2024 Offshore Wind Industrial Growth Plan

Expanding the Horizon of the UK's Offshore Wind Supply Chain

Commissioned by:

RenewableUK

OffshoreWind IndustryCouncil

THE CROWN ESTATE

Crown Estate Scotland
Oighreachd a' Chrùin Alba

Vessel Blade Runner Two transporting Vestas Blades

Foreword

Offshore wind has been one of the great UK success stories of this century so far. From a standing start at the turn of the century, offshore wind could provide over half of UK power by 2030. We are home to the world's five largest offshore wind farms and we have the second biggest pipeline of projects globally. Each gigawatt of new offshore wind adds £2-3bn of value to the UK economy and the sector supports over 30,000 jobs.

Facilities like Siemens Energy in Hull and Manchester and Vestas on the Isle of Wight exemplify global excellence in blade and HVDC technologies, whilst developments by JDR Cables in Blyth, Sumitomo in Nigg and SeAH Wind in Teesside showcase the continuing growth of our domestic capability and prove that our sector can deliver world-class manufacturing in the UK.

The world has woken up to the success we have pioneered here in the UK, and the global pipeline of offshore wind projects has more than doubled since 2022. Supply chains need to rapidly expand to meet this new demand and crunches are already starting to emerge in some key components. Securing the necessary supply chain will be critical to the nation's pathway to net zero.

The Industrial Growth Plan sets out an ambitious vision for the UK in this new era of global offshore wind. It is a vision that is rooted in the strengths of our industry and wider economy – one geared toward the future of offshore wind technology and innovation that drives growth and sustainability.

Last year's Supply Chain Capability Assessment set out the size of the offshore wind opportunity in the UK. The Growth Plan takes this a step further by defining the priorities, objectives and actions needed to capture a bigger share of that opportunity. This is anchored in a 'make or buy' assessment of all the key components and services in the offshore wind value chain. The IGP targets £25bn of GVA through a focus on technology areas vital to domestic supply, or in which we have the capabilities to build UK competitive advantage and leadership in innovation.

This focus on technology is pivotal if we're to translate our ambitions into results for the wider economy. Investing in technology development and a skilled workforce is fundamental to making our economy more productive and boosting prosperity for the long-term. Growth is the destination and technology is the vehicle. The net zero transition is, fundamentally, a technology story and the scale of investment makes it the great growth opportunity of the 21st century.

The technology development seen in the last decade in offshore wind has transformed the economics of energy and the net zero transition. From an expensive, immature technology, offshore wind is now at the heart of the global energy future and one of the lowest cost sources of power. This was largely driven by a transformation in technology as the sector engineered, scaled up and industrialised new solutions.

Globally, 120 nations have committed up to trebling renewables capacity by the end of the decade. As global competition for renewable energy supply chains intensifies, countries with a long-term, strategic approach will be the most successful in attracting investment in new industry.

The UK's record of delivery, mature market design and size of pipeline are major strengths on which we can build. Our success to date in leveraging private and public investment to develop offshore wind is reinforced in the Growth Plan. Funding commitments from public and private sources, alongside policy changes coming down the track and targeted infrastructure support, aim to shift the dial on investment in new industrial capacity and capabilities.

The UK regularly outcompetes others in high-value sectors such as aerospace, pharmaceuticals, automotive and defence and the Industrial Growth Plan aims to add offshore wind to that list. This will require closer partnership between industry, Governments and key stakeholders – and a new IGP Delivery Body aims to enable this. Some of the recommendations in the IGP are challenging, and not all will be ones that Governments can commit to, but the strategic vision and partnership that the IGP sets out is the right ambition for the UK to achieve net zero, grow our economy and increase energy security.

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Executive Summary

Hornsea 1 Offshore Wind Farm

Our Plan for Industrial Growth

The aim of the **Industrial Growth Plan** (IGP) is to:

- Grow supply chain capacity to accelerate and de-risk delivery
- Grow market share at home and abroad through a focus on key technologies

The Growth Plan fits into a **wider approach to support investment**:

- Targeted public & private funding
- Leveraging our world-leading pipeline
- Sustainable CfD pricing and allocation

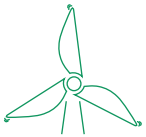
The IGP sets **priorities, objectives, actions and investment needs** across:

- Key technologies to grow value and/or supply security
- Future technology trends and disruption opportunities
- The bringing forward of innovation and facilities for late-stage testing

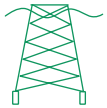
Delivering the Growth Plan requires **partnership and collaboration**. A new Delivery Body will provide:

- The vehicle to coordinate execution of the plan
- Strategic alignment across industry, Governments and other key stakeholders

The UK should be a global technology leader in



Advanced Turbine Technology



Industrialised Foundations & Substructures

Future Electrical Systems & Cables

Smart Environmental Services

Next Generation Installation and O&M

Benefiting the UK economy by

Up to £25bn
Additional GVA over the 10 years post investment

Up to 10,000
Cumulative additional jobs in the sector annually following all investment

Tripling
Manufacturing capacity

Doubling
Research and development investment and output

Enabled by

An Industrial Growth Fund

A collaborative, joint industry fund to support IGP Delivery and investment over a 5-year period

A National Innovation Hub

New late-stage testing at an Offshore Wind Innovation Development & Demonstration (**WInDD**) Hub

New Advanced Turbine Technology Institute

As part of the WInDD Hub, an Advanced Turbine Technology Institute (ATTI) to **advance turbine technology**

Supported by

A New Delivery Body

Expanding the partnership between Governments, Industry, investors, technology developers and wider stakeholders to...

1. **Own the Growth Plan –** invest, monitor and report progress and refresh plan at regular intervals
2. **Align strategic funding** across key funding bodies & stakeholders
3. **Champion the UK** as a leading destination for investment

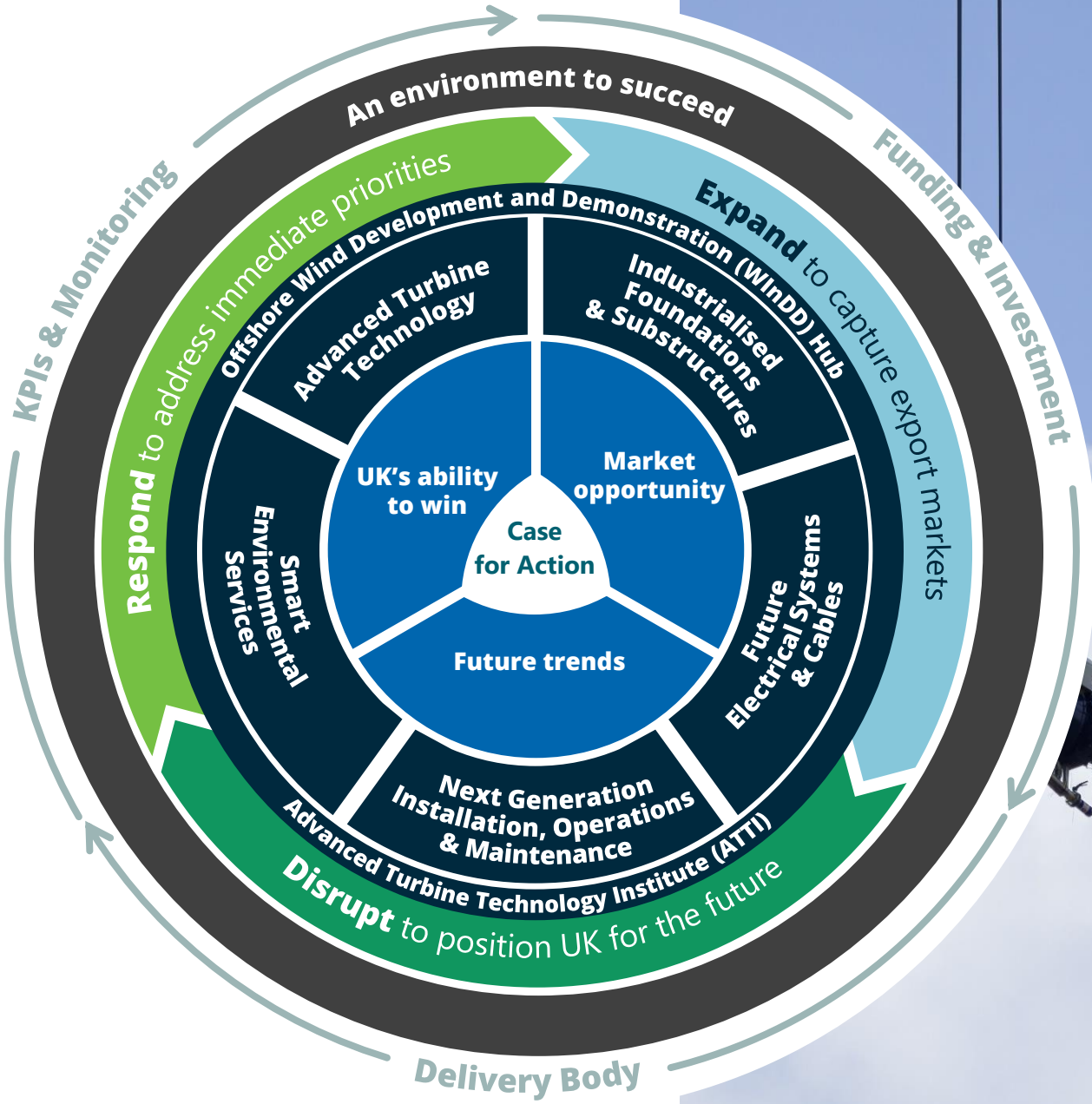
The Plan

For the UK to realise the economic and social potential of offshore wind, targeted investment is required to address constraints in supply, and develop UK capability and capacity. This will enable the UK to take a major piece of the combined £1,300bn serviceable domestic and export market through to 2035.

Key elements of the Plan are:

- **A make or buy prioritisation assessment** considering inputs from a previous study, Supply Chain Capability Assessment [1]
- **The priorities for the UK** based on the outcomes of the make or buy assessment
- **Actions & objectives** for the priorities based on need to:
  - **Respond** to current supply chain constraints and maintain the UK's current market position
  - **Expand** on the UK's capability and capacity to capture international market share and grow the UK's exports; and
  - **Disrupt** the status quo and address current market challenges to put the UK at the centre of offshore wind advancement

Execution of the plan requires collective work across the sector and will be enabled by addressing prerequisites to create an **environment to succeed**, a **Delivery Body** to co-ordinate and promote UK supply chain **funding & investment** and **key performance indicators** (KPI's) to monitor progress.



Establishing the Case for Action

The offshore wind sector has been a major economic success for the UK in the past decade.

For each gigawatt of offshore wind installed, the sector contributes about £2-3bn of gross value add to the UK[1]. Investments to date have created an industry supporting over 30,000 jobs across the UK[2].

The UK exports £1-2bn a year and is winning contracts in c. 50% of package areas, by value[3].

The global competition for investment in clean energy manufacturing has intensified alongside huge growth in the global pipeline of offshore wind projects. The Growth Plan sets out the case for action to secure critical domestic supply, grow market share at home and abroad, and position the UK to lead key technology trends.

Building on the UK's current success, we must position the sector to respond to future technology trends and global scale-up to secure the full economic, energy security and manufacturing benefits that offshore wind can offer.

The global competition for offshore wind is a growth opportunity for the UK...

3x
Growth in offshore wind capacity by 2035

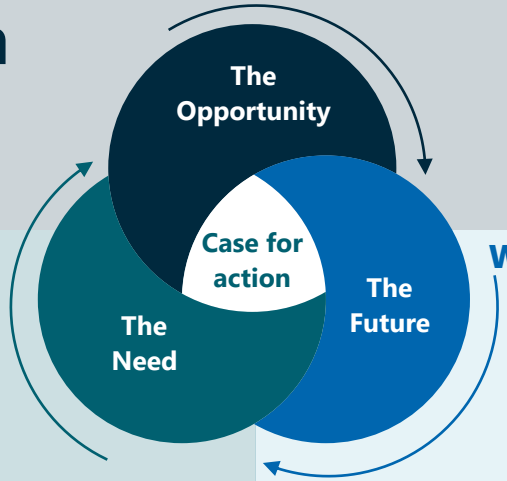
7%
UK's share of offshore wind pipeline to 2035

£270bn
Serviceable domestic market to 2035

5%
Compound annual growth rate for offshore wind expenditure

£8,000bn
Estimated spend on global offshore wind projects to 2050

£1,000bn
Serviceable export market to 2035



Scaling up for net zero...

300
Wind turbine generators required annually (on average) to meet UK demand to 2030 [4]

14x
Increased need for cables in Europe alone to 2030[9]

4x
Increase in UK workforce across 2023-2035[2]

We can lead tech innovation...

100GW
Installed capacity of global deep water and floating projects by 2035

11%
Opportunity for LCOE reduction through O&M improvements[5]

45%
Reduction in global warming impact of materials used through innovation[6]

Building for Success – How the UK currently ranks in offshore wind and innovation

2ND
UK's forward pipeline for offshore wind development

22%
UK's share of the global offshore wind market by operational capacity[4]

4TH
UK's global position in innovation[7]

7%
UK's share of offshore wind research[a,8]

Note: [a] Analysis based on the number of publications for 2023

Identifying the UK's Make or Buy Priorities

The make or buy assessment identified strengths and opportunities for the UK. The outcomes represent a view of today and where the UK is heading, however ongoing monitoring is required to ensure it remains reflective of how the UK's supply chain capability and competitiveness changes over time.

It is a forward-looking prioritisation, rather than a survey of current activity in the sector. There are, of course, activities not ranked within the 'Make' priorities which bring significant value and strength to our supply chain but may not have scored as highly as others in one or more evaluation criteria.

Make: Materials and services where the UK has a high ability to win, is a long-term market opportunity and should look to make

Nurture to Make: High market opportunities but low current ability to win, creating an area that needs nurturing if the UK is to build capability

Buy: Area of low domestic capability and low market value, limited lost value if bought

Protect: Low market opportunity but high ability to win, an area to protect as an enabler to other parts of the supply chain

Make – The UK's Priorities

Advanced Turbine Technology
- Blades
- Towers

Industrialised Foundations & Substructures
- Deeper water foundations
- Moorings and anchors

Future Electrical Systems & Cables
- Static and dynamic array cable
- Offshore export cable
- Offshore substation foundation

Smart Environmental Services
- Environmental surveys

Next Generation Installation, Operations & Maintenance
- Wind turbine installation vessels
- Landfall HDD and cable pull
- Operations
- Asset management services
- Schedule maintenance and repairs
- O&M vessel

Additional strength not identified for intervention
- Commercial and insurance

Nurture to Make

- Turbine drive train
- Steel semi-submersible
- Concrete semi-submersible & gravity foundation
- Onshore export cable
- Electrical system design
- Floating turbine installation
- Floating assembly
- Cables installation vessels
- Decommissioning services

Buy

- Nacelle assembly
- Turbine yaw and electrical system
- HVDC offshore substation topside
- Development services
- Jacket installation
- Foundation installation vessels
- Array and offshore export cables installation
- Onshore export cables installation
- Offshore substation (OSS) installation

Protect

- Monopile foundation manufacturing
- Monopile transition piece manufacturing
- Wind turbine installation equipment and transportation frames
- Monopile installation

Advanced Turbine Technology

UK £46bn
2024-35 serviceable market

Global £139bn
2024-35 serviceable market

Investment £630-1,290m
Estimated investment need

Benefit £4.9-8.0bn
Estimated 10-year GVA

The UK currently has significant turbine blade production capacity, with an aspiration to triple current capacity. In towers, we currently lack domestic production capability.

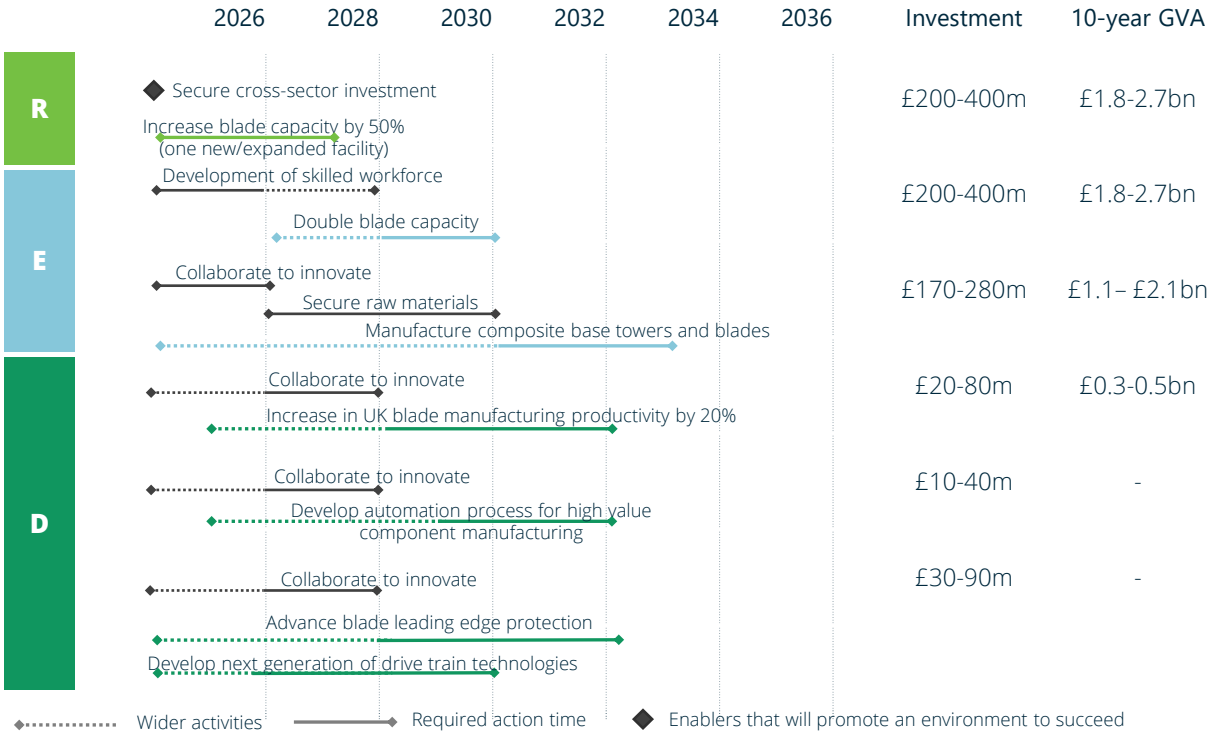
Case for action

	Case for action	
Cost efficiency	UK has cost-base challenges compared to some competitor markets, particularly for lower value components.	Medium
Capability	Existing production facilities from two of Europe's leading blades OEMs. No current UK tower manufacture capacity. Research developed in the UK around composite towers and blades supported by world leading expertise in composite materials.	High
Market size	Estimated average demand of more than 900 blades and 300 towers between 2024 and 2030, based on the projected UK capacity additions. Additionally, strong European demand but may face competition from local suppliers if UK doesn't secure capacity.	High
Wider benefits	Towers and blade manufacturing have significant potential of stimulate economic growth and job creation. Potential for cross-sector synergies with aerospace sector.	High

Case for action: Low | Medium | High

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

Investment in the UK supply chain with a focus on energy capture, conversion and materials innovation for the next generation of turbines.



Environment to succeed enablers

- Develop the port infrastructure
- Facilitate timely grid connections
- Secure cross-sector investment
- Collaborate to innovate

Industrialised Foundations & Substructures

UK £47bn
2024-35 serviceable market

Global £209bn
2024-35 serviceable market

Investment £220-420m
Estimated investment need

Benefit £6.3-12.1bn
Estimated 10-year GVA

Offshore wind foundations and substructures can be monopiles, jackets, gravity-based or floating foundations with substructures anchored by mooring lines or chains.

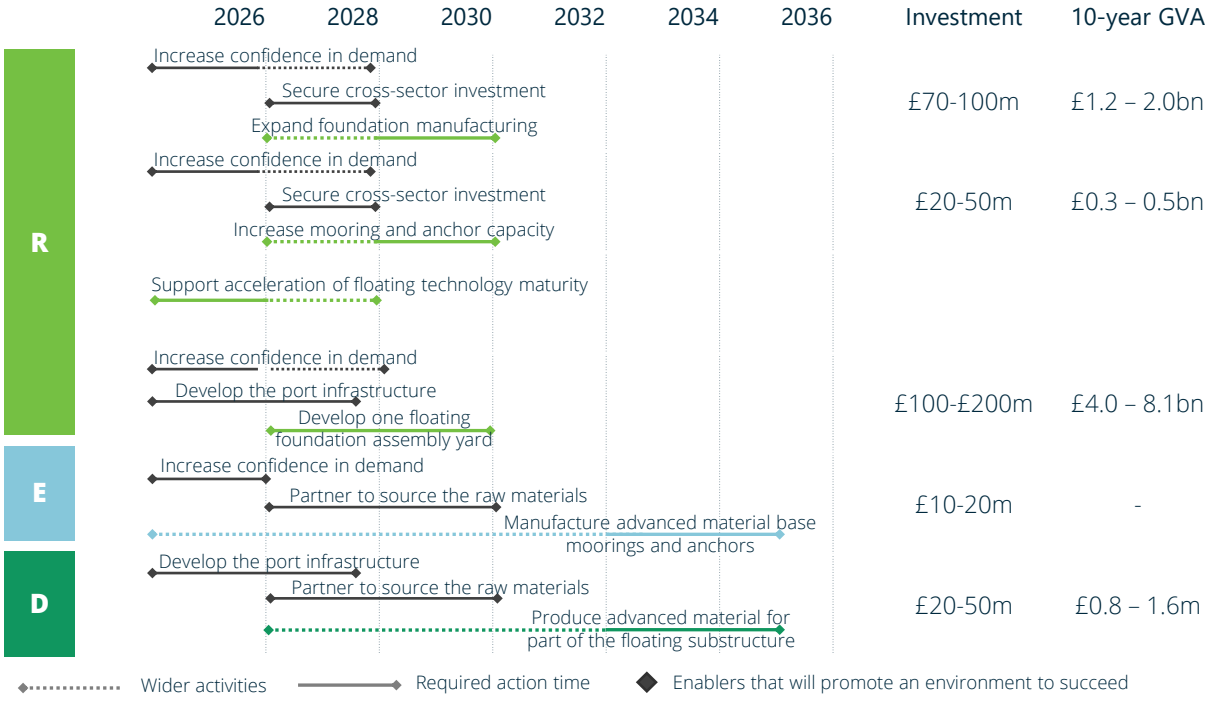
Case for action

Cost efficiency	UK has cost-base challenges compared to some competitor markets.
Capability	Existing production facilities for jackets and transition pieces alongside a good capability in moorings and anchors which is being transferred from UK's well established oil and gas industry. Additionally, potential of some UK-based fabrication yards to diversify into deepwater foundations. Innovation projects in the UK for all components, especially related to corrosion protection material.
Market size	Increase in demand for deeper water foundations for turbines and substations by 2035. Global supply-demand bottlenecks are forecast as early as 2026 for fixed bottom foundations and 2029 for floating.
Wider benefits	Components of foundations and substructures have a significant potential of jobs and GVA creation, especially primary steel for foundations and transition pieces.

Case for action — Low — Medium — High

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

Investment in manufacturing and standardisation of foundations, particularly for floating projects and deeper water fixed bottom water, would help the UK capitalise its first mover advantage in the floating offshore wind space, becoming a market leader in supply.



Environment to succeed enablers

- Develop the port infrastructure
- Partner to source the raw materials
- Secure cross-sector investment
- Increase confidence in demand

Future Electrical Systems & Cables

UK £19bn
2024-35 serviceable market

Global £77bn
2024-35 serviceable market

Investment £240-480m
Estimated investment need

Benefit £1.7-3.4bn
Estimated 10-year GVA

Electrical system and cables includes array, offshore and onshore export cables, electrical system & SCADA design and offshore and onshore substations.

