

The Clean Energy Cluster

Scotland



Commissioned by:





Offshore Wind

National Overview

Executive Summary

Introduction

- (including cables, turbines and foundations) Energy Transition Zone
- Scottish Universities & Colleges

Offshore Wind Clusters: Regional Growth Prospectus

Industrialised

Foundations &

Substructures

Clean Energy Cluster: Subsea and manufacturing expertise with rapid growth and investments in play

Subsea and oil & gas expertise underpin regional capabilities in installation, operations and maintenance, and smart environmental services. New cable manufacturing will further strengthen the cable services offer. Scotland could also secure turbine component production, while its fabrication base is well placed to grow to supply foundations and substructures.

The Clean Energy Cluster encompasses a wide range of nigh-value companies working in onshore wind, with significant plans for growth built on a large fixed and floating offshore wind pipeline. Initiatives such as the Strategic Investment Model (SIM) are seeking to accelerate investments in new port and supply chain infrastructure. NE Scotland and the Central Belt of Scotland are home to a range of manufacturing and service companies supplying into the wider energy sector. This existing supply chain highlights Scotland's importance to UK efforts to grow Smart Environmental Services, Next Generation Installation and O&M, as well as Industrialised Foundations & Substructures and Future Electrical Systems & Cables. Potential foreign direct investments could make Scotland important for UK efforts to secure value from Advanced Turbine Technology.

The Forth and Tay and Cromarty/Moray Firth areas are investing, ready to support the installation of ScotWind and INTOG projects while also hosting additional manufacturing sites. Significant port expansion plans are being taken forward, notably the development work at the Ardersier Energy Transition Facility (ETF). Scottish ports are actively engaging both offshore wind project developers and supply chain companies and are ready to grow subject to investment.

The Scottish Offshore Wind Ports Alliance (SOWPA) is supporting coordination and joint working, while the Scottish Government's Offshore Wind Focus (supporting its Green Industrial Strategy) has clear tier one and two port and supply chain priorities that align with industry's work in the Industrial Growth Plan.

Committed and potential manufacturing at Port of Nigg, Hunterston Terminal, Port of Leith, Montrose Port Authority and other ports mean Scotland will play a major role in supporting the Industrial Growth Plan's (IGP) commitment to treble UK manufacturing. Clear opportunities await to support the growth of floating offshore wind, with Scotland an important global hub for this technology.



The Clean Energy Cluster's unique proposition

Respond:

- The IGP can add value to SIM work to grow UK manufacturing capacity and market presence
- Scottish subsea expertise is critical to UK growth in Installation and O&M, as well as Smart Environmental Services.
- Scottish mooring & anchor expertise provides important foundations for floating offshore wind development.

Expand:

• New cable manufacturing facilities and potential turbine component investments, present clear opportunities for growth.

Disrupt:

• Growth of floating offers route to increased fabrication and construction presence for both steel and concrete components



THE CLEAN ENERGY - Company mapping

The UK's Industrial Growth Plan (IGP) has identified a series of opportunities, grouped under five priorities, for the UK to prioritise and grow value. The Regional Growth Prospectus assessment shows a strong mapping of current capabilities in the Clean Energy Cluster. While current capability is not the sole determinant of future capability, it is a clearly a strong foundation to build on. The UK can supplement this as needed through innovation, investment in start ups and foreign direct investment.

The map to the right shows the distribution of existing capability across Scotland, based on the Supply Chain Capability Assessment commissioned by OWIC and the OWGP complimented with additional data from the cluster. There are clusters of capability across the central belt of Scotland as well as Tayside, Aberdeenshire and the Moray/Cromarty Firth.

Particularly prominent is widespread capability in Next Generation Installation and O&M, particularly around Aberdeen, Montrose and Dundee but also around Glasgow, with capability in areas such as testing and inspection, drones and remote operating vehicles.

Scotland also has widespread capability related to Industrialised Foundations and Substructures, with multiple companies in the Highlands, Aberdeenshire as well as around Glasgow and the Firth of Forth. Also, there is notable capability in **Smart Environmental Systems** around Edinburgh and central Scotland.

This capability is supported by wider national strengths and capabilities in areas such as engineering design, civil contractors, maritime and subsea services and equipment.

