in turn fail to be able to gain experience, improve and grow.

Development and Consenting Challenges

Alongside issues relating directly to the supply chain, there were critical barriers raised regarding the development process for offshore wind farms. Development challenges have the impact of slowing down the development process, leading to more uncertainty for a project. These barriers represent increased risks not only to developers but have a knock-on impact on suppliers too. Some of the main issues and barriers were found to be aspects such as delayed grid upgrades and connection times, constraints regarding aviation and radar and an uncertainty created by a lack of a formal timeline for the planning process in Scotland.

Annex E: Other issues we have considered

In coming to our recommendations, we have considered other options for intervening in the market. It is important to briefly identify and explain thinking here.

First, in our consultation many parties raised the working of the CfD. We have considered the working of the contract for difference (CfD) system and how it impacts and potentially holds back investment in Scotland. There are two relevant parts: how the auction process takes local content into account and the timing of CfD award in comparison to required supply chain discussion.

Consultees expressed a view that the CfD framework needs to change to factor in local content as well as price. Having discussed this we see this a risky option. The CfD works well to drive competition and value. Developers are successful when they manage risk in projects. Adding multiple criteria could work, but there could be side effects. However, we see the establishment of a more rigorous supply chain plan process by UK Government as important and sufficient means to reset what is seen as an acceptable baseline for UK content. This report aims to set out actions for industry and government to work together to achieve those aims.

We have built out our work from this point. Even with a new baseline, the Scottish supply chain will need support. Support is needed to bring relevant parts of the sector to a point where they can compete on a sustainable basis with other suppliers elsewhere in the UK but primarily in other parts of Europe. Industry and government will need to share responsibility for this investment in supply chain capacity and capability. For industry, this investment must be seen to come in lieu of an alternative course of action of adjusting the CfD.

We have also looked at the operation of the CfD. The CfD process means that contract certainty comes late in the day, and this acts as a barrier to new entrants seeking contracts with developers. Our conclusion is that this is an unfortunate but unavoidable element in an auction process linked to a complex capitally intensive infrastructure sector such as offshore wind. To overcome this we instead recommend that developers and contractors are given obligations to engage earlier and that industry support open tender and procurement processes. Also, we want to see coordinated advisory and financial support to help companies enter the market, backed up by industry led programmes to strengthen relationships and partnerships with Scottish based companies.

Next, we need to highlight areas where we are not making recommendations. We have focused attention on the capital phase of the project. While there are opportunities to grow Scottish content in the development, operational and decommissioning phases of offshore wind, the area where there is low Scottish content is manufacturing and installation. It was this area that our consultees also naturally wanted to focus. If we are to significantly grow the economic value of offshore wind to Scotland, this is the area to address.

We have also not made recommendations around skills issues. We have found very positive work on skills led by groups such as the Offshore Wind Industry Council and Scotland's Energy Skills Partnership. Funding via industry and government is in place and there are active programmes to look at skills needs in offshore. Our only note here is that across this report we have highlighted the importance of investing ahead in capacity and capability ready to meet demand. This applies to skills as well, meaning that funding for skills needs to predict and plan for expected growth.

Finally, we have not looked at issues of consenting and other barriers to growth such as grid capacity, connection timelines, transmission charging or OFTO arrangements, important as they are. SOWEC and OWIC both have active programmes looking at many of these issues alongside the UK and Scottish Governments and we have seen clear evidence that this partnership approach is working. This is most apparent in work to resolve aviation barriers which have been a longstanding concern.

This report highlights that the simplest and best way to deliver economic benefit into Scotland is to ensure projects are delivered. Project cancellations and consenting delays have held back projects, and that has held back economic investment. So we commend ongoing work on barriers to deployment and want to note that this important work continues and is supported across industry and government. Project delays would frustrate delivery of the wider recommendations set out in this report.

Annex F: References

[i] Scottish Government (2021) Priorities of Government statement given by the First Minister Nicola Sturgeon at the Scottish Parliament, Edinburgh on Wednesday 26 May 2021

[ii] Just Transition Commission (2021) A National Mission for a Fairer, Greener Scotland

[iii] https://www.offshorewindscotland.org.uk/sowec/

[iv] BEIS (2021) Contracts for Difference for Low Carbon Electricity Generation - Government response to consultation on changes to Supply Chain Plans and the CfD contract

[v] See https://www.crownestatescotland.com/what-we-do/marine/asset/offshore-wind/section/scotwind-leasing

[vi] BVG Associates (2021) Reports for SOWEC on: Contractual terms and conditions in offshore wind; Centralised PQQ portal for UK Offshore Wind; SOWEC supply chain and procurement (awaiting publication by SOWEC)