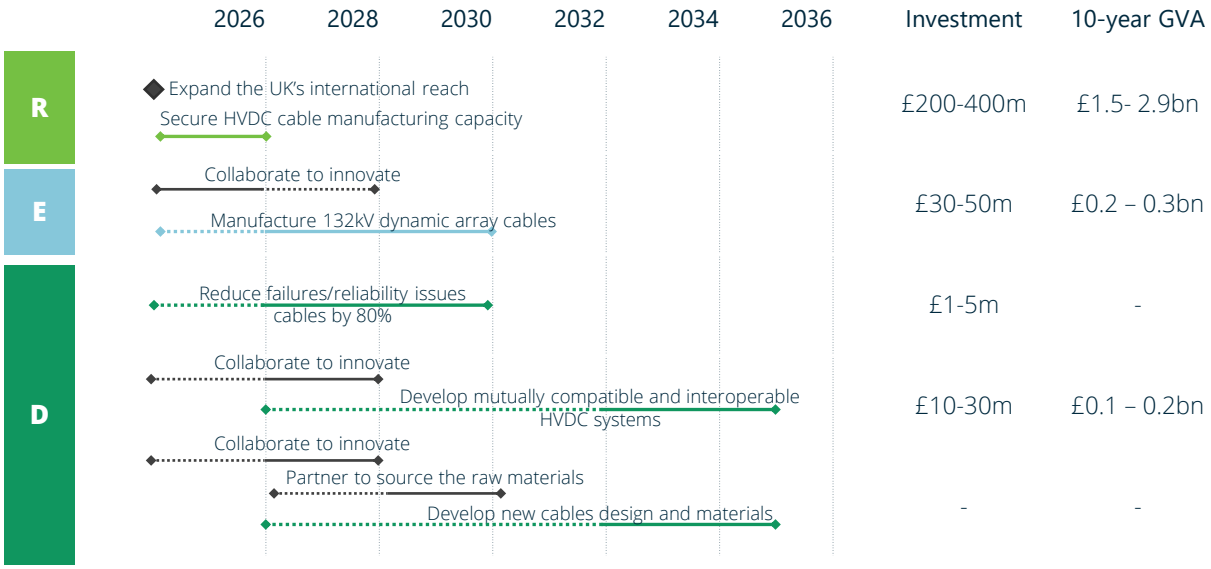
Case for action

	Case for action
Cost efficiency	UK is a successful exporter of cables with UK-based companies winning offshore wind contracts in countries across Europe, APAC and North America.
Capability	The UK has multiple major suppliers with expertise in both HVAC and HVDC systems, with two new HVDC cables factories announced in 2023. Additionally, it has a strong academia and research in electrical engineering leading to a significant number of patents and R&D projects being developed in the UK.
Market size	Significant demand from UK wind farms (1700km per year) and expected investment in UK grid infrastructure. Supply constraints expected to impact Europe and global supply in the next two-three years for array and offshore export cables.
Wider benefits	Array and offshore export cables manufacturing have potential for job creation and economic growth.

Case for action — Low — Medium — High

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

Investment in manufacturing of HVDC cables and electrical system leveraging UK comparative advantage to advance electrical design and cater to a bigger share of the global market.



Environment to succeed enablers

Partner to source the raw materials	Expand the UK's reach	Invest & assess technology priorities	Collaborate to innovate

Smart Environmental Services

UK £0.5bn
2024-35 serviceable market

Global £0.5bn
2024-35 serviceable market

Investment £20-40m
Estimated investment need

Benefit £0.2-0.5bn
Estimated 10-year GVA

Environmental services during early development including surveys, land clearance activities, buoys and vessels.

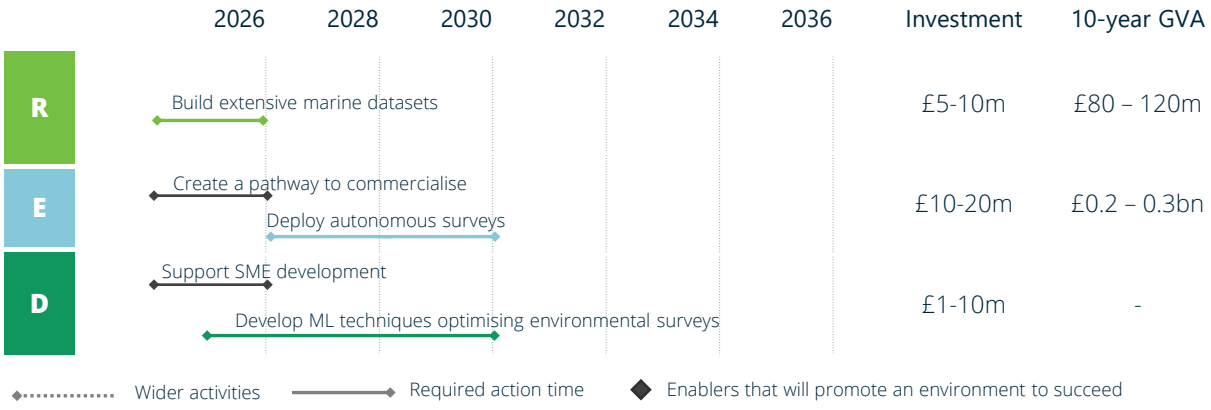
Case for action

Cost efficiency	Long track record in exporting services across more than 28 projects summing to c.22GW capacity in the last 8 years.
Capability	The UK is home to many companies at the forefront of survey technology, including remote sensing, autonomous surveys and data analysis tools, providing more accurate and efficient surveys.
Market size	Less significant expenditure but UK projects tend to buy domestically and there is a large pipeline to 2035.
Wider benefits	Environmental surveys and vessels have some potential for GVA creation. Solutions developed in the UK to address environmental challenges can unlock significant additional deployment domestically and in international markets.

Case for action — Low — Medium — High

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

Investment in new technologies for environmental surveys would help the UK to capitalise its already strong global position in these services, becoming a market leader in supply.



Environment to succeed enablers

- Facilitate timely grid connections
- Expand the UK's reach
- Support SME development
- Create a pathway to commercialise

Next Generation Installation, Operations & Maintenance

UK £71bn
2024-35 serviceable market

Global £211bn
2024-35 serviceable market

Investment £120-260m
Estimated investment need

Benefit £1.0-2.0bn
Estimated 10-year GVA

Installation, operations and maintenance services including the vessels related to initial construction and ongoing maintenance of all components of a wind farm.

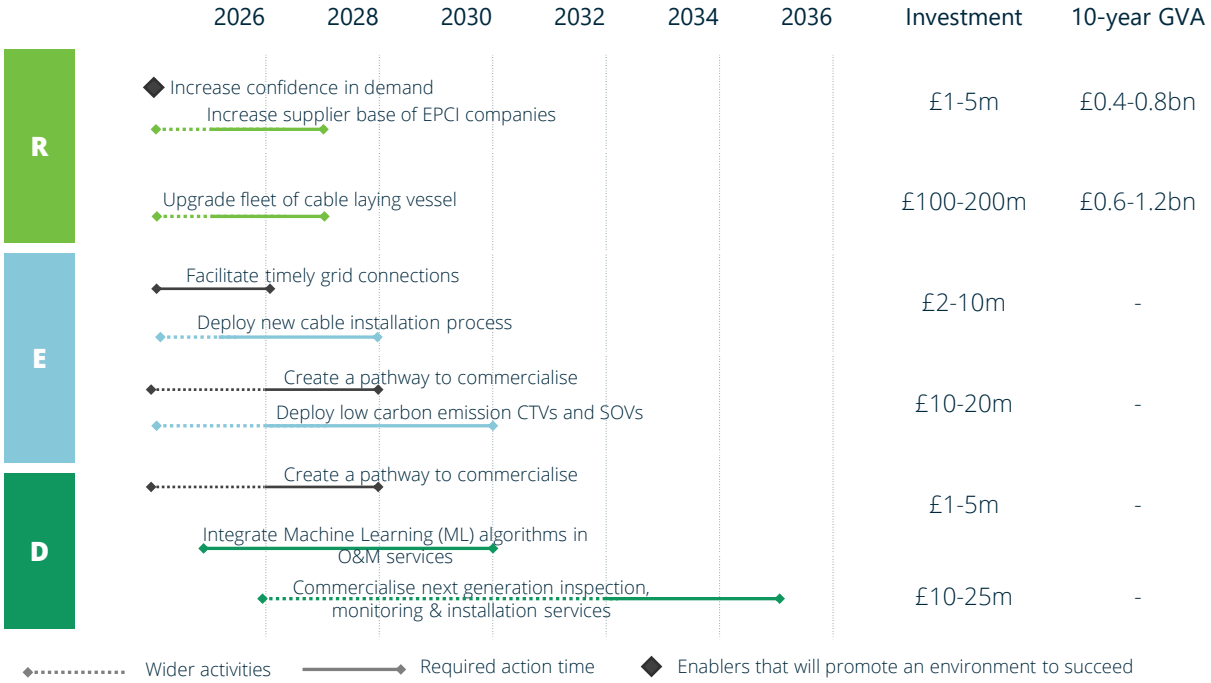
Case for action

Cost efficiency	Medium	The UK provides jack-up vessels to both the UK and European markets.
Capability	Medium	The UK has an established reputation as an expert in O&M, also developing new and more efficient methods for O&M, such as remote monitoring and inspection. The UK has also capability in vessel design, operation and on-deck equipment.
Market size	High	Significant export potential of installation and O&M services to the global market given established reputation.
Wider benefits	Medium	Increased reliability of generation assets and reduced costs.

Case for action: Low | Medium | High

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

Investment in expanding installation, operations and maintenance services as well as deploying low carbon Crew Transfer Vessels (CTVs) and Service Operation Vessels (SOVs) will increase the UK's competitive standing on the global stage by increasing exports.



Environment to succeed enablers

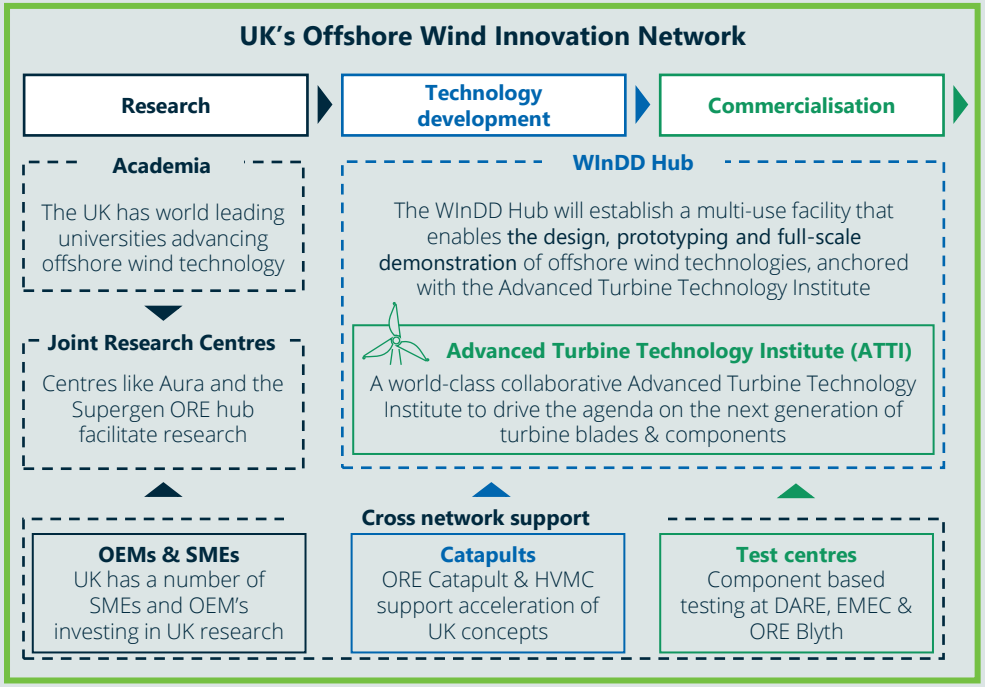
- Facilitate timely grid connections
- Increase confidence in demand
- Build the sectors workforce
- Create a pathway to commercialise

Enabling Technology Development

Establishment of an Offshore Wind Innovation Development and Demonstration (WInDD) Hub

The UK is well recognised for its role in IP creation across multiple industries, including offshore wind. However, the UK tends to invest in early-stage research and innovation, getting ideas to the point of prototype but failing to commercialise and realise the full value of the IP. The failure to commercialise is linked to a lack of development funding and challenges in securing the pull through from industry due to the technical risk.

To take a world-leading position in offshore wind research and fully realise the potential of the investment in disruptive technologies identified in the Growth Plan, the UK needs a dedicated collaborative hub to facilitate innovation. The WInDD Hub aggregates the UK's capabilities and capacity to design, demonstrate and develop innovative technologies across blades, towers, cables, foundations, installation and O&M techniques. A core part of the WInDD Hub is an Advanced Turbine Technology Institute (ATTI) to develop the next generation of turbine blades & components.



Investment £100-300m

Estimated investment need

WInDD Hub areas of focus

Design, development & commercialisation across all five priority areas for the UK

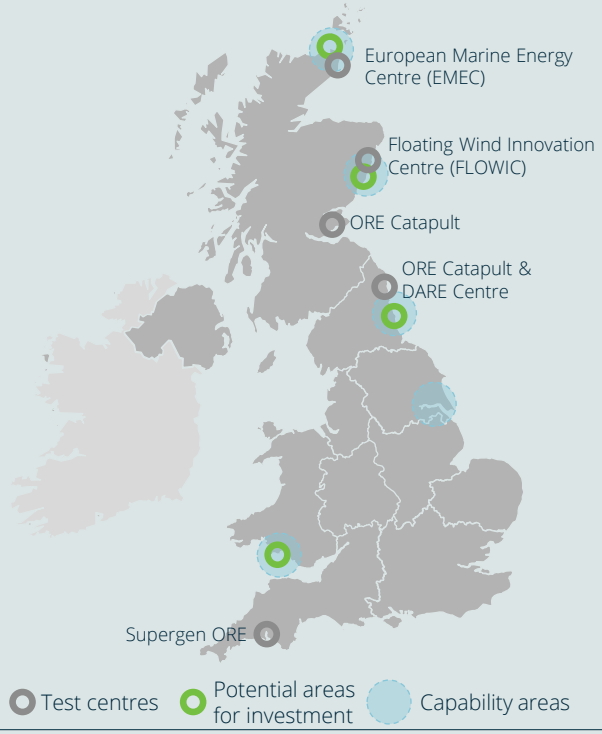


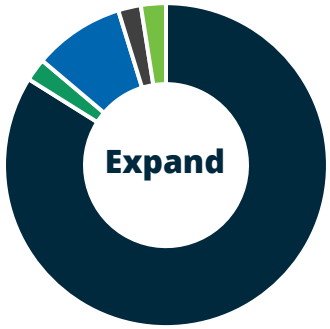

ABB Port Talbot

Total Investment Required

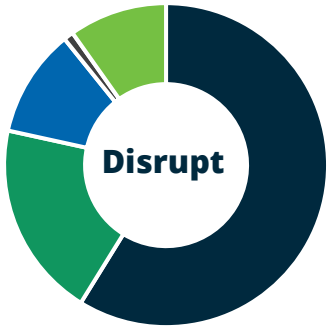
The investment requirements below set out estimates of funding, whether from private or public sources, to deliver priorities and actions identified within the plan. It does not cover wider enabling investment in grid or port infrastructure, nor investments in facilities made prior to April 2024

	Respond	Expand	Disrupt
Total Investment	£800-1,660m	£430-800m	£110-330m
GVA over 10 years*	£9.8-18.2bn	£3.2-5.4bn	£1.2-2.3bn

	Investment need
Increase UK manufacturing capacity of offshore wind blades by 50%	£200-400m
Expand UK foundation manufacturing for designs catering to deep waters	£70-100m
Increase UK capacity of mooring and anchors by 50% from 2023	£20-50m
Add floating foundation manufacturing capacity of 50 units p.a.	£100-200m
Increase HVDC manufacturing capacity by securing two facilities	£200-400m
Build extensive marine datasets	£5-10m
Increase supplier base of EPCI companies	£1-5m
Upgrade fleet of cable laying vessel	£100-200m
Establish a late stage test & demonstration facility	£100-300m



	Investment need
Double UK manufacturing capacity of offshore wind blades to 300% of today	£200-400m
Manufacture advanced composite material blades and towers	£20-30m
Establish one new tower manufacturing facility	£150-250m
Manufacture advanced material for mooring and anchors	£10-20m
Manufacture dynamic inter-array cable at 132kv or more	£30-50m
Deploy autonomous surveys	£10-20m
Develop cable installation technique reducing cable damage	£1-10m
Deploy low carbon vessels for installation and O&M services	£10-20m



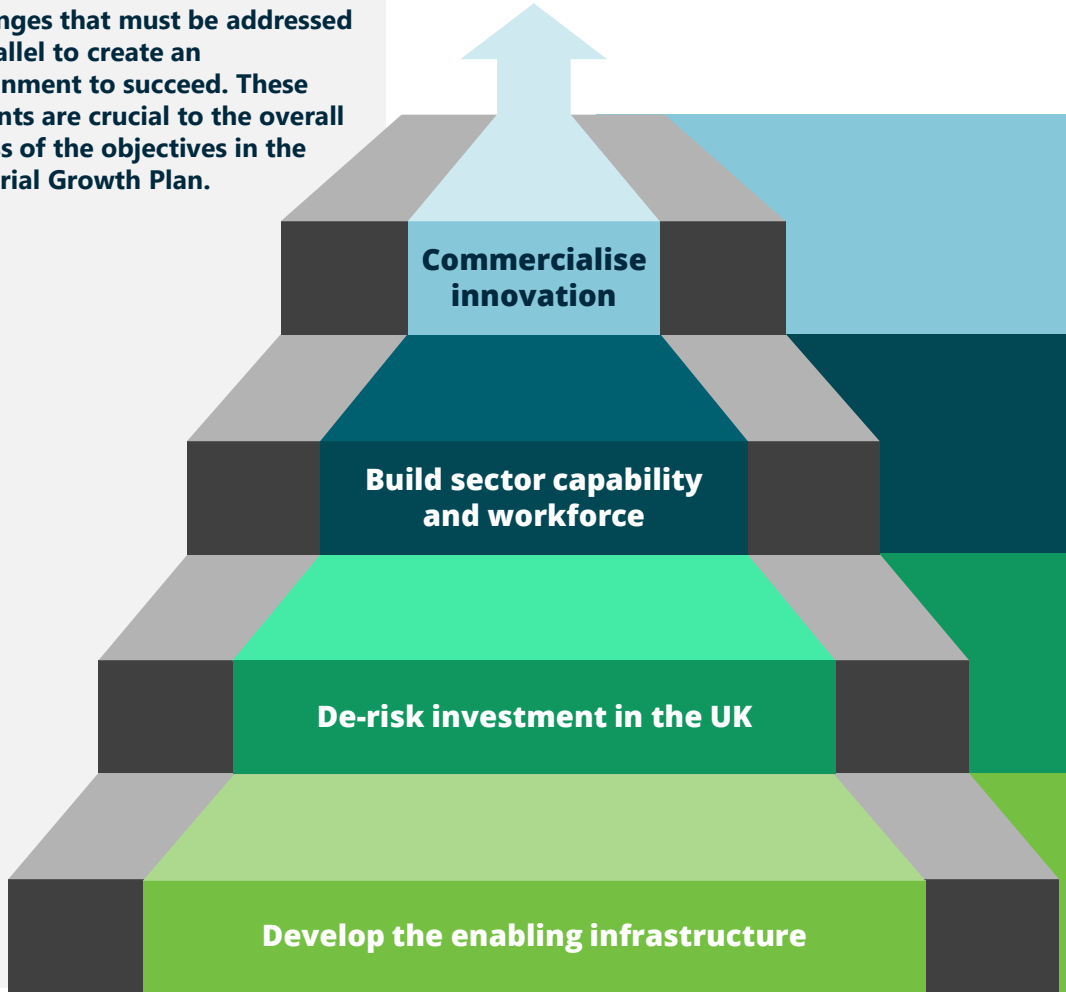
	Investment need
Increase automation of wind turbine blade manufacturing process	£20-80m
Develop automation process for high-value component manufacturing	£10-40m
Advance leading edge blade protection	£30-90m
Develop next generation drive train	-
Produce advanced material for part of the floating substructure	£20-50m
Reduce number of cable related failures/reliability issues	£1-5m
Develop interoperable HVDC systems	£10-30m
Develop new cables design and materials	
Develop ML techniques optimising environmental surveys	£1-10m
Integrate Machine Learning (ML) algorithms in O&M services	£1-5m
Commercialise next generation inspection, monitoring and installation	£10-25m

Priorities:
- Advanced Turbine Technology
- Industrialised Foundations & Substructures
- Future Electrical Systems & Cables
- Smart Environmental Services
- Next Generation Installation and O&M
- Cross-cutting

* GVA generated over 10-years calculated for each investment

Creating the Environment to Succeed

Targeted investment and co-ordinated R&D programs are critical steps in growing and industrialising the sector. There are, however, wider over-arching policy and coordination challenges that must be addressed in parallel to create an environment to succeed. These elements are crucial to the overall success of the objectives in the Industrial Growth Plan.



The UK has challenges in converting intellectual property to commercially deployed innovations and requires cross-sector support to:

- Create a pathway to commercialise
- Invest & assess technology priorities
- Collaborate to innovate

UK requires a mix of organisations and a breadth, depth and volume of skills to facilitate the UK's wide ecosystem and action is needed to:

- Build the sectors workforce
- Support SME development
- Regional Clusters collaboration

Despite a strong pipeline, investment is still faltering, effort is required to translate the pipeline to certainty to de-risk investments to:

- Secure cross-sector investment
- Increase confidence in demand
- Expand the UK's reach

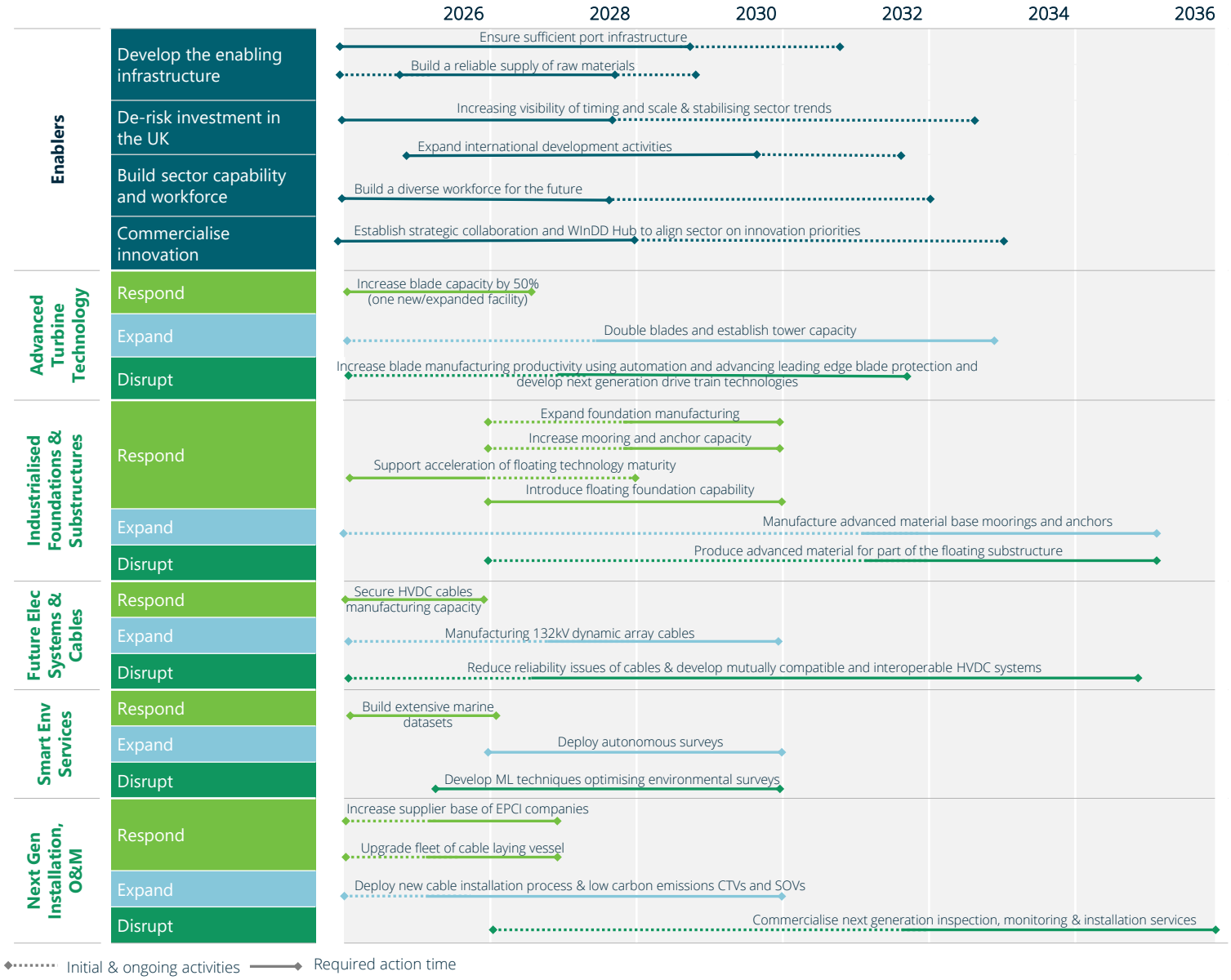
Recognising the need for connections across the supply chain and developing the wider infrastructure to support offshore wind deployment to:

- Partner to source the raw materials
- Develop the port infrastructure
- Facilitate timely grid connections

Roadmap of Action and Investment

Realising the benefits from investment in the plan requires action today. Co-ordinated effort is needed to ensure the enabling infrastructure is built in time and the investment in new capacity provides sufficient demand pull-through.