IGP Priorities

- Advanced Turbine Technology
- Industrialised Foundations & Substructures
- Future Electrical Systems & Cables
- Smart Environmental Services
- Next Generation Installation and O&M
- Undefined under IGP priorities





^{RGY} – IGP aligned priorities

Investment £1.1bn-2.2bn Investment needed, shared between relevant clusters

Based on a national 'make or buy' analysis of critical components and services, the IGP highlights areas essential to domestic supply or where the UK has the potential to build global competitiveness.

While national in scope, the IGP emphasises the vital role of the UK's clusters in driving local supply chain growth and attracting targeted investment based on regional strengths.

This Regional Growth Prospectus helps to set out how the IGP can best build on these regional strengths. Developed with input from the Clean Energy Cluster, the table right shows the most relevant Investment Opportunities set out in the IGP for this region. Also set out is IGP data showing target dates for investment, the value of required UK level investment and expected UK GVA if this investment is made.

IGP priorities	Opportunity		Target date	Investment	National level GVA
Advanced Turbine Technology	Increase UK blades capacity by 50% from 2023	Respond	2027	£200-400m	£ 1.8-2.7bn
Industrialised Foundations & Substructures	Expand UK foundation manufacturing for designs catering to deep waters	Respond	2030	£70-100m	£ 1.2 – 2.0 bn
Industrialised Foundations & Substructures	Increase UK capacity of mooring and anchors by 50% from 2023	Respond	2030	£20-50m	£ 0.3 – 0.5 bn
Industrialised Foundations & Substructures	Develop UK manufacturing capability to produce 50 units of floating foundation per year	Respond	2030	£100-200m	£ 4.0-8.1 bn
Future Electrical Systems & Cables	Increase HVDC manufacturing capacity by securing two proposed facilities	Respond	2026	£200-400m	£1.5-2.9 bn
Smart Environmental Services	Build extensive marine datasets	Respond	2026	£5-10m	£ 80-120m
Next Generation Installation and O&M	Increase the UK's supplier base of EPCI companies	Respond	2027	£1-5m	£0.4-0.8 bn
Advanced Turbine Technology	Double UK blade capacity from 2026, and develop capability to produce >15 MW turbine blades	Expand	2030	£200-400m	£ 1.8-2.7bn
Advanced Turbine Technology	Introduce manufacturing capability to produce advanced composite material blades and towers for fixed and floating	Expand	2033	£170-280m	£ 1.1-2.1bn
Industrialised Foundations & Substructures	Develop UK manufacturing capability to produce advanced material for mooring and anchors	Expand	2035	£10-20m	-
Smart Environmental Services	Claim the top position globally in providing surveying services across global serviceable markets, with more than 30% of contracts awarded to UK suppliers	Expand	2030	£10-20m	£ 0.2-0.3bn
Next Generation Installation and O&M	Implement a new cable installation technique in the UK eliminating cable damage during installation	Expand	2028	£2-10m	-
Advanced Turbine Technology	Increase in UK blade manufacturing productivity by 20%	Disrupt	2032	£20-80m	£ 0.3-0.5bn
Advanced Turbine Technology	Develop automation process for high value component manufacturing	Disrupt	2032	£10-40m	-
Advanced Turbine Technology	Develop world leading solutions that reduce leading edge erosion by 60% in the UK	Disrupt	2032	£30-90m	-
Industrialised Foundations & Substructures	Develop UK manufacturing capability to produce advanced material for part of the floating substructure production to reduce the weight of the floating substructures by 20%	Disrupt	2035	£20-50m	£ 0.8-1.6m
Future Electrical Systems & Cables	Reduce the number of cable related failures/reliability issues of UK supplied cables by 80%	Disrupt	2030	£1-5m	-
Future Electrical Systems & Cables	Develop has mutually compatible and interoperable HVDC systems in the UK	Disrupt	2035	£10-30m	£ 0.1-0.2 bn
Future Electrical Systems & Cables	Develop new wet and dry cable designs and materials	Disrupt	2035	-	-
Smart Environmental Services	Integrate multiple Machine learning techniques optimising environmental surveys and minimising ecological impact in the UK	Disrupt	2030	£1-10m	-
Next Generation Installation and O&M	Integrate Machine Learning (ML) algorithms optimising operations and maintenance services	Disrupt	2030	£1-5m	-
Next Generation Installation and O&M	Commercialise next generation inspection, monitoring and installation services, implementing autonomous vehicles, robotic system and ML algorithms to process data from sensors	Disrupt	2035	£10-25m	-
Advanced Turbine Technology - materials	Grow UK supply into offshore wind blade production	N/A	-	-	-
Industrialised Foundations & Substructures - materials	Grow UK steel supply into offshore wind fabrication	N/A	-	-	-
Other Industrialised Foundations &	Grow UK concrete capability to supply into offshore wind	N/A	-	-	-