[vii] Scottish Government (2017) The future of energy in Scotland: Scottish Energy Strategy

[viii] Scottish Government (2020) Sectoral Marine Plan for Offshore Wind Energy

[ix] Crown Estate Scotland (2020) information on ScotWind, available at https://www.crownestatescotland.com/what-we-do/marine/asset/offshore-wind/section/scotwind-leasing

[x] Scottish Government (2020) Offshore Wind Policy Statement

[xi] National Grid ESO (2020) Future Energy Scenarios

[xii] Scottish Enterprise (2016) Oil and Gas 'Seize the Opportunity' Guides: Offshore Wind

[xiii] Offshore Wind Industry Group (2010) Scotland's Offshore Wind Route Map

[xiv] Scottish Enterprise and Highlands and Islands Enterprise (2010 National Renewable Infrastructure Plan, State 1 & Stage 2 reports

[xv] Global Wind Energy Council (2020) Offshore Wind Market Report

[xvi] BVG Associates (2021) UK and Scottish content baseline and roadmap: A roadmap for the Scottish Offshore Wind Energy Council (awaiting publication by SOWEC)

[xvii] Ocean Energy Action Coalition (2021) The Power of Our Oceans

[xviii] IRENA (2021) World Energy Transitions Outlook

[xix] IEA (2021) Net Zero by 2050 – a Roadmap for the Global Energy Sector

[xx] BVG Associates (2021) UK and Scottish content baseline and roadmap: A roadmap for the Scottish Offshore Wind Energy Council (awaiting publication by SOWEC)

[xxi] Crown Estate Scotland (2020) Ports for offshore wind: a review of the net-zero opportunity for ports in Scotland. Report by Arup

[xxii] ORE Catapult (2021) Initial Predictions for Offshore Wind Farms in the ScotWind Leasing Round

[xxiii] Ironside Farrar (2021) Port Enhancements for Offshore Wind: An Assessment of Current and Future Marshalling and Assembly Capacity in Scottish ports. Report available at https://www.evaluationsonline.org.uk/evaluations/Search.do?ui=basic&action=showPromoted&id=721

[xxiv] www.energyvoice.com/oilandgas/north-sea/decom/339226/ardersier-port-sold-to-new-owners-with-oil-decommissioning-ambitions/

[xxv] See https://www.energyvoice.com/renewables-energy-transition/128202/highland-jobs-boost-floating-wind-demonstrator-off-dounreay/

[xxvi] See https://gegroup.com/news/big-wins-for-scottish-supply-chain-as-global-energy-group-and-salamander-floating-wind-project-team-up

[xxvii] See https://www.kishornport.co.uk/dry-dock-extension/

[xxviii] See https://www.bw-ideol.com/en/port-cromarty-firth-agrees-partnership-global-leader-floating-offshore-wind-0

[xxix] See https://www.insider.co.uk/news/26-million-invested-develop-energy-24362086

[xxx] https://www.forthports.co.uk/latest-news/ambitious-renewable-energy-hub-plans-unveiled-for-the-port-of-leith/

[xxxi] Scottish National Party (2021) Scotland's Future, SNP Manifesto 2021

[xxxii] QMPF (2021) Port Investment Models for Offshore Wind: report to Scottish Enterprise. Report available at https://www.evaluationsonline.org.uk/evaluations/Search.do?ui=basic&action=showPromoted&id=720

[xxxiii] UK Government (2021) https://www.gov.uk/government/news/second-wind-for-the-humber-teeside-and-uk-energy-industry & https://www.gov.uk/government/news/wind-of-change-for-the-humber-region

[xxxiv] BVG Associates (2021) Reports for SOWEC on: Contractual terms and conditions in offshore wind; Centralised PQQ portal for UK Offshore Wind; SOWEC supply chain and procurement (awaiting publication by SOWEC)

[xxxv] OWIC (2020) Collaborating for Growth – Playbook. Strategies for expanding the UK offshore wind supply chain

[xxxvi] ORE Catapult (2021) Report to SOWEC – Innovation in Supply Chain Processes and Engagement

[xxxvii] Scottish Government (2020) £62 million fund for energy sector. https://www.gov.scot/news/gbp-62-million-fund-for-energy-sector/

[xxxviii] BEIS & OGUK (2021) North Sea Transition Deal

[xxxix] UK Government (2021) https://www.gov.uk/government/news/ukef-signs-flagship-green-partnership-to-boost-renewable-exports

[xl] OGA (2020) UKCS Energy Integration - Final Report

[xli] OREC & OGTC (2020) Reimaging a Net Zero North Sea: An Integrated Energy Vision for 2050

[xlii] Data from RenewableUK Project Intelligence, www.renewableuk.com, accessed 15/06/21