However, waiting for the totality of demand risks the UK getting left behind competitor markets; thereby slowing down the deployment of offshore wind. The roadmap sets out an indicative timeline to respond in time for the sectors' requirements.



IGP Delivery Body: Driving Value Through Sector Co-ordination & Investment

The success of the Growth Plan is dependent on:

1. **Sector-wide support and collective work to achieve the outcomes**
2. **Ensuring that progress is monitored and actions adjusted on an agile basis to foster the expansion of the sector, and**
3. **Sufficient funding to help drive the outcomes**

To achieve this requires co-ordination and alignment of the various actors and funding sources across the sector. The Delivery Body will own the growth plan, and work alongside organisations and stakeholders to achieve the ambitions the plan sets out.

A joint industry fund to support investment in the priorities identified in the Growth Plan is being proposed, alongside other strategic funding sources such as GIGA, the UK can become a world leader for offshore wind innovation, industry and deployment.

A centralised independent body, either through an augmentation of the existing Offshore Wind Growth Partnership or establishment of a new organisation is required to take ownership for the plan.

RenewableUK, along with key partners, will take forward work to establish the Delivery Body. This consultative approach will include governance, terms of reference, resourcing and funding mechanisms, funding programmes, feedback mechanisms and wider considerations.

Developing the UK's Offshore Wind Supply Chain to Enable Deployment

Research
Universities and hubs that advance the UK's IP and understanding of offshore wind to develop new concepts

Technology development
Networks and technology organisations that provide world-class capability to support the advancement of UK innovation

Commercialisation
Translation of the UK's world-class IP generation into new products and businesses that improve the outcomes of the sector

Capacity development
Scaling and ongoing investment in the services and equipment required to develop offshore wind developments

Demand & deployment
Deployment of offshore wind developments enabled by supporting port & grid infrastructure and demand support mechanisms

The Delivery Body

An Independent organisation with the core responsibility and mission to support the growth of the UK's Offshore Wind Supply Chain by ensuring sufficient capital is available, as well as working with investors and suppliers to facilitate investment in the expansion of UK capacity and capabilities

Enablers	Delivery Body responsibilities	Stakeholders
Collaborative joint industry fund	**Own the Growth Plan & create sector buy-in**	Governments
UK & Devolved Government funding	**Drive IGP execution & growth of the supply chain**	Developers
UK Export Finance	**Manage and distribute new industry funding associated with the Growth Plan**	Research & Technology organisations
UK Infrastructure Bank & Scottish National Investment Bank	**Facilitate alignment of other sources of supply chain investment**	Supply chain
Research & Innovation funding	**Leverage demand and champion investment in the UK**	The Crown Estate and Crown Estate Scotland
CfD and Sustainable Industry Rewards	**Monitor the progress & growth of the UK's supply chain**	Wider infrastructure inc. Ports & Grid
	Shape the future of the sector and adapt the plan	


Triton Knoll Offshore Wind Farm

Contents

Section 01

Introduction

Wind turbine installation at Seagreen Offshore Wind Farm


Seagreen Offshore Wind Farm

Introduction

The UK's offshore Wind supply chain is at an inflection point. Over the past decade, the United Kingdom has significantly grown its offshore wind industry, creating one which employs over 30,000[2] people, contributes about £2-3bn per GW installed gross value add (GVA) to the UK economy[1] and generates enough electricity to meet the needs of nearly half (47%) of the UK homes[10].

Through collective efforts of offshore wind developers, suppliers, Governments, The Crown Estate, Crown Estate Scotland, research and technology organisations and the wider community, the UK has become a world leader in offshore wind enabling domestic capacity to grow to 14.7GW in 2023[11] from only 3GW in 2012[12].

The UK and international deployment targets for offshore wind create an opportunity for the expansion of the offshore wind supply chain. The Offshore Wind Industry Council's (OWIC) and Offshore Wind Growth Partnership (OWGP) jointly-funded UK Supply Chain Capability Analysis, identified upwards of £92bn[3] of gross value add to the UK from the offshore wind supply chain through to 2040.

The opportunity will not be secured without intervention. Other nations are investing heavily in their own domestic capability, through mechanisms such as the US's Inflation Reduction Act[13] and Europe's Green Deal Industrial Plan[14]. It is becoming even more vital to take action now if the UK is to (1) ensure there is sufficient infrastructure to support domestic deployment targets, and (2) take advantage of our market position to secure the economic and social opportunity the industry holds.

Collaboration over the past decade, accelerated through the 2019 Sector Deal[15], has created a strong foundation on which the UK can grow its capability and the ongoing Strategic Investment Model process is fostering further collaboration to support build-out of the ScotWind leasing round. The sector has not yet reached full industrialisation with challenges in sufficient capital being committed, the commercialisation of intellectual property and a lack of co-ordination on where the UK should develop domestic capabilities. The UK Offshore Wind Champion noted in the 2023 *"Seizing our Opportunities"* report[16] the need for a clear action plan to address the challenges and secure the future opportunity.

Recent commitments from the UK and Scottish Governments to provide financial support to the sector through the £390 million offshore wind and electricity networks pot as part of the Green Industries Growth Accelerator[17] and the up to £500m offshore wind supply chain support[18] respectively, go part of the way however further action is needed.

Building on the work of the Supply Chain Capability Analysis[3] and with collaboration across all parts of the offshore wind supply chain, five priorities have been identified for the UK. Investment in these priorities of between £1.3-2.8bn could contribute additional £14-26bn GVA over a ten year period for the UK.

This Growth Plan is intended as the springboard for industrialisation and fits into a wider system to support capital investment and leverage demand from our domestic pipeline to unlock investment. In combination with the introduction of Sustainable Industry Rewards as part of the Contract for Difference (CfD) scheme, there is an opportunity to develop an ecosystem that supports targeted investment in the supply chain whilst enabling UK and global deployment.

By focusing on the areas underpinning the UK's current success – as well as those in which we can and should position the industry – we can realise the full potential of socio-economic, energy security and manufacturing benefits for the UK. Key areas for investment have been identified alongside enabling actions to secure the long-term success of the UK's offshore wind supply chain.

Through the establishment of a new delivery body and a proposed joint industry fund to support investment in the priorities identified, this Growth Plan sets out the ambition for a sustainable offshore wind supply chain and investment and actions needed to get there.

Vision for the UK's Offshore Wind Supply Chain in 2035

The UK is a world leader in the design and manufacture of advanced turbine technology, has industrialised deep water and floating foundations & substructures and has developed future electrical systems & cables to enable the deployment of floating offshore wind.

The UK's smart environmental services and next generation installation and O&M services reduce overall costs and equipment down-time for the UK and global offshore wind fleet.

Section 02

Case for Action

First campaign at Dogger Bank Offshore Wind Farm

Case for Action

The UK has achieved a huge success in offshore wind over the past decade with the world's second highest deployment globally and helping to achieve a cost reduction of over 60%[12]. This success has been underpinned by:

1) Government and industry co-ordination

The Offshore Wind Sector Deal[15] has been a cornerstone in strengthening the UK's offshore wind deployment and supply chain capability. This marked a deepening of the partnership between the government and the sector. Enhancing and widening the partnership will enable further development of a effective sector.

Investment in research, development, and demonstration (RD&D)

The UK has made significant investments in RD&D over the last decade, providing the UK with a competitive edge in key aspects of the global supply chain. Key investments include the ORE Catapult to support offshore energy technology and innovation[12], the Aura and Supergen centres at the University of Hull and Portsmouth respectively, Joint Industry Programmes developed by the Carbon Trust, the proposed floating wind test and demonstration site by European Marine Energy Centres' (EMEC), and the facilitation of technology deployment through the Net Zero Innovation Portfolio[19].

3) A supportive policy framework

The UK has a legally binding commitment to decarbonise providing a clear signal of intent to develop low carbon technologies. Offshore wind has also benefitted from being part of the CfD allocation rounds since its inception in 2015, which has offered a bankable 15-year support regime to facilitate offshore wind development, providing certainty to the market.

4) A diverse supply chain

The UK has built on adjacent capabilities in oil and gas, aerodynamics and electrical design to nurture a domestic supply chain that has enabled UK based suppliers to win, on average, contracts in around 50% of package areas by value, in the past[3].

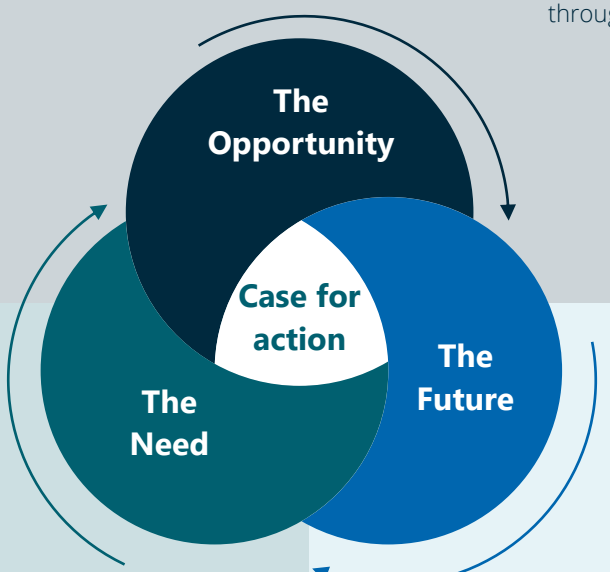
However the areas underpinning the UK's current success have not delivered the full socio-economic, supply chain and manufacturing growth potential that the UK seeks to achieve. The Growth Plan sets out the case for action to secure critical domestic supply, grow market share at home and abroad, and position the UK to lead key technology trends.

3x
120 nations committed to tripling the renewable energy penetration by 2030[20]

Around 2,000 GW
Of global operational offshore wind capacity of offshore wind by 2050[21]

£8,000bn
Total addressable market to 2050 for development services through to decommissioning

5%
Compound annual growth rate for offshore wind expenditure



21%
UK's share of serviceable offshore wind pipeline to 2035

300
Wind turbine generators required annually (on average) to meet UK demand to 2030[3]

100GW
Installed capacity of global deep water and floating projects by 2035

14x
Increased need for cables in Europe alone to 2030 [9]

4x
Increase in UK workforce across 2023-2035

11%
Opportunity for LCOE reduction through O&M improvements[5]

45%
Reduction in global warming potential through alternative materials[6]

The Opportunity

Offshore wind will play an increasingly important role in the global energy landscape. At COP28, over 120 nations committed to tripling the renewable energy penetration by 2030[20]. Technology improvements have enabled significant cost reductions leading offshore wind to be one of the cheapest forms of energy and a major contributor to global decarbonisation efforts.

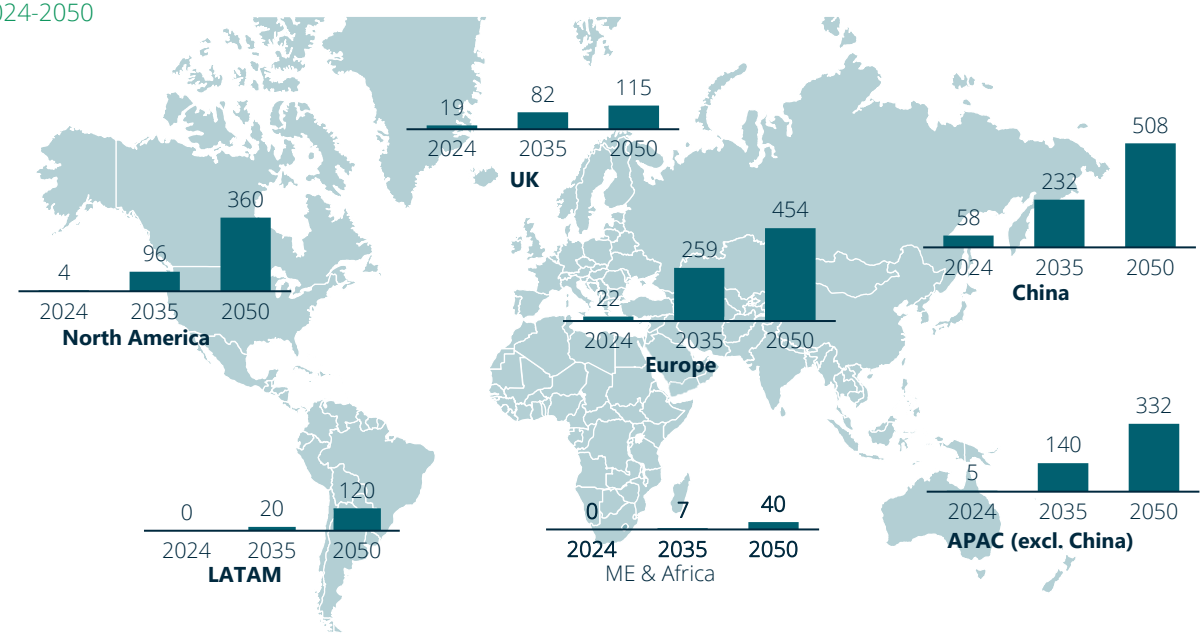
At the end of 2023, there was over 300 GW of offshore wind in the global pipeline due to commence construction by 2030. Through to 2035 there could be more than 750 GW of capacity – almost 10 times the installed capacity at the end of 2023. This will require an almost 3 times increase in current average annual capacity additions, placing pressures on the existing supply chain and creating opportunities for market growth.

Out to 2050, total global capacity is projected to reach around 2,000 GW[21]. China and Europe will continue to be leading markets accounting for around half of global installations, however Latin America, the Middle East and Africa are future growth markets with offshore wind capacity expected to increase significantly beyond 2035 in these regions facilitated by advances in offshore wind technology. Innovations in foundations, substructures and moorings are unlocking deeper waters, with floating offshore wind estimated to account for ~17% of total capacity globally by 2050.

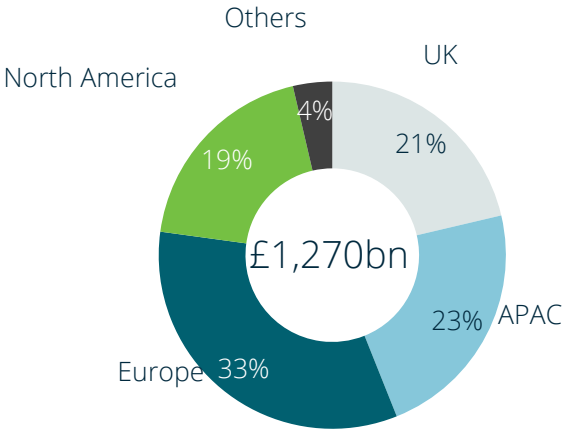
In total, an estimated £8,000bn will be spent across the supply chain globally to reach 2,000 GW[21]. Of this c. £440bn will be spent in the UK. Considering domestic and export supply there is an estimated £3,000bn serviceable market opportunity for UK suppliers between 2024 and 2050.

With appropriate action to develop domestic capability and capacity, there is an opportunity for the UK to secure a significant share of the market spend. Expansion of the UK's expertise in floating and deep water technologies will be a key contributor to future market growth.

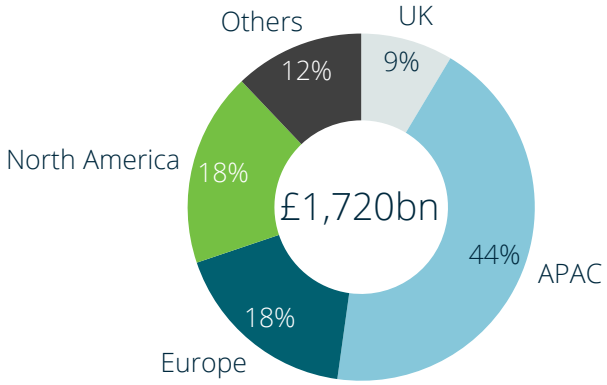
Global pipeline of cumulative capacity
GW, 2024-2050



Expected serviceable amount to be spent for deployment £, 2024-2035



Expected serviceable amount to be spent for deployment
£, 2036-2050



Note: * Includes 62GW of installed capacity by end of 2022 and 16GW of potential capacity added in 2023 globally

Domestic Opportunity

The UK has capability across the offshore wind supply chain, with over 550[3] organisations currently active in the sector, with particular strengths in engineering services, cables and electrical equipment, as well as parts of the wind turbine generator[3].

The domestic opportunity accounts for around c.21% of total serviceable market. Average annual spend on deployment of new offshore wind capacity in the UK is expected to reach c.£22bn per annum through to 2035, growing at a rate of 8% between 2023 and 2035. Out to 2050, this is expected to stabilise to c.£10bn per annum from 2036 to 2050, creating a sizeable ongoing domestic potential.

Across the lifecycle, this equates to a CAPEX spend of c.£210bn up to 2035. OPEX is expected to keep growing with new capacity addition, with average additional spend of £7bn per year. DEVEX spend is estimated to reach c.£7bn up to 2035. The decommissioning market will pick up in mid-2030s with c.£220m spend opportunity up to 2035.

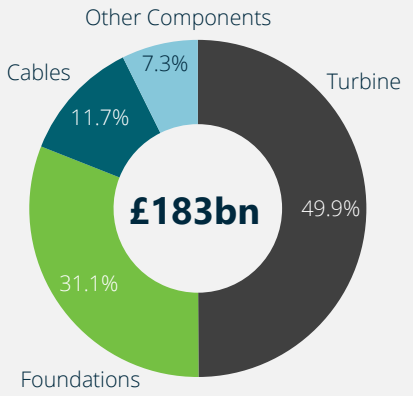
Supply of the wind turbine generator, particularly the rotor assembly offers the largest serviceable market at component level, and is estimated to grow from c.£400m per annum in 2023 to c.£1bn per annum by 2050 at c.4% CAGR.

Cables (offshore export and array) is another key opportunity expected to see rapid market growth. This growth will also be complemented by other industries, such as planned grid expansion. The cables supply market for the offshore wind sector is expected to grow from c.£291m to c.£861m with a CAGR of c.4% between 2023 and 2050.

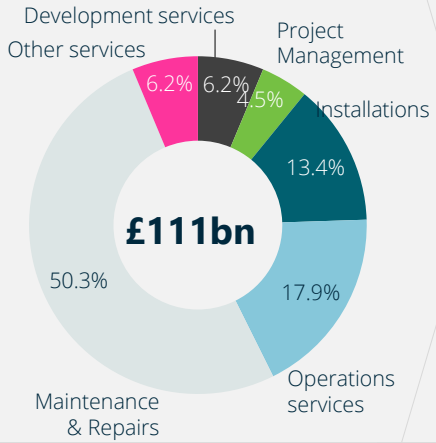
Other components such as towers and installation services also represent sizeable opportunities in the domestic market with a c. 4% CAGR from 2023 to 2050. Gravity based foundations structures for seabed conditions unsuitable for Monopiles & Jackets offers good opportunity for the UK.

UK serviceable market 2024-2035

Components



Services



UK current capability (supplier and innovation)

- Tower
- Blades
- Nacelle assembly
- Drive train & yaw
- Monopile foundation
- Jacket foundation
- Steel Semi-submersible
- Concrete gravity based & semi-submersible
- Moorings & anchors
- Static & dynamic array cable
- Offshore export cable
- Onshore export cable
- Electrical system & SCADA
- Offshore substation jacket foundation
- Offshore substation topside
- Development services
- Wind turbine installation
- Wind turbine installation vessels
- Monopile installation
- Jacket installation
- Foundation installation vessels
- Floating turbine installation
- Floating assembly
- Array and offshore export cables installation
- Cables installation vessels
- Landfall HDD & Cable Pull
- Onshore export cables installation
- Offshore substation (OSS) installation
- Marine services – UXO clearance
- Environmental surveys
- Operations Team
- Asset Management Services
- Commercial & Insurance
- Scheduled maintenance & repairs
- O&M vessels
- Decommissioning

High capability/output | Medium capability/output | Low capability/output

Export Opportunity

UK organisations are proving competitive in international markets. Between 2016 and 2023[4], UK suppliers have won contracts across all stages of the development lifecycle supporting an estimated 190 projects, with key successes in project management, surveys and marine services, and cables.

Top existing destinations for UK exports are Germany, Denmark, Netherlands and Taiwan[4]. For all four destinations, array cables were the components most exported. Outside of Europe and APAC, North America is another important export market that has seen recent growth with an increase in its pipeline.

Continued development in Europe will create a serviceable market opportunity of c.£385bn to £467bn between 2024 and 2035. Sweden, Germany, Ireland, Finland and the Netherlands are the nations with largest deployment pipeline accounting for c.75% of market opportunity from Europe[22].

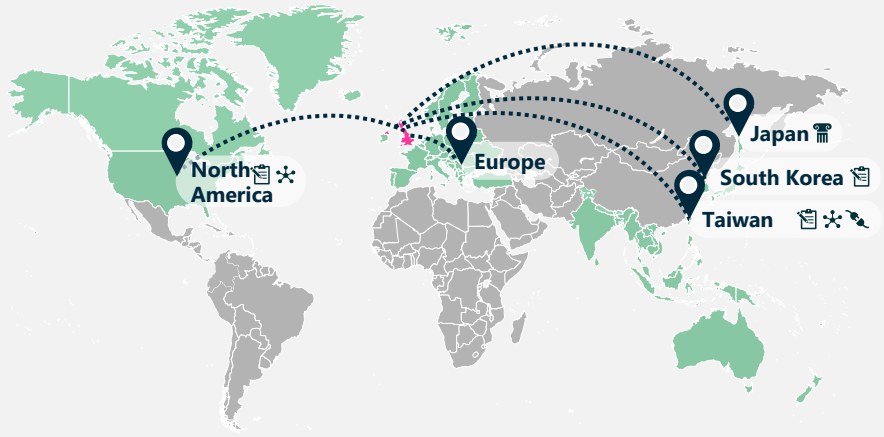
APAC (excl. China) presents a fast-growing market for offshore wind, with a serviceable market between £213bn-£273bn from 2024-2035. South Korea, India, Japan, Vietnam and Taiwan are leaders in the region for deployment up to 2030 representing c.90% of market opportunity[22]. Other countries, such as Australia, represent a long term opportunity with projects to expect to commence installation from the early 2030's. Whilst the largest global market, China's domestic capability limits the serviceable opportunity for UK suppliers and is not considered a key opportunity.

North America is an emerging market for the UK however may not be fully realised in the long term due to a desire to develop domestic capability and reasonably high local content requirements.

In LATAM, Brazil and Colombia, represent an emerging opportunity as they start to establish an offshore wind market. The UK could provide early development services, partnerships, and collaboration on R&D to establish trade links.