Industrialised Foundations & Substructures

Scotland has deep expertise gained in oil and gas that is now being applied to the challenges and opportunities presented by its floating offshore wind pipeline. The clearest opportunity for Scotland comes from its existing mooring and anchor capabilities, that will be needed across the UK. Wider industrial strategy is also focused on securing the manufacture and assembly of steel and concrete platforms.

Advanced Turbine Technology

The potential foreign direct investments (FDI) into Scotland by Vestas and Mingyang offer a route to building up turbine expertise in Scotland. As seen elsewhere in the UK, the opportunity is likely to come from using this OEM presence to build a wider materials and equipment supply chain supplying into these companies. The region also has wider innovation and advanced manufacturing capability to support the sector in efforts to introduce new materials and efforts to increase productivity.

Future Electricity Systems & Cables

The construction of the Sumitomo Electric export cable factory at the Port of Nigg highlights the strength of the region as an FDI destination. This success may be added to with successful delivery of the XLCC factory in Hunterston. Scotland will need to work to secure wider supply chain opportunities and build clustering effects around these facilities.

Next Generation Installation and O&M

The region has a significant supply chain providing installation and O&M services to wind farms in the region. The ports of Dundee, Cromarty Firth and Nigg are already important installation hubs for offshore wind in the North Sea (with Ardersier ETF also under construction), and the region can use this experience to secure greater value from offshore wind installation. Oil and gas expertise also maps well onto regional expertise in cable and subsea services.

Smart Environmental Services

The region's strong subsea capability maps well onto providing environmental services. Regional capability in underwater autonomous vehicles and digital skills will be important for a range of related IGP opportunities.

(R)espond, (E)xpand and (D)isrupt Programmes

Below are shown the IGP Investment Opportunities identified as most relevant to Scotland. Investment data and timelines are taken from the IGP to help focus regional and national conversations on investment priorities.

	2026 2028 203	0 2052	2034	2036
R	Increase blade capacity by 50% Expand foundation manufacturing Increase mooring and anchor capacity Develop one floating foundati Secure HVDC cable manufacturing cap Build extensive marine datasets Increase supplier base of EPCI co	ion assembly yarc acity mpanies	9	
E	Double blade capacity Manufacture c Increase mooring and Deploy autonomous surve Deploy new cable installation proc	omposite base to anchor capacity eys ess	wers and blades	5
	Increase in UK blade manufactu Develop automation proces Advance blade leading Produce advanced material Reduce failures/reliability issues cable	uring productivity is for high value c gedge protection I for part of the flor is by 80%	by 20%	ufacturing ure
D	Develop mutually compa Develo Develop ML techniques opti	utible and interope op new cables de mising environme	erable HVDC sys sign and materia ental surveys	als
	Integrate Machine Learning (ML) a Commercialise next generation i	algorithms in O&M	1 services oring & installati	on services



THE CLEAN ENERGY - Ports summary

Scotland's Clean Energy Cluster is a dynamic initiative aimed at bolstering the country's offshore wind supply chain. Several key regions play a crucial role in this cluster, serving as vital hubs for logistics, assembly, and maintenance of offshore wind projects:

- **Highlands and Islands:** This region offers vast potential for offshore wind projects due to its expansive coastal areas and deep-water ports.
- Aberdeen and Aberdeenshire: Known for their strong maritime infrastructure and expertise in energy, these areas are pivotal for offshore wind development and maintenance.
- **Fife:** With its strategic location and industrial capabilities, Fife provides crucial services for manufacturing and assembly of wind turbine components.
- Central Belt: As a hub for innovation and business development, this region supports the broader supply chain and ports are steadily preparing or repurposing infrastructure for offshore wind development.

Key ports, such as Nigg, Cromarty Firth, Aberdeen and Montrose provide essential infrastructure and services to support the growing renewable energy sector. Several ports are actively expanding or developing new infrastructure to meet the demands of the offshore wind industry. Private and public investment into ports such as Montrose, Kishorn, Nigg and Ardersier is helping to ensure ports are ready to support delivery of INTOG and ScotWind projects.