North America	Latin America (LATAM)	Europe	Middle East & Africa	Asia Pacific (APAC excl. China)
£287bn[b] (2024-2035)	**£35bn[b]** (2024-2035)	**£422bn[b]** (2024-2035)	**£11bn[b]** (2024-2035)	**£244bn[b]** (2024-2035)
Key destinations: USA Priority from: 2035 Current Exports: Development services, Array cables, Export Cables, Substations	Key destinations: Brazil, Colombia Potential Exports: Development services	Key destinations: Germany, Netherlands, Denmark, France Priority from: 2024 Current Exports: Development services, Array Cables, Export Cables, Foundation	Key destinations: NA Priority from: NA Current Exports: NA	Key destinations: Taiwan, South Korea, Japan, Vietnam Priority from: 2024 Current Exports: Development services, Array Cable, Foundation

Existing trading routes globally for OSW components/services exports [17,a]



Top export destinations in Europe [17,a]

Existing trade routes | Top regional exporting destination | Project & development services | Array cables | Export cables | Technician | Foundations

[a] Analysis based on number of contracts awarded to UK based supplier on past projects between 2015-2023,
[b] Export opportunity takes into consideration the UK's capability to export, current supplier base in each region and potential impact of local content requirements, however the actual export potential might vary based on future development of local supply chain in these regions

Case Study: UK Export Successes in Taiwan

Co-ordination and proactive demonstration of UK capability has helped secure export to Taiwan

UK-based firms have had success in the Taiwanese market with an estimated £270m in export wins, 38 UK companies operating in Taiwan and 80 UK firms engaging with the Taiwanese market. The success has been built on and can be replicated through:

Exports

£270m
delivered in exports

Government-to-Government collaboration

- **Aligning policies** with UK practice can help lead to commercial contracts as it makes it easier to access the market
- **Creating tangible actions** for collaboration between SMEs helps to improve company profiles and grow trust in the market

38
UK companies operating in Taiwan

Early engagement of UK experts including Offshore Renewable Energy Catapult, The Crown Estate, Crown Estate Scotland, InnovateUK and UK Export Finance

Strategic involvement in the early stages is important in supporting the UK's credibility in the export market;

- Pivoting beyond financing, UK companies and agencies should be **brought in at the procurement stage** encouraging exports from UK businesses to Taiwan
- Aligning with sector specialists to **support business credibility abroad**

80
UK firms engaging with Taiwan market

Government-to-Business Collaboration

- Annual roundtable in Taiwan chaired by The Crown Estate, will provide **guidance on companies that can collaborate and share knowledge** with the local market
- Government should **raise awareness among the industry** of the Taiwanese market opportunity and existing requirement for transferring industry knowledge to the local market

UKEF has guaranteed £380m in project financing to the Hai Long project in Taiwan, contingent on £130m manufacturing and service exports from the UK to Taiwan under its Buyer Credit facility

Flotation energy is testing and developing a floating offshore wind project near Hsinchu proposed to have 1.2GW capacity. Currently in early planning and expected to commence in 2025, the site is the first such project in Taiwan

Industrial Technology Research Institute (Taiwan government) appointed Arup to provide technical consultancy to local developers on offshore wind training courses, technical design review, quality assurance, project management and development of technical protocols

James Fisher has partnered with Dong Fang and Ho Lung Power Engineering to develop its offerings in Taiwan, providing technical knowledge, operations and maintenance, and termination and testing among other services

Vessel Blade Runner Two

The Need

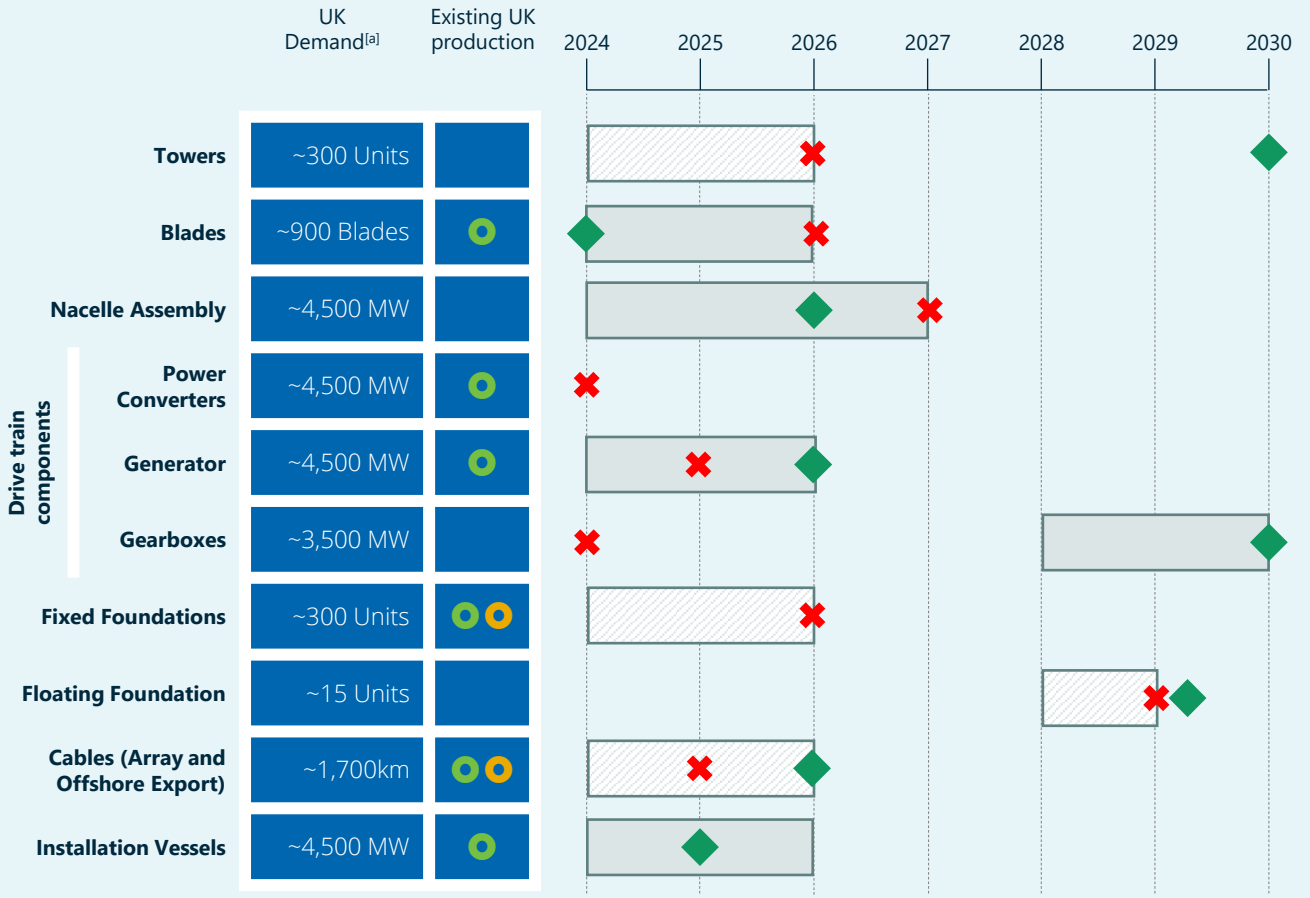
Despite ambitious deployment targets globally, the international supply chain is still developing with supply constrains expected to impact multiple components through to 2030. Increased industrialisation is required in the UK taking account of global capability and capacity.

Towers: Globally there is sufficient tower supply for the pipeline demand until 2030, however on a regional level Europe's tower demand is expected to outstrip supply in 2026[9,23]. The UK has a strength in steel production but does not currently produce the required grade and thickness of steel for towers. This creates a barrier to build out domestic capability, however with transportation and assembly of these towers a big cost component of a development domestic supply could prove commercially viable.

Blades: OEMs have faced difficulties in expanding blade manufacturing due to high inflation, low margins, and the growth of turbine sizes[9]. Constraints in supply chain are anticipate globally in 2026, and in Europe as early as 2024[23]. There is a need for increased expansion to address the constraints and reduce delivery risks to UK developments, which can build on the UK's existing manufacturing capacity.

Nacelle Assembly: Global bottlenecks for nacelle assembly are expected as early as 2026[23]. In a regional sourcing scenario, European suppliers would be unable to cater for regional demand post 2026[9,23] which may impact UK developments. Given the UK has limited presence in large fabrication and its dependence on adjacent supply chains, the UK is unlikely to see investments in nacelle assembly and will rely on external imports to meet its local demand. However, if the UK takes a lead in design and development of the next generation turbines, this may be a future opportunity for the UK.

UK Offshore wind supply chain, demand supply gap assessment and investment horizons



Note: [a] Average annual demand between 2024 and 2030, based on the projected capacity addition in the UK as per Energy Pulse offshore wind project pipeline

Existing UK production
Future UK production
Earliest global supply constraints
Earliest supply constraints in Europe (regional supply)
Time to action
Existing expansion/ investment plans in the UK

Power convertors: Due to a rapid increase in UK and European deployment and limited local supply chains, constraints within the region are being felt today. With surplus global capacity from countries such as China and India, there is a limited intervention required to further develop UK capacity despite domestic capability.

Gearboxes & Generators: Within Europe (inc. UK) constraints are anticipated to impact generator and gearbox supply by around 2026[23]. The UK has limited domestic capability in gearbox and generator manufacturing and no current plans for development. With a lack of large fabricators and China's cost advantage in the supply of these components, despite potential supply shortages, there is a limited advantage to the UK building domestic capacity.

Fixed foundations: Global constraints in foundation supply are not expected until 2030[23], given surplus capacity in China and the APAC region. In Europe, demand is expected to outstrip regional supply for both monopiles and jackets in 2026[23]. Changing demand patterns arsing from increasing turbine size and the move to deeper waters is leading to a need for longer and wider monopiles. With a potential shorter period of return and uncertainty in future demand[9] there is a need to address the challenges to build out the necessary capacity.

A number of developers are exploring **concrete gravity-based** foundations for projects. This technology could offer opportunities to develop UK supply chain and support the potential for UK ports to diversify into concrete foundation fabrication

Floating foundations: Floating foundation manufacturing is still immature with multiple competing designs. The breadth of innovation in this area is making the future demand for any one design unclear making investment a challenge. Development timelines for floating offshore wind are also compounding the issue. Based on current development pipelines, constrains could occur as early as 2029[23] if sufficient investment is not directed to build out capacity.

It is imperative that the UK converts its position as the first mover in the floating offshore wind deployment. Given its pipeline and skills, the UK is well placed to take advantage of the global demand for the design and manufacture of floating foundations and substructures if sufficient action can be taken to address demand uncertainty.

Cables: Export cable demand from offshore wind is expected to grow by more than 14 times in Europe by 2030[9], whilst competing demand for cables from other sectors is expected to also grow with accelerated efforts to reach net zero[9]. Constraints are therefore expected to start in 2025 in Europe and in 2026 globally[23].

Given the UK's existing capabilities in the supply of cables and cable protection systems[9,22], the supply constraint creates a need for additional capacity that the UK could provide. However, the UK currently lacks HVDC and high voltage export cable manufacturing capability. Planned cable manufacturing units by Sumitomo [24] and XLCC [25], will add capability in high voltage export cables to the UK's manufacturing capacity, however additional support is needed to secure the investment and expand the UK's expertise.

Installation vessels: Pressure on the existing fleet of vessels is expected by a globally increasing demand for turbine installation vessels, along with shifting demand to larger vessels capable of installing larger turbines and foundations[23]. Constraints in vessel supply is expected in Europe in 2026[23]. The UK will see vessel demand roughly double between 2023 and 2030. The UK lacks top tier EPCI contractors who operate these vessels placing a reliance on other nations.

Whilst the imbalance in the supply and demand across offshore wind presents a market opportunity, the sector has faced challenges in securing the appropriate investment for expansion due to a number of compounding factors:

Order uncertainty: Despite the long term nature of the sector, a lack of a predictable project pipeline presents challenges for supply chain companies to secure investment, particularly with limited depth or appetite from venture capital[16]. Events such as a lack of projects in Allocation Round (AR) 5 of the CfD has not only pushed the UK's pipeline back by at least a year but questioned the certainty of future orders and developments.

Pipeline uncertainty or delays in project development (as a result of planning process, costs or CfD pricing) complicates financial planning, capacity management, workforce training, and investment.

With investment in new capacity requiring a clear pipeline of future orders and the uncertainty in the market making this difficult, order uncertainty has deterred investment in the UK.

The Government has taken steps to build confidence in the market with an announced 66% rise in the CfD strike price for AR6 and Sustainable Industry Rewards (SIR) due to be incorporated from AR7 onwards. The impact of these policies are unclear however further action is needed from across the sector to provide greater certainty to future orders.

Support to OEMs: There is lack of direct incentives to increase profitability of projects for the OEMs, such as tax credits for investing in new manufacturing plants. OEMs are also facing challenges in scaling up the offshore wind capacity due to lack of proper infrastructure, including ports, heavy lift vessels, and specialised equipment, and storage spaces.

Technology race & reduced time for returns: Over the past decade, rated capacities of offshore wind turbines have increased from 3 MW to over 20 MW, although turbines with >15MW capacities are yet to be used widely. This continued scale-up requires new investment throughout the supply chain reducing the available payback period for any investment. This continued scale-up is creating knowledge gaps in production across the supply chain, increasing risks and the supply chain's willingness to invest.

Skill shortages: Scale-up in requirement for skilled labour due to rising offshore wind deployment has led to skill shortages. This coupled with challenges arising from Brexit, increasing complexity of offshore wind projects, and increasing competition for skill, e.g. power network upgrades and deployment of battery storage will put a strain on skilled workforce in the sector[2] particularly electrical engineering skills. In addition to the number of skilled workers required, the availability of the desired quality and experienced workforce is also a key issue in the UK.

Technology risk: Despite innovation in new technologies, there are challenges in bringing them to market. Limited opportunities to demonstrate new technology at scale is reducing the bankability and preventing the wide-scale adoption of solutions that can help to lower the levelised cost of energy (LCOE), improve reliability, and reduce environmental impacts.

Despite a strong technical background in offshore wind to develop and help commercialise new technology, the UK faces increased competition from nations such as Denmark, Netherlands and France who are investing heavily in RD&D. In 2022 their proportional spend on RD&D specific to wind energy was more than 2.5 times that of the UK[26,a]. Further investment in RD&D is crucial in gaining competitive advantage and becoming a knowledge centre for offshore wind which needs to be enabled by an ecosystem that facilitates quicker testing and commercialisation of products and services[27].

[a] Wind energy sector specific RD&D spend for FY22, from IEA database.

Future Technology Trends

Taking a leading position in technology and innovation can counteract the UK's limited number of UK-based tier 1 suppliers.

The UK hosts a strong innovation ecosystem, ranking fourth in innovation globally[7] and has cross-sector strengths in areas such as automation and advanced materials that will be key in driving forward offshore wind technology. Early-stage research is a particular strength for the UK making up 12% of the top 50 global institutions in marine and ocean engineering[28] and taking an estimated 7% share in global offshore wind publications[a].

Between 2002 and 2021 the UK was in the top 10 in offshore wind patent filings[29]. The growth of investment from other nations had threatened the UK's position and from 2022 the UK has dropped out of the top ten[29].

Multiple technologies will be needed to continue to develop the sector and facilitate the global expansion of offshore wind. With a strong research capability, world leading test and demonstration facilities and a market leading position in floating offshore wind, the UK can develop and commercialise new technologies to address key sector challenges to :

- Scale-up wind turbines
- Lower the LCOE of deep water & floating
- Improve overall wind farm reliability; and
- Enable positive environmental impacts

Increased research and development activity in partnership with Developers, OEMs and the wider RTO community will facilitate commercialisation.

4TH UK's global position in innovation[7]

7% UK's share of offshore wind research[a]

6TH UK's rank in total patent filings between 2002 and 2022[29]

26% Wind energy's share of public R&D renewable energy funding in the UK[26]

Technology trends

Short term (2024 - 2027)	Medium term (2027 - 2035)
Reliable cables	Offshore grids
Smart materials	O&M robotics
Next generation turbines & supporting components	
Deep water technologies & floating offshore wind	
Digitalisation	
Hybrid, storage, power to X	
Nature inclusive wind farms	
Recyclable components/remanufacture	Vessel decarbonisation

Existing UK capability

Emerging UK capability

Scale-up wind turbines

Lower the LCOE of deep water & floating

Improved wind farm reliability

Positive environmental impact

Note: [a] Analysis based on the number of publications for 2023

Whilst technology today will shape the market over the next few years, developments will not stop there and the UK needs to continually invest in R&D to keep ahead of international competitors. Through targeted action and the creation of an environment to enable commercialisation, the UK can disrupt incumbents and take a leading position in the future of offshore wind. The following are areas that the UK has the capability to innovate and take a leading market position:

Reliable cables: Cable failures account for up to 80% of insurance claims[30], with an estimate of average offshore wind insurance claim at £3.1m[31]. The issues do not lie just in cable design, but environmental conditions along the wind farm lifecycle such as installation methods and a lack understanding of failure modes driven by a lack of data sharing. The UK needs to draw on capabilities across cable manufacture and design, installation and environmental services as well as promote fault cause data sharing to tackle this wind farm issue and realise value.

Smart materials: Cost reductions can be driven through improved component reliability or reduced component weight. The UK's expertise through the National Composite Centre is well placed to support the development of composite-based blades and towers. Another application of smart materials may include material alternatives such as synthetic ropes as an alternative to mooring chains, which currently run a risk of breakage in operation.

Next generation turbines: Growth in the average turbine size requires advancements across the entire supply chain. Optimisation of current turbine designs will be key to unlocking the next generation of turbines. The UK's is well placed to scale capacity in line with current technology trends, developing and industrialising the production of larger blades, suitable foundations and increased voltage (132kV) cables to play an active role in turbines >15 MW.

Beyond the scale of today's technology, the UK's composite expertise can enable the UK to grow market share in blade manufacture and enter the market for towers. New materials and manufacturing techniques will drive increased turbine performance and reduce component weight with composite towers offering the potential to reduce the LCOE by 4%[6]

Deeper water technologies & floating offshore wind: The LCOE for floating offshore wind is estimated to be 50% higher than fixed[32] and innovation to drive down costs will be key to capture market share in this technology. The UK is well placed to take advantage, with multiple floating foundation designs tested and implemented on demonstration projects in the UK and manufacturing capability in polyester ropes, buoyancy elements, jewellery and anchors residing from the oil and gas sector. If acted on the UK can take the lead to respond to cost competitiveness challenge the technology faces

Digitalisation & O&M robotics: O&M cost reductions are expected to reduce the LCOE by 8% for fixed and 13% for floating offshore wind[5]. Uptake of digital and autonomous solutions will drive this with examples including:

- Digital solutions and AI to improve wind farm control and predictive modelling, fleet optimisation and inventory management
- Robotics and drones to automate O&M processes such as blade inspection[35] and enable automation of manufacturing across the supply chain. ORE Catapult's Digital, Autonomous and Robotics Engineering (DARE) places the UK in a strong position for the development and testing of automation technology. Commercial applications are already seen in the UK, with heavy lift cargo drones deployed at the Hornsea 1 Offshore Wind Farm in the UK[34]

Offshore (HVDC) grids: Development in operation and control of HVDC grids will enable interconnection of offshore grids, connection of wind farms to different national markets and offshore loads as well as power exchange between regions[33].

Hybrid, storage, power to X: Hybrid offshore wind solutions allow offshore wind to combine with other generation sources such as solar. Energy storage systems and power to X (such as hydrogen) technologies will enable system flexibility and security of supply[33].

Nature inclusive wind farms: Synergies can be realised with offshore wind deployment and effects on wildlife, such as using platforms and vessels to create artificial reefs or using the wind farm area for seaweed growth[33]. Significant expertise resides in the UK to enable habitat creation through offshore wind[35].

Recyclable components: The majority of the materials utilized in the construction of wind turbines, such as metal, fiberglass, and resin components, are recyclable. The composites employed in the fabrication of the blades, however, present a significant challenge in terms of separation and recycling. Recycling and remanufacture of offshore wind farms is becoming more prominent with UK based companies such as Plaswire and Continuum, turning composite waste into recyclable products for construction.

Vessel decarbonisation: Decarbonising offshore wind O&M vessels is seen as 'low hanging fruit' [36] in achieving wind farm circularity, given the synergies with the maritime industries decarbonisation ambitions[37]. Vessels utilising alternative green fuel such as electricity, hydrogen, ammonia, etc. would shape the future of this segment.

Scale-up wind turbines | Lower the LCOE of deep water & floating | Improved wind farm reliability | Positive environmental impact

Section 03

The Plan

Blades for Moray East Offshore Wind Farm

The Plan

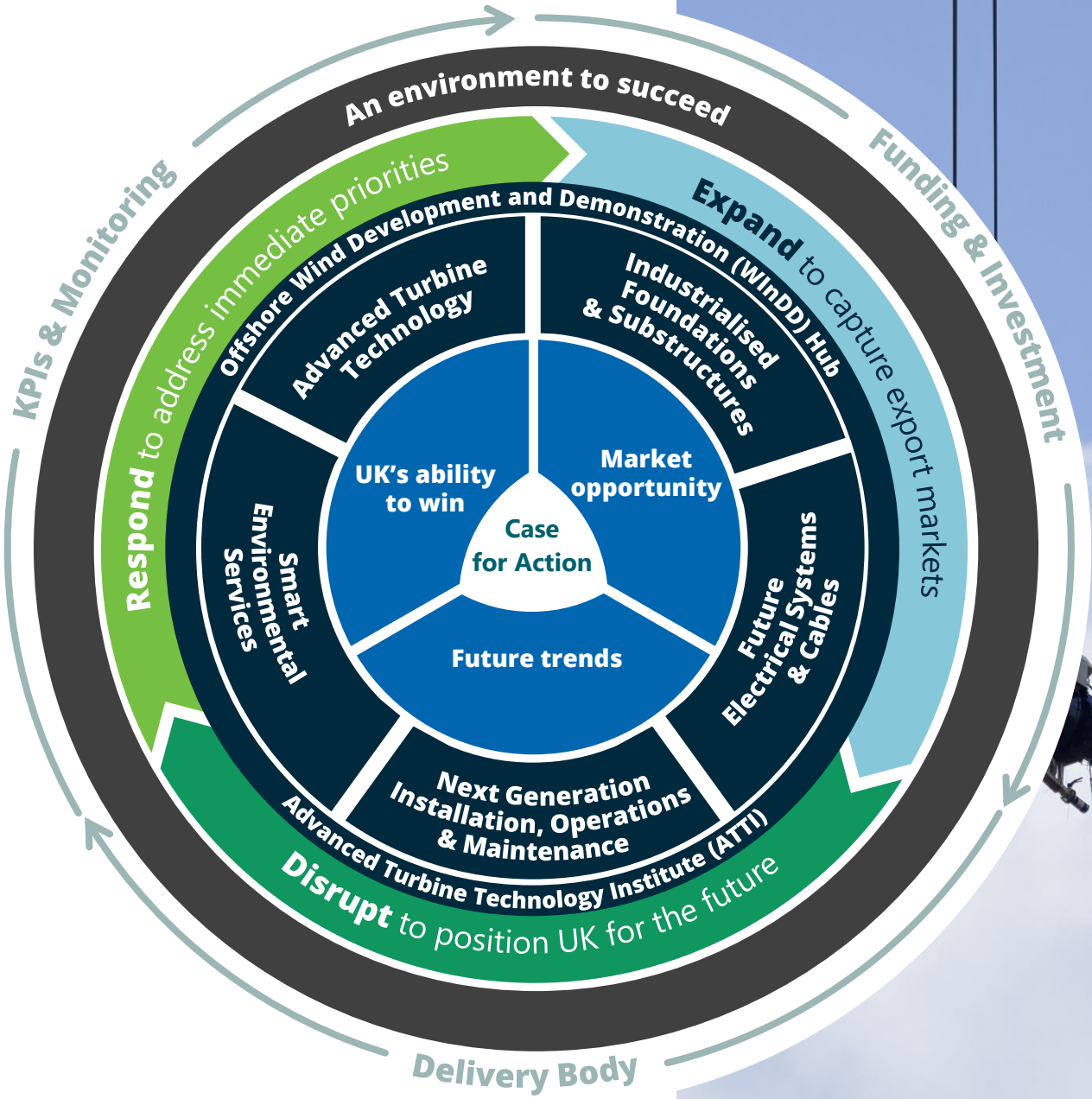
For the UK to realise the economic and social potential of offshore wind targeted investment is required to address constraints in supply, develop UK capability and capacity. This will enable the UK to grow market share of the combined £1,300 bn serviceable domestic and export market through to 2035.

Key elements are the Plan are:

- **A make or buy prioritisation assessment** considering inputs from a previous study, Supply Chain Capability Assessment [3]
- **The priorities for the UK** based on the outcomes of the make or buy assessment
- **Respond**, **Expand** and **Disrupt** programmes to build the UK's supply chain investing in new facilities, research and development activities

Execution of the plan requires collective work across the sector and will be enabled by addressing prerequisites to create an **environment to succeed**, a **Delivery Body** to co-ordinate and promote UK supply chain **funding & investment** and **key performance indicators** (KPI's) to monitor progress.

As the UK's capability and the sector develops, the Growth Plan will require ongoing refinement to ensure effort is directed to the technologies and parts of the supply chain the UK is best placed to lead.



> "A new Offshore Wind Industrial Growth Plan should be....based on a sober and thorough "make or buy" strategic competency analysis."
>
> -- Tim Pick
> (OWGP Chair Former OSW Champion)

UK Priorities

A repeatable prioritisation framework was developed considering the whole offshore wind supply chain, to identify the priorities for the UK. The framework built on data from sources including the Supply Chain Capability Analysis[3] and the Innovation Roadmaps[35] supplemented with additional analysis.

The framework assessed:

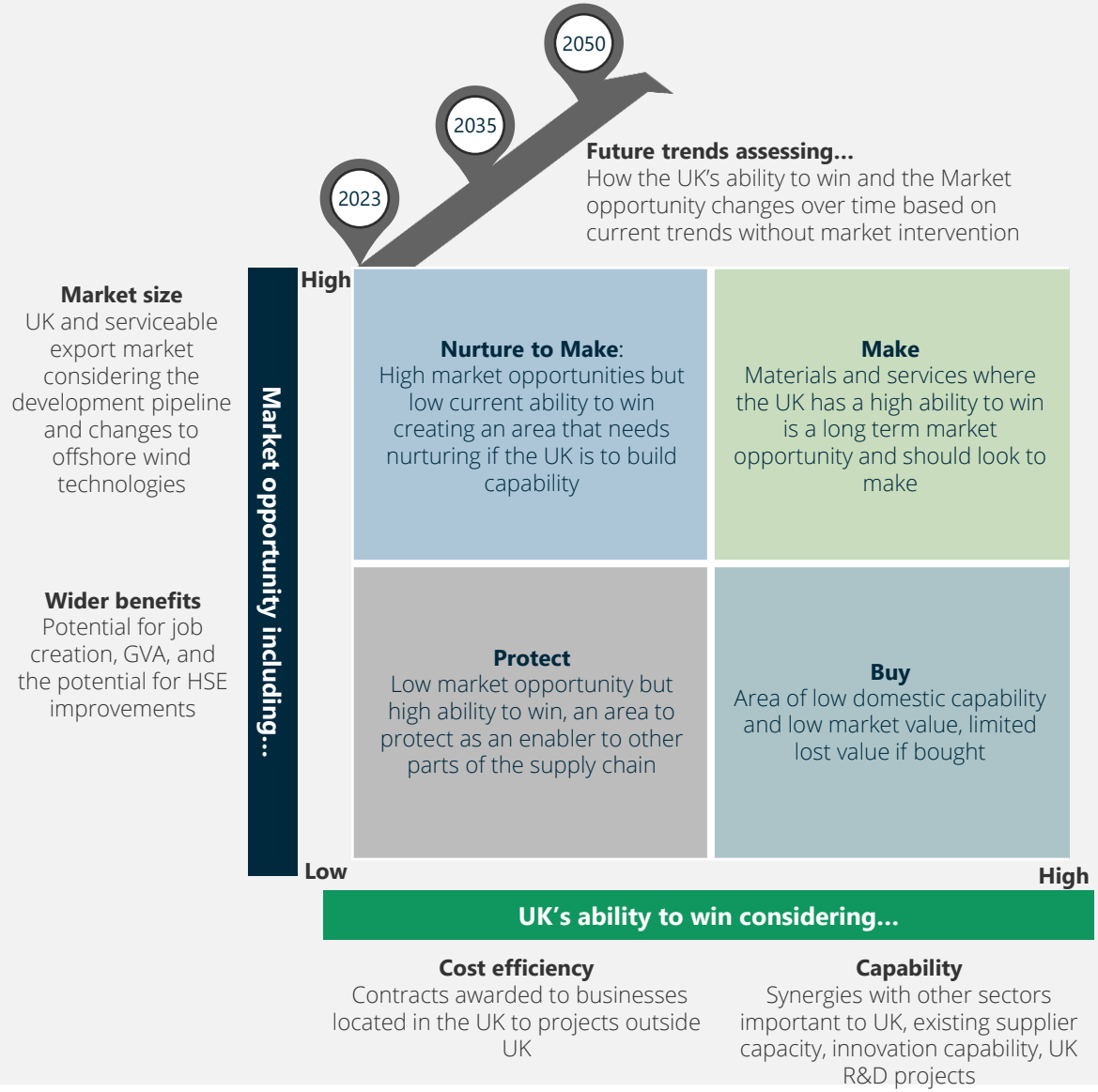
- **The UK's ability to win**: Considering the UK's end-to-end capability and current ability to win contracts in international markets
- **Market opportunity:** Serviceable market potential based on project pipelines for the UK and export markets and potential for GVA and jobs benefits (based on outcomes of the OWIC and OWGP funded Supply Chain Capability Analysis[3])
- **Future trends**: Assessment of how the UK's ability to win and the market opportunity change over time based on current trends without market intervention

The outcomes enabled the identification of a strategy for the UK today:

- **Make**: Materials and services where the UK has a high ability to win is a long term market opportunity and should look to make
- **Buy**: Area of low domestic capability and low market value, limited lost value if bought
- **Nurture to Make**: High market opportunities but low current ability to win creating an area that needs nurturing if the UK is to build capability
- **Protect**: Low market opportunity but high ability to win, an area to protect as an enabler to other parts of the supply chain

The outcomes reflect the capability and market today accounting for current trends. As the UK and sector develops, the periodic monitoring will identify key changes from today to understand where further opportunity and intervention is needed.

Make or buy prioritisation framework



Manufacturing Opportunity

Turbine Blades & Towers: Towers and blades manufacturing can stimulate economic growth and job creation. The UK has a Siemens Gamesa's blade factory in Hull and Vestas' plant in the Isle of Wight, however there is a need for additional capacity to support the development pipeline. Drive Train components (Power Convertors / Gearboxes / Generator) have limited current supply in UK but potential for IP generation for the next generation of components. Without the adjacent supply chain such as casting, other WTG components as nacelle assembly are not considered a make opportunity for the UK and will not be considered in this plan.

Subsea Foundations & Substructures: By 2035, there is expected an increase demand of foundations for turbines and substations. The UK has existing expertise with companies such as Smulders. Despite the presence of lower cost jackets in the global market, the UK can utilise its design and technical capability in jackets and semi-submersibles to progress the sector towards deepwater foundations and floating foundations through alternative and automated production techniques, enabling the UK to benefit from an increased adoption of these technologies. Monopile foundations will have a consistent demand in the next few years and are not anticipated to require additional intervention following SeAH's investment in Teesside.

Electrical Systems and Cables: Array and export cables form a crucial part of the UK supply chain with several companies, such as JDR Cables, based in the UK servicing domestic and export markets. Further investment is being made by Sumitomo and XLCC for new manufacturing facilities. Building upon the success of the High Voltage Alternate Current (HVAC) system in North East of UK, there is an opportunity for the UK supply chain to pioneer innovations in the electrical system. With the expansion of WTG size and distance from shore, the High Voltage Direct Current (HVDC) grid is becoming an important solution for electricity transmission. Despite the UK's limited infrastructure for DC substation manufacturing, the supply chain can develop a new interoperable electricity network system, facilitating the scale-up of offshore wind.

Component	UK's ability to win: Cost-efficiency[a]	UK's ability to win: Capability[b]	2035 Market opportunity: Wider benefits	2035 Market opportunity: Market value	Outcome
Tower	Low	Medium	High	High	Make
Blades	Low	High	High	High	Make
Nacelle assembly	Low	Medium	Medium	High	Buy
Drive train	Low	High	High	Medium	Nurture
Yaw and electrical system	Low	High	Medium	Medium	Buy
Monopile foundation	Medium	High	Medium	Medium	Protect
Monopile Transition Piece	Low	High	Medium	Low	Protect
Deeper water foundations	Medium	High	Medium	High	Make
Steel semi-submersible	Medium	Medium	Medium	High	Nurture
Concrete semi-submersible	Medium	Low	High	Medium	Nurture
Moorings & anchors	Medium	High	Medium	High	Make
Static & dynamic array cable	Medium	High	High	High	Make
Offshore export cable	Medium	High	High	Medium	Make
Onshore export cable	Medium	Medium	Medium	High	Nurture
Electrical system & SCADA	Low	Low	High	Medium	Nurture
Offshore substation foundations	Medium	High	Medium	High	Make
Offshore substation topside	Medium	Medium	Medium	Medium	Buy

- High capability/output
- Medium capability/output
- Low capability/output

Make — High value & high ability to win
Buy — Low value & low ability to win
Nurture — High value & low current ability to win
Protect — Low value & high ability to win

Note: [a] Cost efficiency refers to number of contracts won in the global market by companies headquartered in the UK
[b] Capability refers to end-to-end capability across innovation and existing suppliers

Services Opportunity

Development Services: The UK has local expertise on services such as consenting, leasing and development alongside project procurement and management services. Development services only account for small portion of the total market and are services likely to be supported locally in overseas markets. As such they are not seen as a current priority for action.

Environmental Services: The UK holds a competitive edge in providing environmental services for offshore wind developments, attributed to its historical experience in offshore activities, well established industrial base, and a highly skilled workforce. These advantages, coupled with the country's leadership in research and development in this sector, position the UK to effectively increase its global market share in environmental services for offshore wind developments.

Installation, Operations & Maintenance: The UK has an important base of installation and operations & maintenance services suppliers with a skilled workforce and high-quality equipment. As development grows globally, the UK has a sizeable opportunity to export its skills and knowledge in these services. The UK has also capabilities in vessel design, operation, on-deck equipment. Due to labour and other costs, manufacturing of a UK based vessel fleet will be capital intensive and currently deemed an unlikely UK opportunity.

Additionally, UK suppliers are at the forefront of developing advanced O&M solutions, such as the use of drones for inspections or AI for predictive maintenance, further strengthening the UK's global position.

Decommissioning: Although the UK will need to leverage its extensive experience in offshore activities to carry out decommissioning projects efficiently, safely, and with minimal environmental impact, it will not represent a significant opportunity in the global market and is yet to be included as a priority in this plan.

Service	UK's ability to win: Cost-efficiency[a]	UK's ability to win: Capability[b]	2035 Market opportunity: Wider benefits	2035 Market opportunity: Market value	Outcome
Development services	Medium	Medium	Medium	Low	Buy
Wind turbine installation	High	Medium	Low	Medium	Protect
Wind turbine installation vessels	High	High	Low	High	Make
Monopile installation	High	Medium	Low	Low	Protect
Jacket installation	High	Medium	Low	Medium	Buy
Foundation installation vessels	Low	Medium	Low	Medium	Buy
Floating turbine installation	Medium	Medium	Medium	Medium	Nurture
Floating assembly	Medium	Low	High	Medium	Nurture
Array and offshore export cables installation	High	Medium	Medium	Low	Buy
Cables installation vessels	Low	Medium	Medium	High	Nurture
Landfall HDD & Cable Pull	High	Medium	High	Medium	Make
Onshore export cables installation	Medium	Low	Medium	Medium	Buy
Offshore substation (OSS) installation	Medium	Low	Medium	Medium	Buy
Environmental surveys	High	High	High	Medium	Make
Operations Team	Low	Medium	High	High	Make
Asset Management Services	Low	High	High	High	Make
Commercial & Insurance	Low	Medium	High	High	Make
Scheduled maintenance & repairs	Low	High	High	High	Make
O&M vessels	Low	High	High	High	Make
Decommissioning	Low	Medium	Medium	Low	Nurture

High capability/output
Medium capability/output
Low capability/output

Make — High value & high ability to win
Buy — Low value & low ability to win
Nurture — High value & low current ability to win
Protect — Low value & high ability to win

Note: [a] Cost efficiency refers to number of contracts won in the global market by companies headquartered in the UK
[b] Capability refers to end-to-end capability across innovation and existing suppliers

Securing the priorities

The outcome of the prioritisation assessment identified specific parts of the supply chain for the UK to develop. They span across the full lifecycle of an offshore wind farm and can be grouped into five areas. Each are at different maturities domestically and internationally and require specific action to accomplish the necessary industrialisation.

Investment is required to build domestic capability and capacity and undertake future focused research programmes. Actions to support the UK's development have been determined and grouped into three programmes to achieve the following objectives:

- **Respond** to current supply chain constraints and ensure capacity to secure the domestic opportunity and maintain the UK's current market position by investing across critical areas
- **Expand** on the UK's current research and development capability, SME's and existing capacity to capture international market share and grow the UK's export capability
- **Disrupt** the status quo and address current market challenges leveraging the UK's research, development and design capability through technology innovation and commercialisation to put the UK at the centre of offshore wind advancement

Respond programmes are the immediate priority and primarily focused on infrastructure investments that are needed in the market. Unless the UK takes action to build capability in these areas it risks losing the opportunity to international competitors. Expand programmes further build out capacity in time for emerging export markets.

Disrupt programmes primarily focus on building knowledge and intellectual property and then translating this into future capacity developments as the technologies mature. With the pace of technology the UK needs to remain flexible and adapt Disrupt activity and resource should sector priorities change to maximise future return on today's investment.

The UK's 'Make' priorities

Advanced Turbine Technology
- Turbine design and engineering
- Tower
- Blades
- Drive train components
- Composite-based components
- Automation of manufacturing process
- Leading edge protection

Industrialised Foundations & Substructures
- Floating foundation design
- Deeper water & floating foundations
- Moorings and anchors
- Automated welding
- Composites for light weight foundations
- Synthetic mooring line materials

Future Electrical Systems and Cables
- Array cables
- Export cables
- Dynamic inter-array cables at 132kV
- HVDC system interoperability
- Standardised systems

Smart Environmental Services
- Environmental surveys
- Autonomous vehicles for environmental survey
- Machine learning for environmental impact analysis

Next Generation Installation, Operations and Maintenance
- Wind turbine installation
- Operations and maintenance
- Cables installation vessels operation

Programmes

Respond
- Immediate priorities
- Investment in capacity
- Address near-term supply chain shortages
- Support the UK's domestic deployment targets
- Benefits to the UK before 2030

Expand
- Investment in additional capacity and capability
- Address emerging markets and future capacity requirements
- Targets exports
- Benefits to the UK around 2030

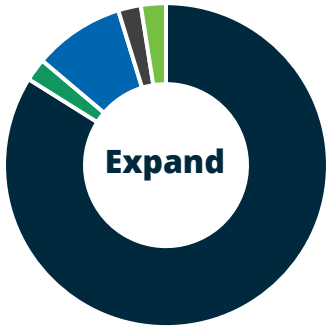
Disrupt
- Investment in research, development and design
- Enable technology innovation
- Address market challenges
- Position the UK as centre for offshore wind
- Longer term benefits to the UK

Investment, Programmes and Impact

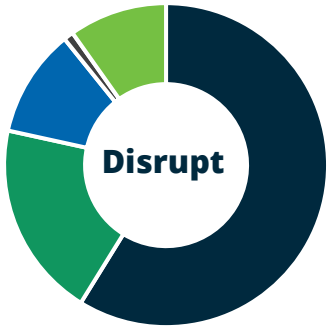
The investment requirements below set out estimates of funding, whether from private or public sources, to deliver priorities and actions identified within the plan. It does not cover wider enabling investment in grid or port infrastructure, nor investments in facilities announced prior to April 2024

	Respond	Expand	Disrupt
Total Investment	£800-1,660m	£430-800m	£110-330m
GVA over 10 years*	£9.8-18.2bn	£3.2-5.4bn	£1.2-2.3bn

	Investment need
Increase UK manufacturing capacity of offshore wind blades by 50%	£200-400m
Expand UK foundation manufacturing for designs catering to deep waters	£70-100m
Increase UK capacity of mooring and anchors by 50% from 2023	£20-50m
Add floating foundation manufacturing capacity of 50 units p.a.	£100-200m
Increase HVDC manufacturing capacity by securing two facilities	£200-400m
Build extensive marine datasets	£5-10m
Increase supplier base of EPCI companies	£1-5m
Upgrade fleet of cable laying vessel	£100-200m
Establish a late stage test & demonstration facility	£100-300m



	Investment need
Double UK manufacturing capacity of offshore wind blades to 300% of today	£200-400m
Manufacture advanced composite material blades and towers	£20-30m
Establish one new tower manufacturing facility	£150-250m
Manufacture advanced material for mooring and anchors	£10-20m
Manufacture dynamic inter-array cable at 132kv or more	£30-50m
Deploy autonomous surveys	£10-20m
Develop cable installation technique reducing cable damage	£1-10m
Deploy low carbon vessels for installation and O&M services	£10-20m



	Investment need
Increase automation of wind turbine blade manufacturing process	£20-80m
Develop automation process for high-value component manufacturing	£10-40m
Advance leading edge blade protection	£30-90m
Develop next generation drive train	-
Produce advanced material for part of the floating substructure	£20-50m
Reduce number of cable related failures/reliability issues	£1-5m
Develop interoperable HVDC systems	£10-30m
Develop new cables design and materials	-
Develop ML techniques optimising environmental surveys	£1-10m
Integrate Machine Learning (ML) algorithms in O&M services	£1-5m
Commercialise next generation inspection, monitoring and installation	£10-25m

Priorities:
Advanced Turbine Technology | Industrialised Foundations & Substructures | Future Electrical Systems & Cables | Smart Environmental Services | Next Generation Installation and O&M | Cross-cutting

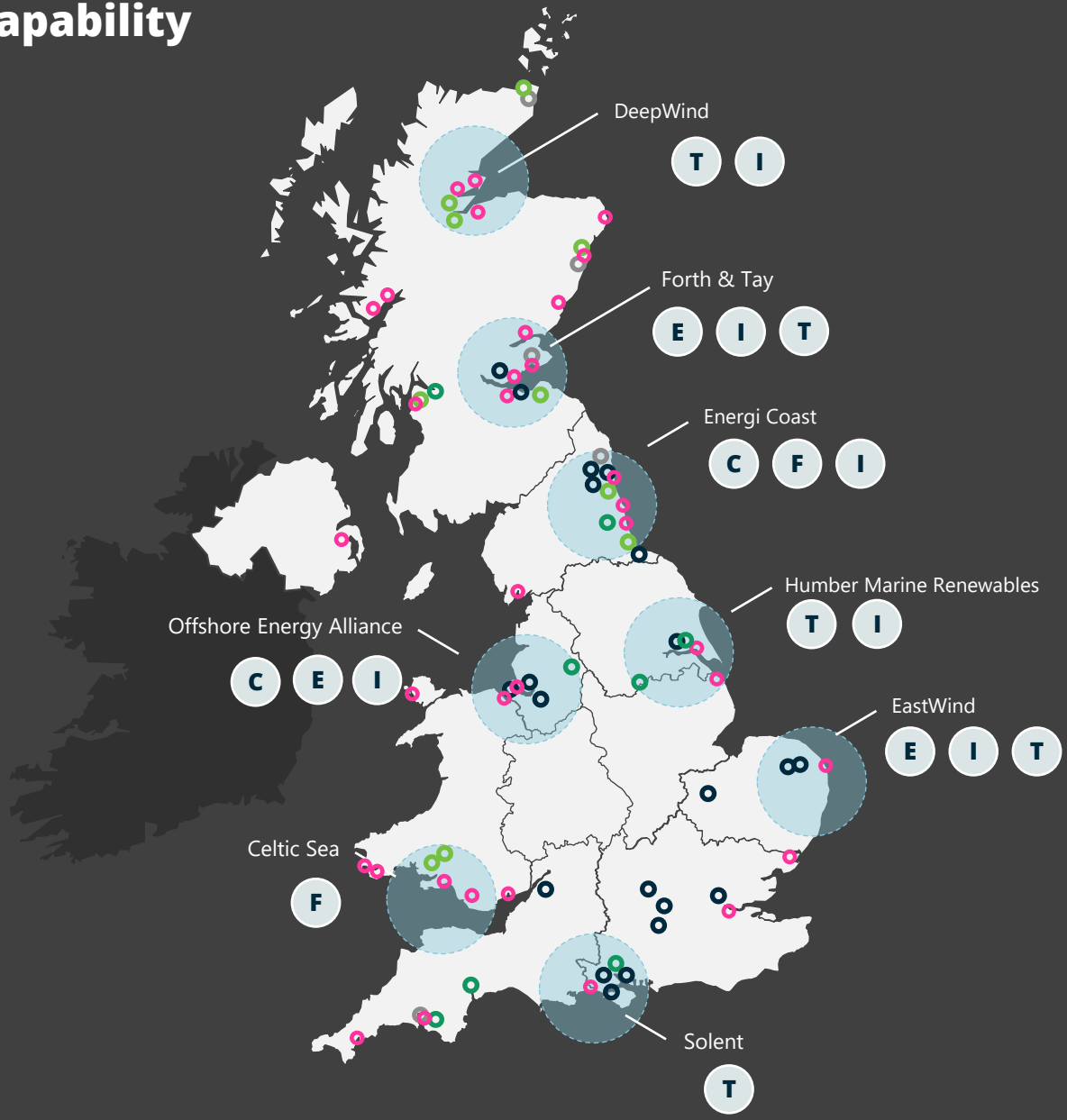
* GVA generated over 10-years calculated for each investment

Leveraging the UK's Regional Capability

The UK has existing clusters of supply chain capability spread from Northern Scotland down to South West England. These have emerged from collaborative effort and will play a pivotal role in growing the UK's competitive advantage. The clusters have diverse capability across the priorities and bring together industry, Governments, academia and the community to boost productivity and competitiveness and drive innovation.

It is critical for the success of the sector to coordinate efforts and leverage the skills, expertise and concertation of existing industry to provide the best opportunities to maintain and grow the UK's position in the supply chain. This includes developing the appropriate port infrastructure and enabling test & demonstration facilities to create opportunities across the UK to have a connected network of capability.

The benefits of clustering activity is not restricted by geographic boundaries, however expanding the natural ability of the clusters will help to accelerate the UK's wider capability. New investment will grow the UK's ability to innovate, supply domestic capability and expand exports and accelerate deployment.



Key[a]

- T Turbine Blades & Towers
- F Foundations & Substructures
- C Electrical Systems and Cables
- E Environmental services
- I Installation, Operations & Maintenance
- Offshore wind clusters
- Existing facilities
- Potential facilities
- Ports
- Academic partnerships
- Test Centres

Notes: [a] List of facilities are non-exhaustive [b] Regional GVA calculated for Growth Plan actions where regional impact could be identified through previously expressed investment plans or location of current UK facilities

Advanced Turbine Technology

2035

- The UK has a production output 3x greater than in 2023, with the worlds greatest performance in leading edge protection and the highest rate of first pass yield in blade production

UK

£46bn

2024-35 serviceable market

Investment

£630-1,290m

Estimated investment need

Global

£139bn

2024-35 serviceable market

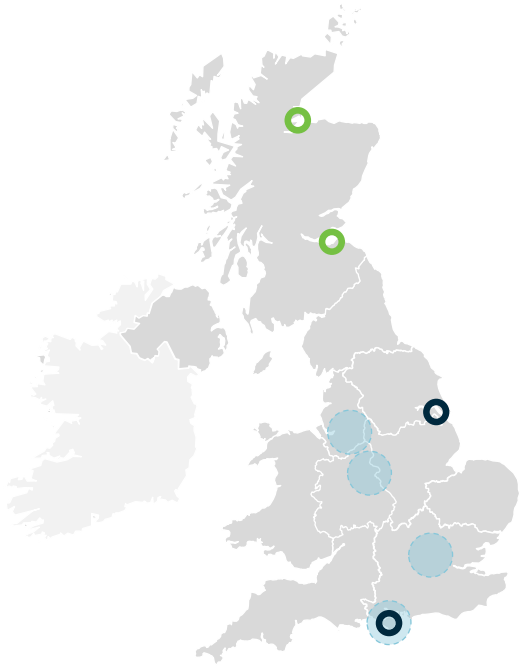
Benefit

£4.9-8.0bn

Estimated incremental 10-year GVA

Goals

Respond	Increase UK blades capacity by 50% from 2023	2027
Expand	Double UK blade capacity from 2026, and develop capability to produce >15 MW turbine blades	2030
	Introduce manufacturing capability to produce advanced composite material blades and towers for fixed and floating	2033
Disrupt	Increase UK manufacturing productivity by 20%	2032
	Achieve first pass yield outcome greater than 95% in the UK	2035
	Develop world leading solutions that reduce leading edge erosion by 60% in the UK	2035
	Develop next generation drive train technology	2030



Existing facilities | Potential investments | Capability areas

UK's comparative advantage

Existing production facilities from two of Europe's leading OEMs with a myriad of smaller components manufacturing facilities

ORE Catapult's 100m blade test facility in Blyth able to perform a full range of advanced testing procedures in blades to be installed in UK projects or UK developed

World leading expertise in composite materials with key composites being widely used in aerospace, automotive, construction and infrastructure, defence, marine, oil and gas and rail

Investment

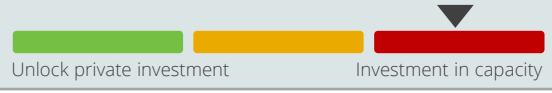
£570-1,080m
Estimated investment need

£185bn
Market opportunity cumulative 2024-2035

£4.6-7.5bn
Estimated incremental 10-year GVA

1300-2600
Net increase in annual Jobs

Level of support required

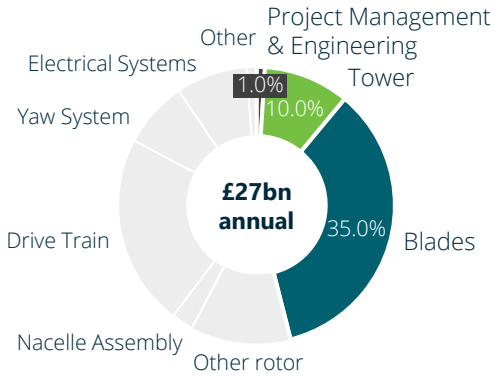


Specific components to be developed in the UK

- Future turbine design and engineering
- Tower
- Blades
- Drive train

The current UK supply for blades outweighs the demand and both blades and towers are imported from Europe. Investment in the UK supply chain to manufacture blades and towers for next generation of offshore wind turbines will increase the UK's competitive standing on the global stage.