The Port of Cromarty Firth recently secured over £55mn in funding from the Floating Offshore Wind Manufacturing Investment Scheme (FLOWMIS) to support its Phase 5 expansion. The Port of Dundee is also enhancing its capabilities to serve as construction and maintenance bases, while the 180-hectare Ardersier Energy Transition Facility is undergoing significant redevelopment to support both fixed-bottom and floating offshore wind.

The Orkney Harbour Authority is developing the Scapa Deep Water Quay. Once constructed, this could feature a water depth of 15-20 metres, 20 hectares of space and a quay to support the assembly and deployment of floating wind components.

Elsewhere, Navantia UK's acquisition of Methil & Arnish, could significantly boost offshore wind manufacturing, while on the west coast at Hunterston PARC, XLCC intends to develop a manufacturing facility to produce HVDC subsea cables.

O&M activities are supported by several Scottish ports, including Wick, Buckie, Fraserburgh, Peterhead, Montrose and Eyemouth.





THE CLEAN ENERGY - Ports and O&M

O&M activities are supported by several Scottish ports, including Wick for Beatrice, Buckie for Moray West, Fraserburgh for Moray East, Peterhead for Hywind Scotland, Montrose for Seagreen and Eyemouth for Neart na Gaoithe. Aberdeen could become a major hub for O&M, with additional ports distributed around the Scottish coastline to support future projects.

With a significant pipeline of new development ahead, there will be a need for further port infrastructure at the above and other Scottish ports for O&M activities.

Larger ports may be able to act as bases for a range of activities, with space to support manufacturing, installation and/or O&M. In the following pages, there is a focus on those ports also able to potentially support installation and manufacturing activities identified within the IGP.

Across the UK, there is a general shift to larger projects further from shore, often in deeper waters. Projects further from shore cannot easily be serviced by Crew Transfer Vessels (CTVs) that take O&M staff out to wind farms from port each day. This will mean more use of Service Operations Vessels (SOVs) that stay out at a windfarm for longer periods before returning to a base port for resupply and crew changeover. While different projects may choose different ports depending on individual project needs, there are opportunities for clustering of activities such as SOV supply and support to improve operational efficiency. Such clustering of O&M activities can potentially also enable further supply chain clustering in support of multiple projects. This clustering has taken place in oil and gas, so as the number of projects in offshore wind grows, this may also take place in offshore wind.

Floating offshore wind O&M will have much in common with fixed, but there will be some differences. A critical one is the potential use of ports for providing periodic maintenance and larger component replacement. Instead of these activities being conducted in situ, turbines may be towed back to port for this work. It is expected that ports which undertake assembly and integration activities will be maintained in readiness to carry out such future maintenance work.

The IGP identifies UK expertise in O&M as a strength. UK projects and the supply chain are also leading offshore wind sector work to develop new and more efficient methods for O&M, such as remote monitoring and inspection. The UK also has capability in vessel design, operation and on-deck equipment.

IGP opportunities relating to O&M concern low carbon emission CTVs and SOVs; integration of machine learning into O&M services, and; commercialisation of next generation inspection, monitoring and installation services.



Eyemouth Harbour, courtesy of Corstorphine & Wright Architects, Photography by Chris Humphreys

Energi Coast Clean Ene



THE CLEAN ENERGY – Installation & manufacturing ports



Ardersier*	山口村山	•	Deepwater quayside Sheltered water Expansive quayside	• • •	Significant laydown space Suitable for turbine assembly Green Freeport
Arnish	1	•	Manufacturing facilities under development		
Cromarty Firth	▲ 济雪	•	Deepwater quayside Heavy lift capability Wet storage available	•	Offshore energy decomm facilities Green Freeport
Inverness		•	Sheltered water Expansive quayside Mooring and anchoring handling facilities	•	Heavy lift capability Green Freeport
Kishorn	山口村主	•	Deepwater quayside Dry dock facility Onsite Quarry	•	Manufacturing facilities available for repurposing Concrete batching plant
Lerwick*	重竹雪	•	Deepwater quayside Expansive quayside Significant laydown space	•	Offshore energy decomm facilities Ongoing expansion efforts
Lyness		•	Mooring, anchoring, and cable handling facilities under development	•	Former naval base Member of Orkney Future Ports
Nigg*	山市村业	•	Deepwater quayside Expansive quayside Significant laydown space	•	Suitable for turbine assembly Manufacturing facilities in development Green Freeport
Scapa Deep Water Qua	y* 12竹渔	•	Deepwater quayside Sheltered water Expansive quayside	•	Development underway for turbine assembly Part of Orkney Future Ports
Stornoway	竹	•	Deepwater quayside Expansive quayside Rig anchorage area	•	Heavy load assembly areas Extensive storage

* Under Development: Port upgrades underway, FID reached, or secured grant funding for expansion



THE CLEAN ENERGY – Installation & manufacturing ports



Aberdeen	è		:	Deepwater quayside Heavy lift capability	•	Significant warehouse facility Offshore wind logistics hub
Burntisland	$\mathbf{\hat{T}}$		•	Significant laydown space Heavy lift capability	•	Ship servicing facilities
Dundee	蒼 🎍		· ·	Expansive quayside Heavy lift capability Significant laydown space	•	Offshore energy decommissioning facilities
Hunterston*	🖢 🏚 🎍		•	Deepwater quayside Significant laydown space	•	Manufacturing facilities under development
Leith	44		· ·	Sheltered water Expansive quayside Dry dock facility	•	Offshore energy decommissioning facilities Rail access within port
Methil	竹虾	25	•	Sheltered water Land available for further development	•	Offshore energy decommissioning facilities
Montrose	12 🎍		:	Expansive quayside Mooring and anchoring handling facilities	•	Known O&M operational base
Rosyth	L.		•	Heavy lift capability Rail access within port	•	Quick access to North Sea

* Under Development: Port upgrades underway, FID reached, or secured grant funding for expansion

THE CLEAN ENERGY – IGP alignment (installation & manufacturing ports)

Port specifications and input from the Clean Energy Cluster have been used to evaluate each port's ability to support manufacturing activities, and services such as assembly and installation. These ports were selected and assessed based on track history and their installation and manufacturing characteristics, such as extensive quay lengths, large laydown areas, and high bearing capacities.

This evaluation adopts the "Expand" and "Respond" terminology set out in the 2024 Offshore Wind Industria Growth Plan, set against priority symbols to reflect the opportunity for the key ports located in this cluster.

In this context: "Expand" indicates a port has good infrastructure, with upgrades required to fully facilitate the underlying activities; and "Respond" defines a port to have strong infrastructure, with minor to minimal improvements needed.

Notes on this assessment:

- "Disrupt" has been omitted from the evaluation as there are many ports that, with sufficient investment, could support the IGP priorities over the coming decade.
- A port is classed as being able to support a particular priority if it could host a range of the varied activities within the priority (for example it could host towers or blades or drive train components, not just one type of facility).
- The IGP priority "Smart environmental services" has been omitted from this analysis as these services are less constrained by port infrastructure. For the IGP priority "Next Generation Installation, Operations and Maintenance" only installation activities have been considered, as it is assumed there is widespread capability across multiple ports to support 0&M.

1000		
g	Advanced Turbine Technology	Future Electrical
	 Turbine design and 	Systems and Cables
	engineering	 Array cables
	Tower	Export cables
	Blades	Dynamic inter-array cables
al	Drive train components	132kV
	Composite-based components	HVDC system interoperab

- Automation of manufacturing process
- Leading edge protection

- ility
- Standardised systems
- Automated welding Composites for light weight foundations

s at

Substructures

foundations

Synthetic mooring line materials

Industrialised Foundations &

Floating foundation design

Deeper water & floating

Moorings and anchors



Next Generation Installation

- Wind turbine installation
- Cables installation vessels operation

Ma

Activity	Actions	Aberdeen	Ardersier	Arnish	Burntisland	Cromarty Firth Dundee		Hunterston
anufacture	Expand							
	Respond							
Services	Expand							
	Respond							



THE CLEAN ENERGY – **IGP alignment** (installation & manufacturing ports)

Activity	Actions	Inverness	Kishorn	Leith	Lerwick	Lyness	Methil	Montrose	Nigg	Rosyth	Scapa Deep Water Quay	Stornoway
Manufacture	Expand											
	Respond											
Services	Expand						۲۰۰۶ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰					
	Respond											