Split of serviceable value additions by component
Base case scenario, average 2024-2035, £bn



*Interventions and benefits only corresponds to the highlighted components and services and are estimates only

			Completion year	Investment	GVA (10-Year)
R	Increase UK blade capacity by 50% from 2023	Increase the UK manufacturing capacity of offshore wind blades by a new manufacturing facility or expansion of existing facilities with a government grant to support it *Action owner: Industry*	2027	£200-400m	£1.8-2.7bn
E	Double UK blade capacity from 2026, and develop capability to produce >15 MW turbine blades	Increase the UK manufacturing capacity of offshore wind blades including blades for turbines of 15MW or more by a new manufacturing facility or expansion of existing facilities *Action owner: Industry*	2030	£200-400m	£1.8-2.7bn
E	Introduce manufacturing capability to produce advanced composite material blades and towers for fixed and floating	Following from the Joule Challenge, incorporate new composite-based components in the next generation of offshore wind turbine blades for at least 300 MW of production in the UK based facilities *Action owner: Industry*	2030	£20-30m	-
		Establishment of one new tower manufacturing facility focused on using composite material to decrease structure weight in floating offshore wind, with towers manufacturing capacity of 50 – 100 towers annually *Action owner: Industry*	2033	£150-250m	£1.1-£2.1bn

Investment £60-210m
Estimated R&D investment need

£266m
Market opportunity cumulative 2036-2050

£0.3-0.5bn
Estimated incremental 10-year GVA

90-180
Net increase in annual Jobs

Level of support required

Technology development focus areas for the UK are:

- Composite-based components
  - Composite materials in blade and tower manufacturing can lead to weight reduction, increasing electricity generation
- Automation of manufacturing process
  - Enhancing automation of blade manufacturing can improve process efficiency and reduce quality issues, directly improving wind farm reliability and leading to cost reduction
- Solution for leading edge erosion either via new manufacturing process or alternative bonding methods
  - Eliminating or reducing leading edge erosion will ensure aerodynamic performance is maintained throughout the blade lifetime, increases offshore wind farm revenues

The disruptive technologies will be enabled by a new Offshore Wind Innovation Development and Demonstration (WInDD) Hub including a world-class collaborative Advanced Turbine Technology Institute to support collaboration, technology development and demonstration. The technology institute will review wider opportunities to support technology development, including power converters, bearings, resin application.

			Completion year	Investment	GVA (10-Year)
D	Increase UK manufacturing productivity by 20%	Develop a proof of concept to prototype on automation system for blade manufacturing to be implemented in an existing manufacturing line to increase output *Action owner: Academia and Industry*	2028	£10-40m	-
		Incorporate automation of wind turbine blade manufacturing process in one facility in UK, increasing output by 20% *Action owner: Industry*	2032	£10-40m	£0.3-0.5bn
	Achieve first pass yield outcome greater than 95% in the UK	Following from the *Joule Challenge*, incorporate automated processes used to replace hand lamination (and other process with low levels of consistence) in the next generation of offshore wind turbines blades for at least 300 MW of production in the UK based facilities *Action owner: Academia and Industry*	2035	£10-40m	-
	Develop world leading solutions that reduce leading edge erosion by 60% in the UK	Develop leading edge protection via new manufacturing process (3D printing of constituent parts, forming processes) or new materials (alternative bonding methods) *Action owner: Academia and Industry*	2030	£20-50m	-
		Incorporate blade leading edge protection to one blade design, decreasing the level of repair needed across its lifetime *Action owner: Industry*	2035	£10-40m	-
	Develop next generation drive train technology	Open competition for next generation drive train technologies aiming at floating wind *Action owner: Academia and Industry*	2030	-	-

Automatic robot system for offshore wind blade manufacturing

The industry is moving towards an automated blade manufacturing process, the UK needs to learn from Denmark and improve their capability to ensure a competitive and efficient supply chain. Denmark is working on development of an automatised preforming robot system (APRS) for the layup of composite materials in the manufacture of large offshore wind turbine blades, through a partnership between Siemens Gamesa, Airborne, Syddansk University and Denmark's Tekniske University (DTU). The projects is set to finalise in 2026. The system will lay up the preform piles automatically replacing the current manual process. This project launched in 2023.

The APRS will decrease the time that large, expensive wind blade moulds occupy and will improve the quality of the blade. A reduction of 120-140 man-hours per blade is expected, as well as reduced material waste.

Offshore Wind as an Opportunity for UK Glass Fibre

Materials requirement

Significant scale-up in raw material production is required to meet the demand in the offshore wind pipeline – this includes metal productions such as steel and copper, carbon fibre, glass fibre, cement and resin.

- Carbon fibre plays a crucial role in the construction and performance of wind turbine blades
- Offshore wind industry's reliance on glass fibre composites extends beyond the blades to other structural components of wind turbines, including nacelles and towers

The versatility and strength of glass fibre make it a fundamental raw material across various UK industries, such as;

Construction: fibreglass-reinforced concrete and insulation materials production

Automotive: production of strong, lightweight components such as bodies, bumpers and interior parts

Aerospace: production of reduced weight aircraft components, improving fuel efficiency

Telecommunications: optical fibre manufacturing for high-speed data transmission

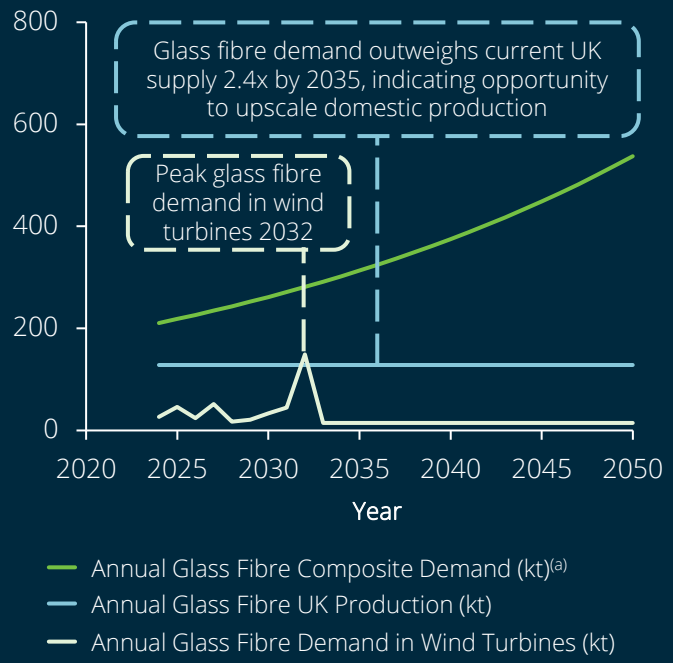
Considering the high demand from other industries along with the increased demand in offshore wind, import reliance will increase in the future.

Glass fibre production sector in the UK has the opportunity to substantially increase its capacity to keep pace with UK demand. For this, wider ecosystem of measures will be required:

Enhance engagement of OEMs and glass fibre manufacturers

Develop a recovery and recycling processes for used glass fibre products, including a novel process and routes to market

Glass fibre production and demand
kt, 2024-2050[38,39]



(a) Assumed rate of £1/kg of glass fibre as per OREC analysis on Sustainable decommissioning: wind turbine blade recycling


Wind turbine blade factory in Hull

Industrialised Foundations & Substructures

2035

- The UK becomes a major hub for deepwater and floating foundations manufacturing and assembly, with sizeable share in the exports market, commercialising advanced material based floating foundation solutions

UK

£47bn

2024-35 serviceable market

Investment

£220-420m

Estimated investment need

Global

£209bn

2024-35 serviceable market

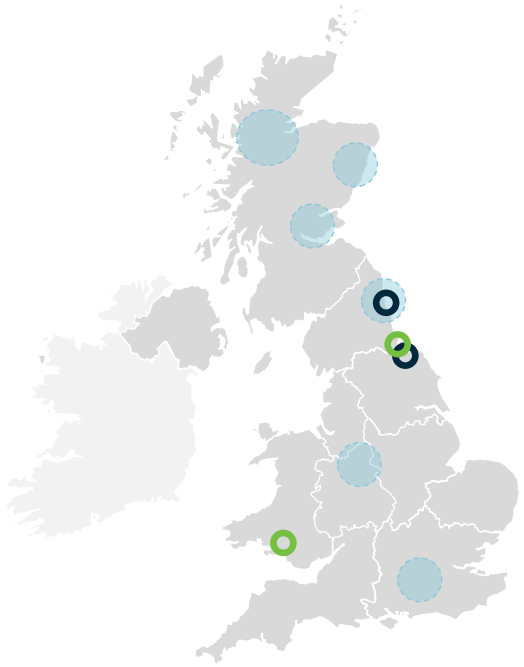
Benefit

£6.3-12.1bn

Estimated incremental 10-year GVA

Goals

Respond	Expand UK foundation manufacturing for designs catering to deep waters	2030
	Increase UK capacity of mooring and anchors by 50% from 2023	2030
	Develop UK manufacturing capability to produce 50 units of floating foundation per year	2030
Expand	Develop UK manufacturing capability to produce advanced material for mooring and anchors	2035
Disrupt	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%	2035



Existing facilities | Potential investments | Capability areas

UK's comparative advantage

Existing production facilities for jackets and transition pieces alongside a good capability in moorings and anchors which is being transferred from the UK's well established oil and gas industry

Development of the world' largest monopile factory currently underway creates an anchor point for the UK to further develop capability

The potential of some UK based fabrication yards to diversify into floating foundations, helping de-risk an existing floating wind pipeline of projects in the UK and establishing the UK as a first mover in a rapidly growing international market

Investment

£200-370m

Estimated investment need

£256bn

Market opportunity cumulative 2024-2035

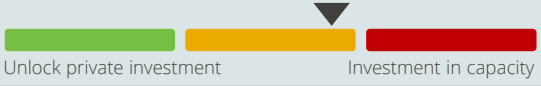
£5.5-10.5bn

Estimated incremental 10-year GVA

1100-3700

Net increase in annual Jobs

Level of support required

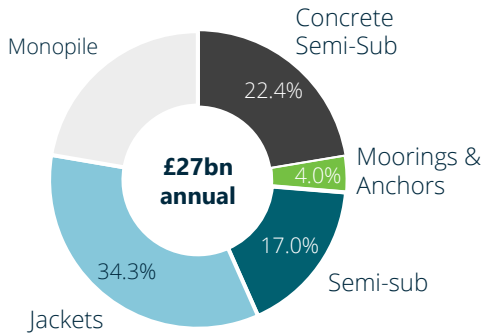


Specific components to be developed in the UK

- Floating foundation and design
- Deeper water & floating foundations
- Moorings & Anchors

Leveraging UK existing manufacturing facilities for jackets and transition pieces, and capability in moorings and anchors from oil and gas industry to expand into deep water designs. Particularly for floating and deeper water foundations, which would help the UK capitalise its first mover advantage in the floating offshore wind space.

Split of serviceable value additions by component
Base case scenario, average 2024-2035, £bn



*Interventions and benefits only corresponds to the highlighted components and services and are estimates only

			Completion year	Investment	GVA (10-Year)
R	Expand UK foundation manufacturing for designs catering to deep waters	Increase the UK manufacturing capacity of foundation focusing on design of foundations for deep water with a new manufacturing facility or expansion of existing facilities *Action owner: Industry*	2030	£70-100m	£1.2-2.0bn
R	Increase UK capacity of mooring and anchors by 50% from 2023	Support Floating Offshore Wind Centre of Excellence to accelerate the development and qualification of moorings & anchors, reducing cost and risk associated *Action owner: Industry*	2027	-	-
R	Increase UK capacity of mooring and anchors by 50% from 2023	Extend the UK manufacturing capacity of moorings and anchor to total production capacity of 400 mooring lines and anchors, by adding a new manufacturing facility or expand existing facilities *Action owner: Industry*	2030	£20-50m	£0.3-0.5bn
R	Support acceleration of floating technology maturity	Support competition to identify, assess and support floating foundation technologies with the greatest potential to support UK development *Action owner: Industry*	2026	-	-
R	Develop UK manufacturing capability to produce 50 units of floating foundation per year	Develop sector "bill of works" on floating offshore wind needs and technical requirements, including moorings, and internal connectors *Action owner: Industry*	2026	-	-
R	Develop UK manufacturing capability to produce 50 units of floating foundation per year	Upgrade one fabrication yard's infrastructure to accommodate the specific requirements of manufacturing and assembling floating foundations. This may include larger assembly areas, specialised equipment e.g. automated welding and storage facilities *Action owner: Industry*	2030	£100-£200m	£4.0-8.1bn
E	Develop UK manufacturing capability to produce advanced material for mooring and anchors	Incorporate advanced material such as synthetic materials in the manufacturing facility of mooring and anchors specialised in offshore wind, developing the next generation of mooring and anchoring system *Action owner: Academia and Industry*	2035	£10-20m	-

Investment £20-50m
Estimated R&D investment need

£417bn
Market opportunity cumulative 2036-2050

£0.8-1.6bn
Estimated incremental 10-year GVA

270-540
Net increase in annual Jobs

Level of support required

Technology development focus areas for the UK are:

- Automated welding
  - Automation of the welding process can increase processing speed and reduce issues in quality control due to human error, both of which lead to cost reduction in the technology
- New materials such as composites for light weight foundations
  - Fabrication of lighter weight foundations can enable the use of bigger turbines increasing electricity generation
- New designs and materials for moorings and anchors such as synthetic mooring line materials
  - Secure long term demand for our current and future manufacturing capacity
  - Potential cost savings compared to conventional steel chain or wire moorings

The disruptive technologies will be enabled by a new Offshore Wind Innovation Development and Demonstration (WInDD) Hub to support collaboration, technology development and demonstration.

D 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%

	Completion year	Investment	GVA (10-Year)
Hold an open competition for floating offshore wind foundations design project, aiming to reduce the steel weight and associated costs of offshore wind floating foundations *Action owner: Academia and Industry*	2027	£1-10m	-
Integrate winning solution in one commercial demonstration project for floating offshore wind in UK *Action owner: Academia and Industry*	2032	£1-10m	-
Following the successful demonstration project, expand 20% floating offshore wind manufacturing capability to the new design *Action owner: Industry*	2035	£20-30m	£0.8-1.6bn

Transferable floating dry dock to be deployed

The US is investing into transportable floating dry dock solutions, for floating offshore wind assembly. The solution would help eliminate issues arising due to insufficient water depth and lack of assembly space at the ports to build and loadout the substructures.

The solution is being developed through a partnership between Crowley, a US-based supply chain solution provider, and Tugdock to provide a ready-to-go solution that does not require planning or environmental permissions. The partnership, which commenced in 2023, is exploring potential uses of the platform in locations such as the US West Coast where water depth and conventional dry docks may be ill-suited for the logistics required.

Tugdock is a UK based company is jointly working with US-based supply chain solution provider to develop this innovative solution, which will solve logistics challenges and accelerate the growth of floating offshore wind in the US. It is important that the UK fosters such partnerships within the UK to protect the UK's comparative advantage and stay at forefront of floating technology innovation.

High Grade Low Carbon Steel Opportunities in the UK

UK Steel industry overview

Steel is a key material used in offshore wind components, and on average it contributes to more than 80% of the total weight of a wind turbine system.

An estimated 19 Million tonnes of steel would be required in the next 12 year equating to an average of ~1.5 million tonnes of steel per year from the Offshore wind sector[40]. This is more than 20% of the UKs total steel production in 2022. Alignment efforts between offshore wind and the steel sector can bring out significant value add for the sectors and the UK.

Additionally, to meet Government targets, the steel industry needs to transform towards a net zero steel sector. Industrial electricity prices are a key barrier as net zero steel production uses more electricity. However, the opportunities are significant as no steel sector or steel company in the world has yet successfully decarbonised. [41]

The UK steel industry would need drastic transformation to realise most benefit, mainly across three priority areas:

- **Cost Competitiveness:** Steel sourced from the UK is comparatively costlier than other competing countries such as Germany, China and India. One of the factors impacting steel cost is electricity cost. On an average, steel producers in the UK paid 61% higher electricity prices compared to their competitors in Germany in 2022 [42]. In the period between 2016 to 2021 the UK steel sector paid £345million higher due to electricity price disparity compared to Germany[42]. This has resulted in significant imports for steel from lower cost countries. In 2022 around 55%[43] of the UK's overall steel demand were met through imports.
- **Production strategy alignment:** Despite having significant demand expected from offshore wind sector**,** currently no suppliers in the UK is fabricating the grade and quality of steel required for manufacturing of substructures to cater to the offshore wind sector. Germany for example produces all major grades of steel required in offshore wind sector.

Some actions could booster and drive more investment in the sector in the UK , allowing the UK to secure a first mover advantage in the net zero steel sector:

Supply ~7 Million Tonnes
Of finished steel products produced in the UK in 2022[42]

Demand ~19 Million Tonnes
Cumulative steel demand from offshore wind in the UK to 2035[40]

Core demand centres for decarbonised steel

Electric vehicles | *Wind turbines* | *Energy* | *Infrastructure & rail* | *Construction*

Measures to improve competitiveness of UK industrial electricity pricing and/or extended supports and exemptions for policy and network costs

Financial support for energy efficiency projects

Create a market for Net Zero steel, ensuring that consumers have the information they need to make lower carbon steel choices and that imported, high-emission steel does not undermine domestic investment


Hutchinson Engineering Secondary Steel

Low Carbon Concrete for Offshore Wind

UK Concrete sector overview

Concrete is an important part of the offshore wind sector supply chain and significant amount of concrete is utilised in deployment of wind turbines. Particularly with turbines using concrete based substructures.

The UK has a strong presence in concrete segment with more than 95% of concrete utilised in the UK sourced locally. The concrete sector has also made significant progress in reducing the carbon content of concrete in last decade and is aiming to be carbon negative by 2050. Concrete and the offshore wind sector can drive synergies with a more concerted approach. Gravity based foundation structures for seabed conditions unsuitable for monopile and jacket foundation offer high UK content and decarbonisation opportunities.

With the drive for green content and companies announcing Scope 1-3 decarbonisation goals, the market is set to be disrupted with demand for green concrete expected to rise in the future. The UK can establish a comparative advantage in this space which can support the national decarbonisation agenda by addressing key targets such as 2050 Net Zero – MPA is targeting a carbon negative concrete sector.

Given the capital Intensive nature and the wider Impact it entails on the whole of the UK's economy, such transformation will require co-ordinated measures across the industries, producers and the government.

Demand ~15 Million m^3

Of ready made concrete sold in the UK in 2022[44]

Core demand centres for concrete

Wind turbines | *Construction* | *Energy*

Decarbonisation opportunity

Industry

- Voluntarily drive demand for UK manufactured green concrete
- Standard reporting mechanism for environmental impacts for incentives and rewards tracking

Producers

- Production capacity build through new capacity, retrofits and facility upgraded
- Offshore wind and concrete industry collaboration

Government

- Government grants to accelerated adoption of green concrete
- Policy mandates: Mechanisms such as UK ETS and the UK CBAM
- Sustainable Industry Rewards supporting decarbonisation
- Competitive industrial electricity tariffs

Green cement/concrete supply

Voluntary industry wide demand

Regulatory environmental support

Decarbonisation targets

Future Electrical Systems & Cables

2035

- The UK has a strong manufacturing base for cables and electrical (HVAC & HVDC) systems and is an export leader, supplying across offshore wind and other grid infrastructure development programs

UK

£19bn

2024-35 serviceable market

Investment

£240-480m

Estimated investment need

Global

£77bn

2024-35 serviceable market (Global)

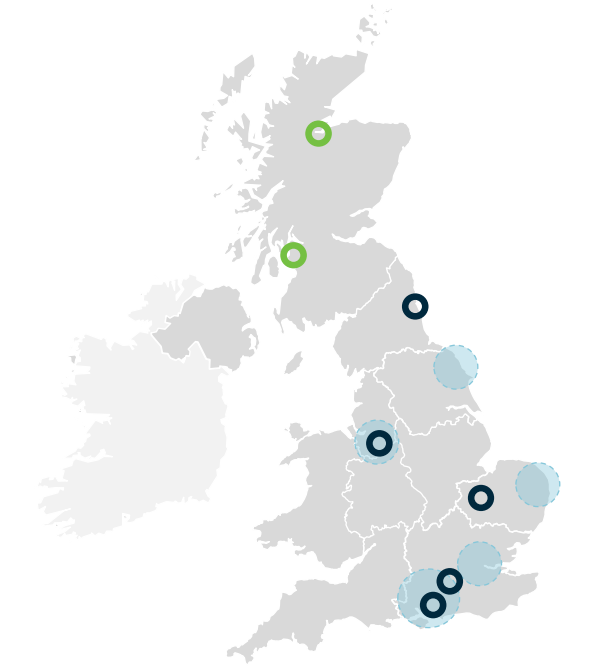
Benefit

£1.7-3.4bn

Estimated incremental 10-year GVA

Goals

Respond	Increase HVDC manufacturing capacity by securing two proposed facilities	2026
Expand	Develop UK manufacturing capability to produce dynamic inter-array cables at 132kV in 20% of its factory	2030
Disrupt	Reduce the number of cable related failures/reliability issues of UK supplied cables by 80%	2028
	Develop has mutually compatible and interoperable HVDC systems in the UK	2035
	Develop new wet and dry cable designs and materials	2035



Existing facilities | Potential investments | Capability areas

UK's comparative advantage

The UK has more than 5 major suppliers with expertise across Cables, HVAC and HVDC electrical systems and it is further expanding its manufacturing capability in cables, with two new HVDC factories announced in 2023

The UK electrical engineering sector has traditional strengths with strong academia and research, leading to a significant number of patents and R&D projects in cables being developed in the UK

The UK is a major exporter of cables with UK based companies winning offshore wind contracts in 12 countries across Europe, APAC and North America

Investment

£230-450m

Estimated investment need

£96bn

Market opportunity cumulative 2024-2035

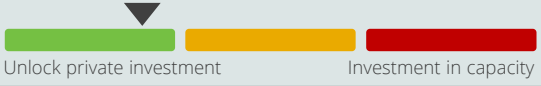
£1.6-3.2bn

Estimated incremental 10-year GVA

560-1300

Net increase in annual Jobs

Level of support required

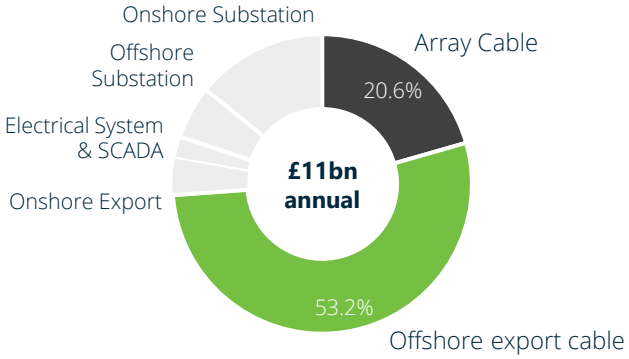


Specific components to be developed in the UK

- Array cables
- Export cables
- Cable protection systems
- Electrical system design

Historically, the UK has been a major hub for the supply of power transformers and other HVAC components. The UK can capitalise on its knowledge to cater for future demand for >132 KV dynamic cables and HVDC systems.

Split of serviceable value additions by component
Base case scenario, average 2024-2035, £bn



*Interventions and benefits only corresponds to the highlighted components and services and are estimates only

			Completion year	Investment	GVA (10-Year)
R	Increase HVDC manufacturing capacity by securing two facilities	Support plans for HVDC cables and connectors through initiatives such as grants, and apprenticeship program support *Action owner: Government*	2026	£200-400m	£1.5-2.9bn
		Support infrastructure development through streamlining permits and providing regulatory assistance to expedite the construction *Action owner: Government*	2026	-	-
E	Develop UK manufacturing capability to produce dynamic array cables rated at 132KV or more in 20% of its factory	Support Floating Centre of Excellence programme to de-risk and accelerate the development of high voltage dynamic power cables (>132kV) *Action owner: Academia and Industry*	2028	£1-5m	-
		Demonstrate the feasibility and reliability of 132KV dynamic cable (and/or 275 kV static and dynamic) on at least one UK demonstration project summarising key findings in terms of quality, installation process and wider benefits *Action owner: Academia and Industry*	2028	£1-5m	-
		Establish a new or expand an existing cable manufacturing plant to manufacture 132KV or more dynamic array cable *Action owner: Industry*	2030	£30-40m	£0.2-0.3bn

Investment £10-30m
Estimated R&D investment need

£124bn
Market opportunity cumulative 2036-2050

£0.1-0.2bn
Estimated incremental 10-year GVA

130-260
Net increase in annual Jobs

Level of support required

Technology development focus areas for the UK are:

- Dynamic inter-array cables at 132kV
  - Dynamic cabling is essential for the roll out of floating offshore wind technology. Increasing the voltage of dynamic inter-array cables enables either more turbines to be connected to each string or the use of larger wind turbines, reducing installation costs for developers and increasing the sector market share potential for suppliers
- HVDC system interoperability
  - HVDC grids will enable interconnection of offshore grids, connection of wind farms to different national markets and offshore loads as well as power exchange between regions. Defining technical frameworks and standards to ensure that HVDC systems, HVDC transmission systems or HVDC components from different suppliers can work together is a key enabler for the formation of HVDC grids
- New designs and materials
  - Developing design competence will be essential to secure long term demand for our current and future manufacturing capacity

The disruptive technologies will be enabled by a new Offshore Wind Innovation Development and Demonstration (WInDD) Hub to support collaboration, technology development and demonstration.

			Completion year	Investment	GVA (10-Year)
D	Reduce the number of cable related failures/reliability issues of UK supplied cables by 80%	Support ORE's ELECTRODE program, anonymous data sharing to be use for data driven anomalies for fault identification *Action owner: Industry*	2026		-
		Run a joint study (Developers, cables manufacturers and installers) to understand failure mechanisms *Action owner: Industry*	2026	£1-5m	-
	Develop mutually compatible and interoperable HVDC systems in the UK	Open competition for HVDC interoperability, aiming to increase compatibility of current systems (including any updates to European systems) *Action owner: Academia and Industry*	2030	-	-
		Integrate winning solution in one offshore wind demonstration project *Action owner: Academia and Industry*	2032	£1-5m	-
		Following the successful demonstration project, integrate new system into UK based HVDC manufacturing *Action owner: Industry*	2035	£10-20m	£0.1-0.2bn
	Develop new wet and dry cable designs	Open competition for new cable design and new polymers focusing on sustainability *Action owner: Academia and Industry*	2035	-	-

Design and demonstration of interoperability of HVDC grids

Europe are developing future HVDC systems which are mutually compatible and interoperable by design and to improving the grid forming capabilities of converters. It is an InterOPERA project co-funded by The European Union and Horizon Europe Framework Programme, a key funding programme for research and innovation in Europe.

The resulting system-level design will be usable as guidance to co-ordinate offshore network planning. This project can set future interoperability standards with large funding of a total of €69m[45]. It has launched in January 2023, and set to finalise in April 2027. TO ensure forward compatibility for future system expansion, the UK needs to ensure interoperable HVDC systems are de-risked and integrated within UK based manufacturing.

Smart Environmental Services

2035

- The UK is a world leader in environmental services providing environmental management and assessment services to 30% of developments globally, with constant innovation in the hardware and software combination to optimise services

UK

£0.5bn

2024-35 serviceable market

Investment

£20-40m

Estimated investment need

Global

£0.5bn

2024-35 serviceable market (Global)

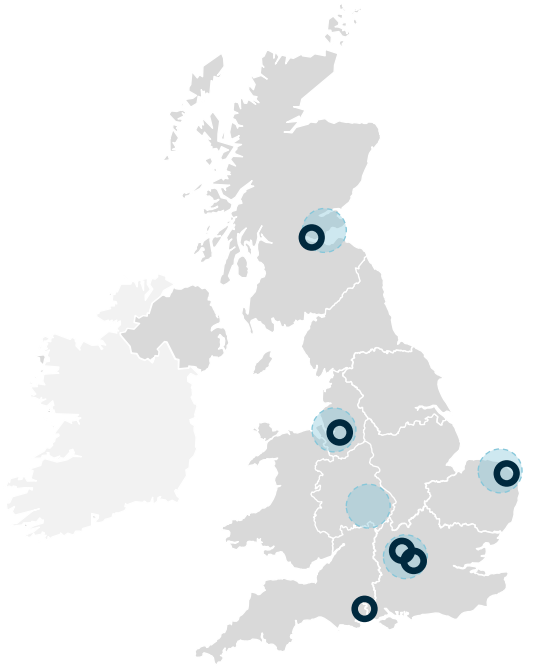
Benefit

£0.2-0.5bn

Estimated incremental 10-year GVA

Goals

Respond	Build extensive marine datasets	2028
Expand	Claim the top position global in providing surveying services across global serviceable markets, with more than 30% of contracts awarded to UK suppliers	2030
Disrupt	Integrate multiple Machine learning techniques optimising environmental surveys and minimising ecological impact in the UK	2030



Existing facilities | Potential investments | Capability areas

UK's comparative advantage

The UK has longer experience in offshore wind development with the environmental surveys historically being provided by UK based suppliers, creating a depth of knowledge

The UK is an important provider of environmental and development services in the global market, with a long track record in exporting services across more that 28 projects summing to c.22GW capacity in the last 8 years

The UK is home to many companies at the forefront of survey technology, including remote sensing and data analysis tools, providing more accurate and efficient surveys

Investment £20-30m
Estimated investment need

£1bn
Market opportunity cumulative 2024-2035

£0.2-0.5bn
Estimated incremental 10-year GVA

110-200
Net increase in annual Jobs

Level of support required

Unlock private investment — Investment in capacity

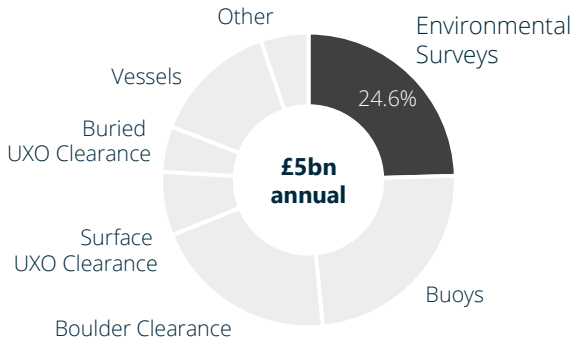
Specific services to be developed in the UK

- Environmental surveys

Historically, the UK has been a major hub for environmental surveys. The UK can leverage its comparative advantage to advance environmental services and cater to a bigger share of the global market.

			Completion year	Investment	GVA (10-Year)
R	Build extensive marine datasets	Expand data collection part of the Marine Data Exchange with projects being planned and executed to help better inform new developments which will be enabled by the partnership between Crown Estate Scotland and The Crown Estate to accept marine data submissions from Crown Estate Scotland tenants *Action owner: Industry*	2028	£5-10m	£80-120m
		Following Offshore Wind Evidence and Change Programme, Industry wide collaboration to respond to barriers identified OWIC's Pathways 2 growth group to improve consenting outcomes *Action owner: Industry*	2028	-	-
E	Claim the top position global in providing surveying services across global serviceable markets, with more than 30% of contracts awarded to UK suppliers	Develop advanced robotics solution for autonomous surveying through collaboration between ORE Catapult's technology innovation centres such as DARE and the industry to reduce consenting time by 40% *Action owner: Academia and Industry*	2030	£10-20m	£0.2-0.3bn

Split of serviceable value additions by component,
Base case scenario, average 2024-2035, £bn



*Interventions and benefits only corresponds to the highlighted components and services and are estimates only

Investment £1-10m

Estimated R&D investment need

£1bn

Market opportunity cumulative 2036-2050

-

Estimated incremental 10-year GVA

-

Net increase in annual Jobs

Level of support required

Unlock research — Commercialise

Technology development focus areas for the UK are:

- Autonomous vehicles for environmental surveying
  - Combining sensor technology with unmanned autonomous vessels could be a cost efficient way of performing environmental assessment services, as well as reducing costs, CO2 emissions and personnel risk
- Machine learning for environmental impact analysis including species monitoring and habitat mapping
  - Supporting a more streamlined approach to environmental impact assessments (EIA) and accelerating the consenting process

The disruptive technologies will be enabled by a new Offshore Wind Innovation Development and Demonstration (WInDD) Hub to support collaboration, technology development and demonstration.

			Completion year	Investment	GVA (10-Year)
D	Integrate multiple Machine Learning techniques optimising environmental surveys and minimising ecological impact in the UK	Open call for innovation projects integrating Machine Learning and AI with environmental surveys to decrease ecological impact *Action owner: Academia and Industry*	2025	-	-
		Standardise open data in transferable formats to help develop models and AI training *Action owner: Industry*	2028	£1-5m	-
		Integration of winning technology/project in a demonstration project in the UK with InnovateUK grant funding *Action owner: Industry*	2030	£1-5m	-

Deployment of wind lidar buoys in the North Sea

As part of the area development plan, Germany is using automated lidar buoys for meteorological investigations. The Fraunhofer Institute for Wind Energy Systems investigation was contracted by the Federal Maritime and Hydrographic Agency of Germany to undertake a study into the deployment of automated buoys to carry out preliminary meteorological investigation in the North Sea as part of the area development plan. The buoys which were launched in autumn 2023, will precisely record both meteorological and oceanographic data for 12 months. In particular, the measurement results of wind conditions will contribute to an efficient and economic design of future offshore wind farms.

This is the fourth investigation to further accelerate offshore expansion in Germany. Collecting high-quality data is important in designing future offshore wind farms to ensure sustainability and durability.

Next Generation Installation, Operations & Maintenance

2035

- The UK is a centre of excellence for installation services and O&M with innovative installation technology optimising the requirement for installation vessels at scale

UK

£71bn

2024-35 serviceable market

Investment

£120-260m

Estimated investment need

Global

£211bn

2024-35 serviceable market (Global)

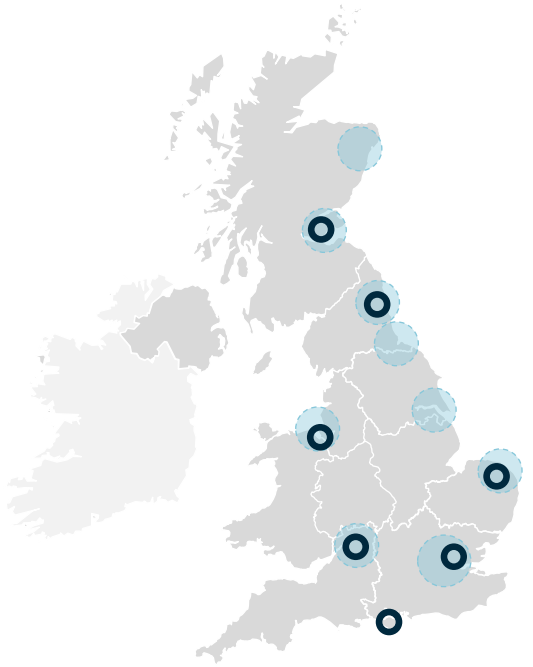
Benefit

£1.0-2.0bn

Estimated incremental 10-year GVA

Goals

Respond	Increase the UK's supplier base of EPCI companies	2027
	Increase the UK's fleet of cable laying vessels	2027
Expand	Implement a new cable installation technique in the UK eliminating cable damage during installation	2028
	Use only low carbon emission vessels for all installations, operations and maintenance services in the UK	2030
Disrupt	Integrate Machine Learning (ML) algorithms optimising operations and maintenance services	2032
	Commercialise next generation inspection, monitoring and installation services, implementing autonomous vehicles, robotic system and ML algorithms to process data from sensors	2035



Existing facilities | Potential investments | Capability areas

UK's comparative advantage

The UK has demonstrated supplier capability exemplified by companies like Seajacks, providing jack-up vessels to both the UK and European markets

The UK has extensive experience with offshore wind development and an established reputation as an expert in the O&M

The UK is home to many companies that are continually developing new and more efficient methods for O&M, such as remote monitoring and inspection

Investment

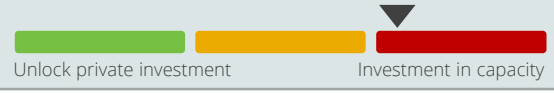
£110-240m
Estimated investment need

£282bn
Market opportunity cumulative 2024-2035

£1.0-2.0bn
Estimated incremental 10-year GVA

330-650
Net increase in annual Jobs

Level of support required

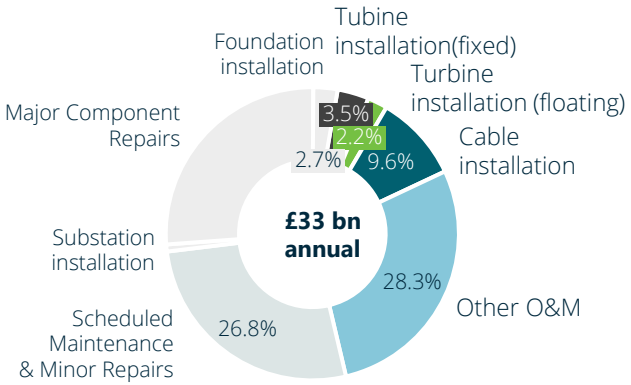


Specific components/services to be developed in the UK

- Wind turbine Installation
- Operations and maintenance
- Cables installation vessels operation

The UK has a historical strength in offshore O&M services stemming from the oil and gas sector. As offshore wind development grows globally, the UK has a sizeable opportunity to export its skills and knowledge in these services.

Split of serviceable value additions by component
Base case scenario, average 2024-2035, £bn



*Interventions and benefits only corresponds to the highlighted components and services and are estimates only

			Completion year	Investment	GVA (10-Year)
R	Increase the UK's supplier base of EPCI companies	Establish programme to support growth of UK based small to medium size EPCI suppliers *Action owner: Industry*	2027	£1-5m	£0.4-0.8bn
R	Increase the UK's fleet of cable laying vessels	Increase the fleet of cable laying vessels via upgrades to existing vessels *Action owner: Industry*	2027	£100-200m	£0.6-1.2bn
E	Implement a new cable installation technique in the UK eliminating cable damage during installation	Establish a data sharing platform to increase collaboration between suppliers and installation service providers to work in collaboration for increased data sharing to streamline the cable installation process to eliminate any cable damage *Action owner: Industry*	2028	£1-5m	-
		Test cable laying process in a late stage demonstration centre to gather results in a controlled setting and de-risk the technology as needed for implementation *Action owner: Academia and Industry*	2028	£1-5m	-
E	Deploy low carbon emission vessels for all installations, operations and maintenance services in the UK	Expand resources for R&D match-funding Clean Maritime Demonstration Competition (CDMC) to support the design and development of clean maritime solutions towards commercialisation, focusing on low carbon Crew Transfer Vessels (CTVs) and Service Operation Vessels (SOVs) designed for offshore wind *Action owner: Academia and Industry*	2030	£10-20m	-

Investment £15-30m

Estimated R&D investment need

£404bn

Market opportunity cumulative 2036-2050

-

Estimated incremental 10-year GVA

-

Net increase in annual Jobs

Level of support required

Technology development focus areas for the UK are:

- Low carbon emission vessels
  - Aligning the UK offshore wind targets with the objectives of the UK maritime decarbonisation agenda via low carbon vessel designed specifically to meet the installation and O&M services requirements of offshore wind farm can help EPCIs future-proof their operations while decreasing carbon emissions
- Next generation inspection, monitoring and installation services
  - By applying new technologies such as autonomous vehicle and/or Machine Learning, the EPCIs will be able to decrease operating costs while increasing their market share by installing further away from the shore

The disruptive technologies will be enabled by a new Offshore Wind Innovation Development and Demonstration (WInDD) Hub to support collaboration, technology development and demonstration.

			Completion year	Investment	GVA (10-Year)
D	Integrate Machine Learning (ML) algorithms optimising operations and maintenance services	Open call for innovation projects integrating Machine Learning and AI with environmental surveys to decrease ecological impact *Action owner: Academia and Industry*	2025	-	-
		Integration of winning technology/project in a demonstration project in the UK with InnovateUK grant funding *Action owner: Industry*	2032	£1-5m	-
	Commercialise next generation inspection, monitoring and installation services, implementing autonomous vehicles and robotic system	Establish a clear regulatory framework for the use of autonomous technologies in offshore wind farm installation to provide certainty for companies and encourage them to invest in these technologies *Action owner: Academia and Industry*	2027	-	-
		Expand support for the Digital, Autonomous and Robotics Engineering (DARE) Centre to develop and commercialise next generation O&M solutions, including autonomous installation and inspection vehicles as well as solutions for monitoring and control using advance Machine Learning *Action owner: Industry*	2032	£2-5m	-
		Integrate autonomous technology and/or robotic system in one demonstration project based in the UK to showcase potential for commercialisation *Action owner: Industry*	2035	£10-20m	-

Artificial intelligence platform for a global wind turbine fleet

The USA is advancing digital solutions for offshore wind farms to support advanced asset management. The solution delivered as a partnership between ONYX Insight and Pattern Energy to boost operational efficiency across North America. The initiative aims to deploy wind turbine predictive maintenance solutions for stable and efficient fleet management. The solution was launched in 2022 across Pattern Energy's 4.2 GW North American portfolio.

The AI Hub will enable consolidation of disparate historical data from multiple sources in a single centralised software (instead of relying on multiple software platforms simultaneously). With the software allowing the globalisation of O&M services, developing UK capability is essential to ensure the UK takes a lead in advancing and bringing new solutions to market.

Enabling Technology Development

Establishment of an Offshore Wind Innovation Development and Demonstration (WInDD) Hub

The UK is well recognised for its role in IP creation across multiple industries, including offshore wind. However, the UK tends to invest in early-stage research and innovation, getting ideas to the point of prototype but failing to commercialise and realise the full value of the IP. The failure to commercialise is linked to a lack of development funding and challenges in securing the pull through from industry due to the technical risk.

To take a world-leading position in offshore wind research and fully realise the potential of the investment in disruptive technologies identified in the Growth Plan, the UK needs a dedicated collaborative hub to facilitate innovation. The WInDD Hub aggregates the UK's capabilities and capacity to design, demonstrate and develop innovative technologies across blades, towers, cables, foundations, installation and O&M techniques. A core part of the WInDD Hub is an Advanced Turbine Technology Institute (ATTI) to develop the next generation of turbine blades & components.

Investment £100-300m

Estimated investment need

WInDD Hub areas of focus

Design, development & commercialisation across all five priority areas for the UK

UK's Offshore Wind Innovation Ecosystem

Research → **Technology development** → **Commercialisation**

Academia

The UK has world leading universities advancing offshore wind technology

Joint Research Centres

Centres like Aura and the Supergen ORE hub facilitate research

WInDD Hub

The WInDD Hub will establish a multi-use facility that enables **the design, prototyping and full-scale demonstration** of offshore wind technologies, anchored with the Advanced Turbine Technology Institute

Advanced Turbine Technology Institute (ATTI)

A world-class collaborative Advanced Turbine Technology Institute to drive the agenda on the next generation of turbine blades & components

Cross ecosystem support

OEMs & SMEs
UK has a number of SMEs and OEM's investing in UK research

Catapults
ORE Catapult & HVMC support acceleration of UK concepts

Test centres
Component based testing at DARE, EMEC & ORE Blyth

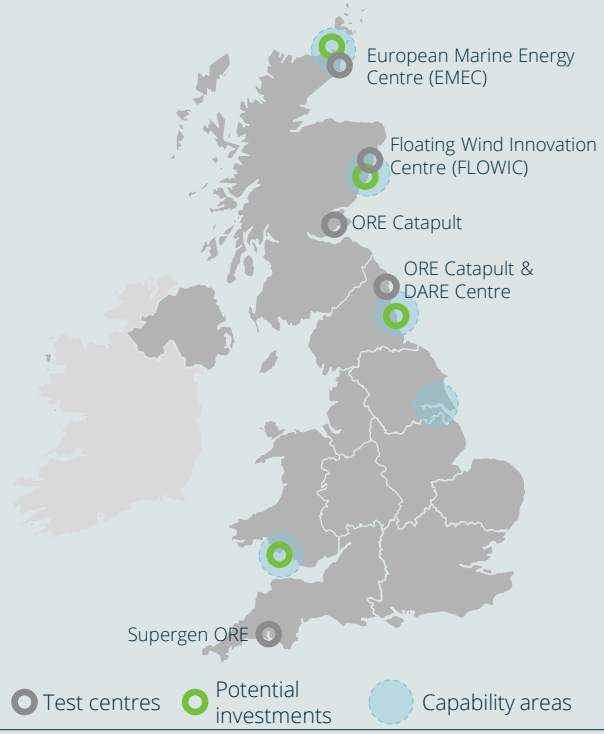



ABB Port Talbot

Establishing the WInDD Hub and ATTI

The WInDD Hub will build on the UK's comparative advantages in offshore wind research, existing deepwater ports and renowned test centres, working collaboratively to drive the direction of offshore wind technology development.

Collaborative engagement across the supply chain will facilitate the establishment of the hub with the necessary infrastructure for land and sea testing for the demonstration of next generation components and services. To be world class the hub will require sufficient land to accommodate the growth in turbine technology, reinforced quays and a deep-sea harbour and a grid connection that enables full scale offshore wind turbine testing.

Through the ATTI and co-ordinated action across the supply chain, the UK will be able to be a leader in the design, development and full-scale testing and integration of:

- Advanced turbine technology
- Industrialised foundations & substructures
- Future cable designs
- Smart environmental services
- Next generation installation, operations and maintenance techniques

Enabling the UK to create the right environment to 'fail fast' and enable agility to rapidly identify technology winners and make sure the UK continues to adapt and lead offshore wind technology.

		Completion year	Investment	GVA (10-Year)
Establish new Offshore Wind Innovation Development and Demonstration (WInDD) Hub	Establish one Offshore Wind Innovative Technologies Demonstration and Development Hub to leverage the UK's innovation network. Collaboration will be needed from key anchor tenants including: • A world-class collaborative Advanced Turbine Technology Institute to develop and test the next generation of turbine blades, as well as supporting wider collaboration on key components including: – Deep water and floating foundation design – New cables designs – New environmental technologies – Innovative installation, operations and maintenance techniques	2028	£100-300m	-
	Conducting test and demonstration of technologies in a marine and/or port environment that provides a grid connection, access to infrastructure and space for assembly, deployment and maintenance and associated activities needed for technology demonstration.			
	Promote the development of an industry standard approach to technology demonstration agreements for innovators seeking access to commercial Offshore Wind Farms for testing and demonstration, currently being progressed by OWGP	2026	-	-
	Promote research and development activities to attract innovative technologies and projects to the test centres. This may include international collaboration to leverage global expertise and attract international projects. This can enhance the test centre's reputation and capabilities	2030	-	-

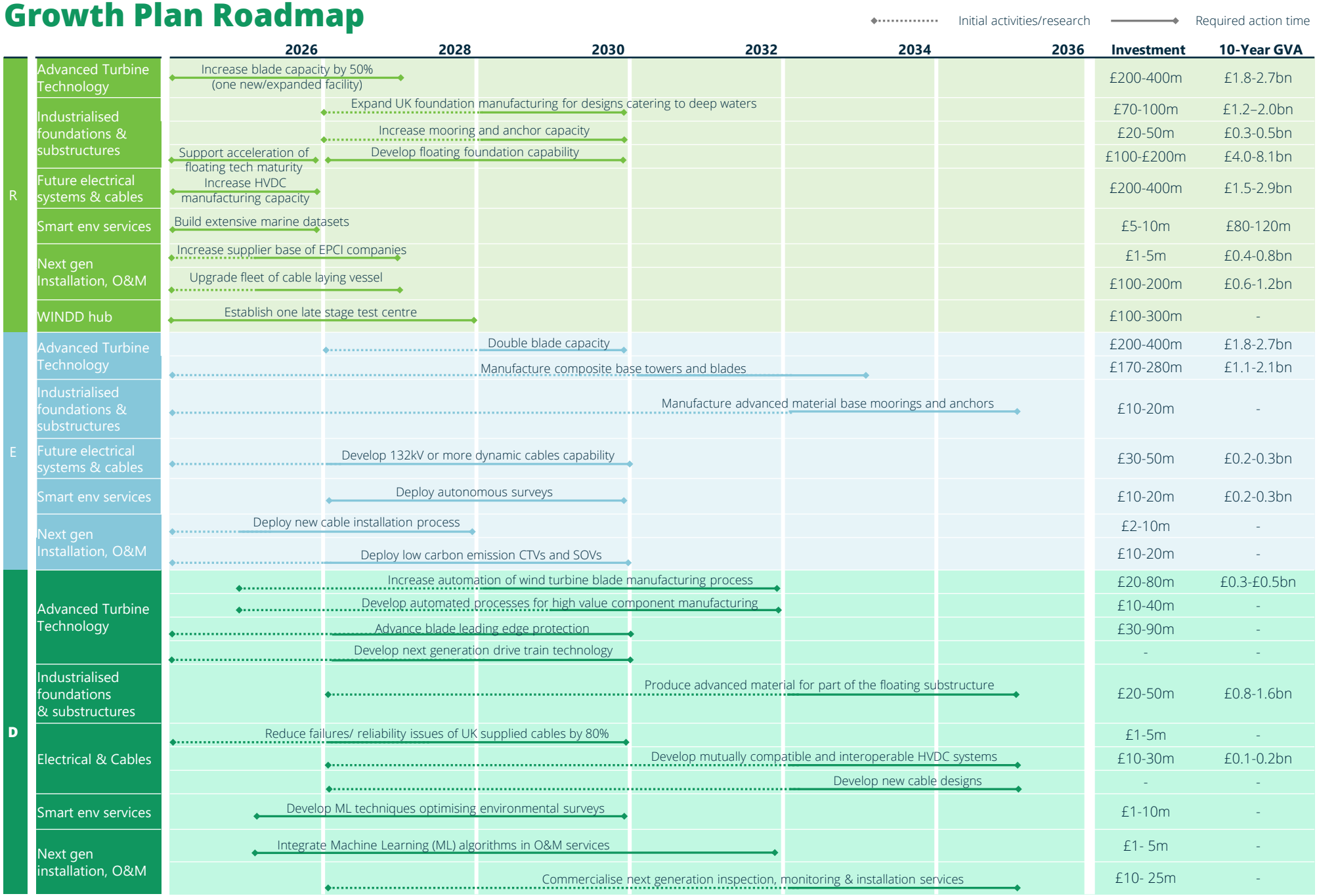
Test and demonstration centre for offshore wind innovative technologies

The port of Rotterdam hosts Maasvlakte 2, a test and demonstration area for innovative technologies in offshore wind. It was initiative of the municipality of Rotterdam, Port of Rotterdam Authority, InnovationQuarter and TKI Wind op Zee.

The centre is testing ground for innovative offshore wind solutions, including turbine designs, energy storage system, and grid connection strategies. All parts of the offshore wind supply chain can use the facilities to test and demonstrate new technologies in a controlled environment with similar wind speed, water depth and seabed conditions as offshore.

By facilitating the demonstration of new technologies, the centre accelerates the commercialisation of more efficient, reliable and cost effective solutions.

Growth Plan Roadmap



Section 04

Environment to Succeed

Smulders New Yard Layout at Newcastle

Environment to Succeed

Targeted investment and co-ordinated R&D programs are critical to grow the UK's offshore wind sector, however there are wider over-arching systemic challenges that must be addressed in parallel to create an environment to succeed and support the success of the industry in the long-term. These aspects are crucial to the overall success of the Growth Plan's objectives.

Action is needed to:

Develop the Enabling Infrastructure

Without a sufficient and reliable supply of raw materials, the necessary port infrastructure and timely grid connections, offshore wind deployment in the UK will stall. Action is underway to address some of these areas however additional work is needed to further support the sectors development.

De-risk Investment in the UK

Despite collaborative effort across the sector and the annual allocation rounds, uncertainty on future demand is still stalling investment in the UK's supply chain. There is a need to increase certainty of the pipeline to de-risk investments and create confidence for organisations of all sizes to commit to investing in the UK.

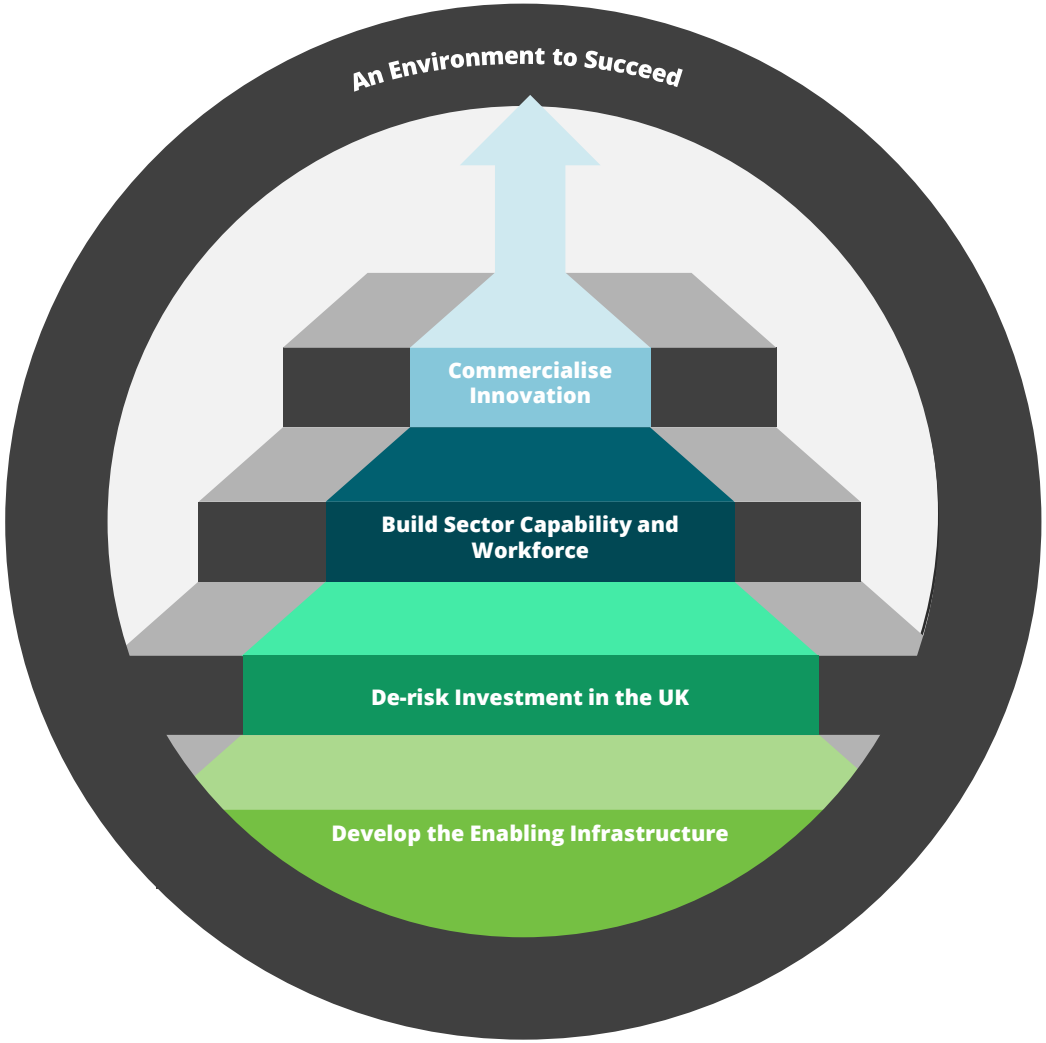
Enhance Sector Capability and Workforce

The sector will not succeed without a diverse set of organisations, a sufficiently capable workforce and a wider enabling policy and regulatory environment. All aspects of the sector need the connections to secure the foundations of the sector and facilitate UK supply chain developments.

Commercialise Innovation

Despite a strong capability in innovation, the UK has struggled in converting intellectual property to commercially deployed products. Cross-sector support to accelerate innovation will help to place the UK as a market leader and ensure the UK is seen as a destination to innovate and commercialise in the offshore wind sector.

Action from across the offshore wind sector and collaboration with organisations across the UK is needed to mitigate these issues and drive the success of the industry.



Develop the Enabling Infrastructure

Raw materials, sufficient capacity in the electricity grid and at UK ports are essential for facilitating the offshore wind industry. Ports are critical to the manufacturing, storage, assembly and deployment of offshore wind component and projects. The increasing scale of wind components, as well as the increased rate of project deployment, will require substantial upgrade and expansion of UK ports in order to deliver on our industrial ambitions.

Grant-funding, such as OWMISS and the freeports policy have unlocked limited port redevelopment, further action is needed to provide long term revenue support. In the interim, existing policy levers such as FLOWMISS and supportive institutions including UKIB and SNIB need to be aligned to enable near-term delivery of critical infrastructure.

There is also a need for greater co-ordination with other sectors to ensure supply of raw materials including concrete, glass fibres and metals to prevent bottlenecks in sourcing supply. With an estimated £54bn investment needed in the UK's network infrastructure , further action is needed to align connection requirements with wider grid upgrades.

The recommendations are designed to enhance delivery of the enabling infrastructure pivotal for the wider success of the sector.

In March 2023, the Government established the Floating Offshore Wind Manufacturing Investment Scheme (FLOWMIS) to support critical port infrastructure that will enable the delivery of floating offshore wind. The grant scheme of up to £160 million is aimed at supporting and enabling turbine integration, floating wind foundation assembly and manufacturing.

Partner to source raw materials	Enhance cooperation with other countries through Strategic Partnerships to diversify the UK's supply of critical raw materials, similar to Memoranda of Understanding (MoUs) signed by EU for a Strategic Partnership with Canada and Ukraine in 2021, with Namibia and Kazakhstan in 2022 and with Argentina, Chile, Zambia and the Democratic Republic of Congo in 2023 [47]	DBT	High
	Establish long term offtake agreements, as well as support with technology and skills expertise, with the raw material suppliers in countries with UK partnerships	OEMs	High
	Co-ordinate with the composite recycling projects that are underway across the world focusing on matching materials to the supply chain needs and ultimate products	OREC	Medium
	Launch additional Offshore Wind Tech Accelerator in Industrial Cluster regions focusing on materials manufacturers through a low carbon process and alternative sources of materials	OREC, RTOs, Carbon Trust	Medium
Develop the port infrastructure	Build out the necessary supporting infrastructure at five ports across the UK to have a range of options to support the UK's offshore wind deployment and create a base for supply chain organisations to develop additional capacity. This will need to take the form of continued cross-sector effort. The Delivery Body can aid in facilitating investment models, demand aggregation and facilitation with funders/lenders. Industry supports further policy development to explore revenue support models.	Ports, Government, Delivery Body	High
	Assess the potential to procure or establish a long-lease agreement for common infrastructure across key at-risk assets such as installation and heavy lift vessels to reduce delivery risk but also create incentives for the use of UK based installation teams.	DESNZ	Low
Facilitate timely grid connections Cross-sector	Undertake cross-sector workshops to assess the potential to implement standardisation across offshore wind developments in a similar manner to the TenneT 2 GW Grid Connection System in Germany and the Netherlands[48] to support resource reduction	Delivery Body	High
	Work with National Grid to assess total material demand for cables and supporting electrical infrastructure and develop mitigations to ensure the necessary grid developments and offshore wind connections can proceed at a pace in line with sector targets	OWIC, DEZNZ, National Grid	Medium
	Continue to work closely with the Electricity System Operator and build on the partnership announced in December 2023 to increase information sharing on seabed leasing plans to facilitate energy infrastructure planning building on the recommendations from Nick Winser	The Crown Estate, ESO	Low

Level of urgency — Low — Medium — High

De-risk Investments

Despite a world leading pipeline in offshore wind, the UK has faced significant challenges in converting this into supply chain investments, with small and large organisations delaying or postponing investment in manufacturing capacity. The increased strike price for allocation round 6 has signalled the UK Government's building confidence in the sector and supporting increased interest in UK supply chains. This needs to be sustained over the long-run to support strategic industrialisation.

Providing greater confidence to the market, debt providers and other financial institutions can help bring forward investments leading to a knock-on impact on GVA, with an estimated impact of every £100 spent on capital infrastructure an average of £130 of annual GVA is realised.

The recommendations are designed to help address the lack of certainty in demand to provide greater clarity on future opportunities and de-risk the investment.

The Scottish Government, in collaboration with Scottish Offshore Wind Energy Council (SOWEC) and offshore developers, have been working to develop a shared view of infrastructure needs to support Scottish developments. The Strategic Investment Model (SIM) brings together all parts of the industry to help ensure timely investment, reduced project risk and an enhance the supply chain. Three projects, from the original 45, are currently being supported and represent up to £500m in capital investment.

Secure cross-sector investment	Reach agreement on proposal to provide funding from industry over 5-year period to support delivery of the Growth Plan, aligned with wider initiatives such as GIGA, Sustainable Industry Rewards, OWMISS, Scottish Government and other support for infrastructure and technology development	Developers, OEMs	High
	Ensure the proposed sustainable industry rewards due to be introduced from Allocation Round 7 create the supporting and lasting environment to facilitate the development of the offshore wind supply chain and wider ambitions of the policy change	DESNZ	High
	Work with funders across the supply chain to simplify funding qualification and applications through the development a standard facility funding model/types to accelerate investment	Delivery Body	Medium
	Expand 'Invest-to-Export' Export Development Guarantee product to secure overseas investment in offshore wind supply chain, as demonstrated a success with SeAH investment in Teesside	UKEF	Medium
Increase confidence in demand	Build on the outputs of the Growth Plan to create a one stop shop for offshore wind supply chain investments (learning from or integrating the Strategic Investment Model), periodically undertaking co-ordination activity to collate demand requirements, foster joint industry commitments and provide supportive funding or underwriting mechanisms via Growth Plan funds. The aim will be to build connections, triage investments and ensure any separate funding pots are appropriately ring-fenced to maximise benefits within subsidy control limits	Delivery Body	High
	Increase future pipeline certainty by provide longer term clarity on the scale of future allocation rounds or consider committing to a long term (10-year) minimum annual offshore wind auction budget and/or capacity to improve planning and co-ordination akin to the 15 GW annual collective commitment of nine European nations[49]	DESNZ	Medium
	Ensure the CfD structure and strike price creates a sustainable environment to address supply chain pressures and provide confidence to developers and the wider supply chain on the certainty of the UK developments and reduce the risk of repeat of allocation round five	DESNZ	Low
	Assess opportunities to facilitate the development of standards of non-competitive components to support cost reduction of components, expanding existing agreements in place such as that between Vestas and Siemens Gamesa for transportation frames	OEMs, Standards Agency	Medium
	Continue engagement with the market and stakeholders as TCE develops its work to digitally map the seabed resource needed to meet future demand, the "2050 Marine Delivery Routemap" enabling the delivery of multiple priorities including net zero and nature recovery	The Crown Estate	Medium
	Continue to explore programs, such as the Offshore Wind Marine Evidence and Change program to further increase the evidence base of the sector of the UK's marine environment to support further de-risking of developments and allow timely development of UK's pipeline.	The Crown Estate	Medium
Expand the UK's reach	Expand the existing international development activities in key international markets to support exposure of UK organisations to international developments and seek to replicate the demonstrated success in Taiwan to help grow the UK exports	DBT	High

Level of urgency: Low | Medium | High

Enhance Sector Capability and Workforce

There are an estimated 30,000 people working across the offshore wind sector today and around 1500 organisations providing materials and services to the sector. The expansion of the supply chain requires the continued growth of these organisations and the fostering of additional people and companies to enter the sector.

Training facilities and cross-sector collaboration will be essential in fostering the relationships between all parts of the supply chain to facilitate the growth of the UK's SME base and establish the UK as a top employment destination and attract the diversity of talent required.

The recommendations are intended to build the capability at all levels across the UK and ensure there is the workforce and diversity of capability needed for the future.

Build the sector's workforce	Implementation of the Offshore Wind People & Skills Plan to create quality jobs, develop high-level skills and build a diverse workforce for the future that is required between now and 2030, to support delivery of the UK's clean energy, net zero and energy security targets.	OWIC, Cross-sector	Medium
	Expand partnerships with knowledge transfer hubs of research such as the Aura Centre or the Supergen Offshore Renewable Energy Hub to bring new technologies into the market to answer key industry pain points	Developers, Academia, RTOs	Medium
	Expand on existing offshore wind training centre to address near-term skills challenges in areas such as welding, electrical technicians and commissioning engineers to provide the UK with sufficient talent to support domestic deployment and attract international organisations to train their workforce in the UK	Training providers, OWIC, Industry	High
	Launch a marketing campaign targeting small and medium enterprises working on novel technologies for floating offshore wind to raise awareness of the existing R&D support programs available across the Catapults	Catapults	Medium
	Build on the Workforce Foresighting approach pioneered by ORE Catapult, and sponsored by RenewableUK, to identify future workforce capability requirements in more detail	ORE Catapult, RenewableUK	Medium
	Expand on the work with key offshore energy industry organisations to further promote and facilitate cross-sector mobilisation of the workforce between offshore sectors and facilitate capability growth in offshore wind	OWIC	Medium
Regional Clusters Collaboration	Increase collaboration and co-ordination across the eight regional Clusters through the development of a Cluster Plan to promote the growth of the local supply chains and support localised investment to build on existing areas of specialisms.	Delivery Body, OWIC, SOWEC, Clusters	High
Support SME development	Expand the support services for SMEs through an expansion or addition to OWGP's Wind Expert Support Toolkit, Fit 4 Offshore Renewables and Sharing in Growth Offshore Wind programmes to nurture UK capabilities and grow domestic capacity	OWGP, Delivery Body	Medium
	Explore the implementation of a centralised procurement platform or mandating the use of the NSTA Energy Pathfinder platform for CfD awarded developments to use, akin to the Find a Tender service, to increase visibility of tenders of UK developments, facilitate access for small and medium enterprises allowing exposure of contractors to UK capability ultimately fostering the SME community	DESNZ	Medium
	Develop a support program to provide resources to OEMs and SMEs to co-develop their business case and help appraise investment opportunities and connect them to potential funding opportunities	Delivery Body, OEMs, SMEs	Low

The OWIC People & Skills Plan, which will be jointly owned, implemented and monitored across industry through the Offshore Wind Industry Council, is to create quality jobs, develop high-level skills and build a diverse workforce for the future that is required between now and 2030, to support delivery of the UK's clean energy, net zero and energy security targets.

Level of urgency: Low | Medium | High

Commercialise Innovation

The UK has a long-standing record of innovation, through programs such as the Carbon Trusts' Offshore Wind Accelerator Program and Innovate UK's Knowledge Transfer Networks. Despite world leading test and demonstration facilities at Blyth and OREC the UK still faces challenges in bringing inventions to market. Further action is required to ensure there is the long term conversion of British intellectual property into globally deployed innovations.

Changes announced in the 2023 autumn statement to amend the R&D tax credit scheme as well as changing the capital expensing scheme to be permanent will support funding for innovation and expansion.

The recommendations are designed to reduce the commercialisation 'valley of death' and make the UK the destination for offshore wind innovation.

Create a pathway to commercialise	Maintain the R&D tax credit scheme to support organisations of all sizes invest in R&D. Following the 2023 autumn statement, from 1 April 2024, the merged R&D scheme provides a net benefits to profit makers of 15% and to loss making organisations of 16.2%	UK Government	High
	Explore opportunities to establish innovative subcontracting frameworks considering equitable risk sharing between companies to enable growth of innovative design and DEVEX services	Developers, EPCIs	Medium
	Continue to assess innovation discounts building on experience from Offshore Wind Leasing Round 4 for future leasing rounds, aligned to the priorities agreed on an annual basis with industry through the Delivery Body technology forum	The Crown Estate	Low
	Expand the number of companies supported through the ORE Catapult's Launch Academy to help SMEs commercialise new technologies for the offshore wind supply chain	ORE Catapult	Medium
	Consider revising the R&D target of 2.4% of GDP by 2027 upwards to greater than 3% in line with leading international nations such as North America (3.47%), Japan (3.27%) and Germany (3.13%) [45]. This will emphasise the UK as a key place to undertake research	UK Government	Low
Invest & assess technology priorities	Work closely with the existing innovation workstream to collaborate with Developers, OEM's, SMEs and RTO's to discuss shared industry challenges to facilitate the identification of innovation opportunities, educate innovators on the needs and develop a technology roadmap for the industry with clear pathways to commercialisation and inform future growth plans	Delivery Body	Medium
	Establish a reporting framework and agreement to provide increased transparency on the level of private sector R&D investment within the UK	Delivery Body, DESNZ, Industry	Low
Collaborate to innovate	Expand the strategic collaboration established between the Offshore Renewable Energy Catapult with HMV Catapult to Digital Catapult and Energy Systems Catapult, forming a strategic collaboration to align on offshore wind innovation priorities and realise synergies between the Catapult's expertise	ORE Catapult, HMV Catapult	High
	Post floating offshore wind innovation challenges on InnovateUK's Innovation Exchange platform and direct engagement with technology organisations to help fast-track knowledge share across sectors and help address technical challenges in floating offshore wind and support cost reduction	Developers	High
	Review the current application of the system, performance, availability and reliability trend analysis (SPARTA) platform and assess options to increase visibility across technology organisations to foster a greater sharing of data to support problem solving initiatives	ORE Catapult, Industry	Medium

In 2023 it was the launch of a new National Floating Wind Innovation Centre in Aberdeen. With funding and collaboration from Energy Transition Zone Ltd. (ETZ) and Offshore Renewable Energy Catapult, the centre is dedicated to expediting the commercialisation of floating offshore wind across the UK. Furthermore, it will support the development and incubation of novel products, services, and businesses within the sector.

Level of urgency — Low — Medium — High

Section 05

Delivering Value

Triton Knoll Offshore Wind Farm

Delivering Value

The UK's offshore wind industrial landscape consists of a range of different organisations, all of whom are pivotal in the success of the UK's offshore wind supply chain. Whilst existing organisations have been sufficient to achieve the extent of success seen today, the landscape will change with the growth of the sector.

A centralised independent body, either through an augmentation of the existing Offshore Wind Growth Partnership or establishment of a new organisation is required to take ownership for the plan and work with the sector to drive the growth of the UK's supply chain.

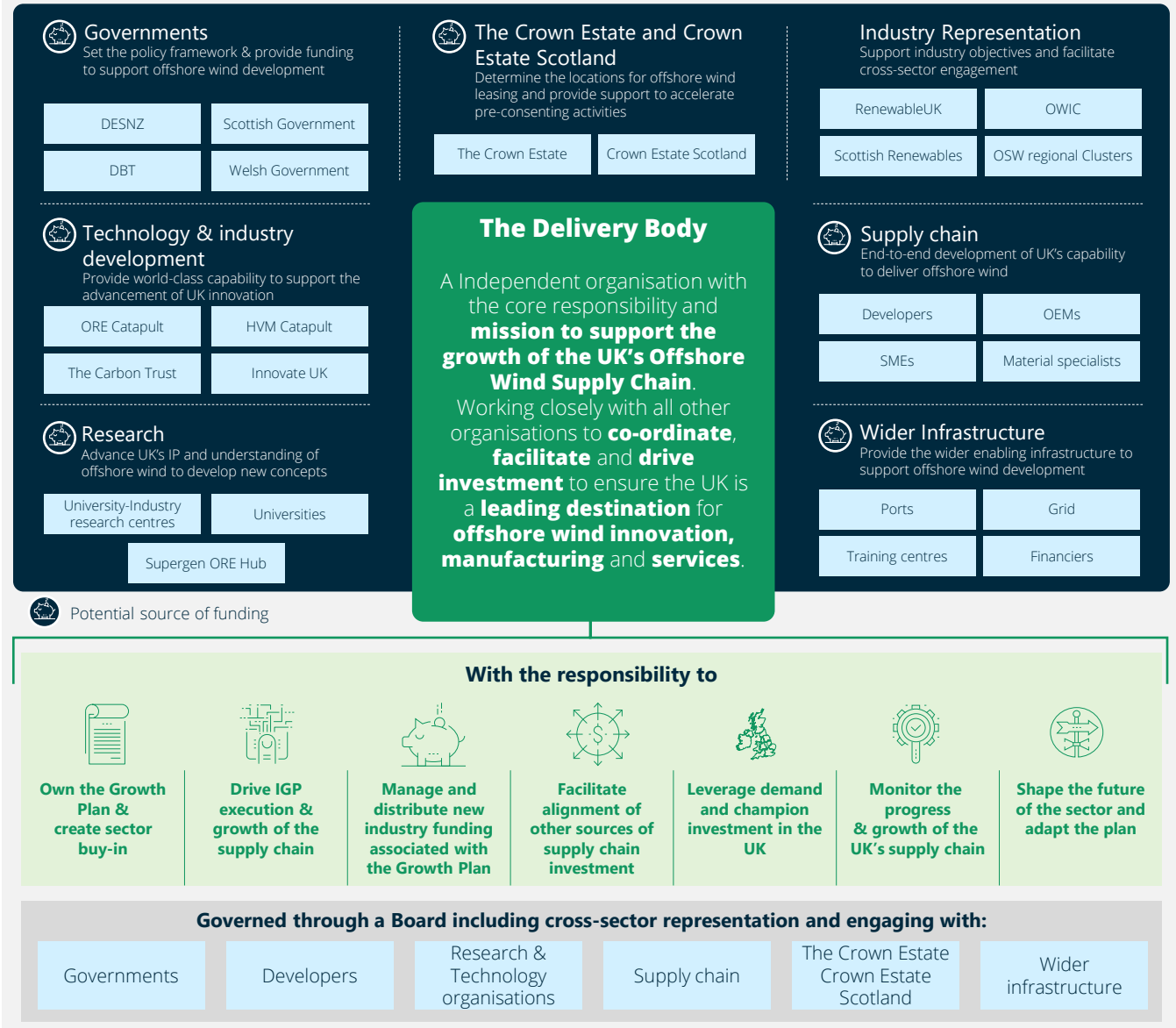
Delivery Body

Progress is underway to establish the Delivery Body by the end of 2024. The specifics are still under development however it is expected that (1) the organisation will have the autonomy to make decisions, (2) it is appropriately resourced (3) there is the governance to facilitate cross-sector alignment.

The anticipated responsibilities of the Delivery Body will be to:

- Own the Growth Plan & create cross-sector buy-in
- Drive the execution & growth of the supply chain
- Manage and distribute new industry funding associated with the Growth Plan
- Facilitate strategic alignment of other sources of investment and funding into the supply chain
- Champion the UK as a destination for offshore wind
- Shape the future of the sector and adapt the plan and priorities as necessary

Current UK Offshore Wind Industrial Landscape & Role of the Delivery Body



Offshore Substation Platform Installation at Dogger Bank

Delivery Body Responsibilities

Own the Growth Plan & create sector buy-in

The Delivery Body will act as the single point of responsibility for the Growth Plan and manage the input and identification of ongoing priorities. This include working closely with other organisations and existing mechanisms to create buy-in on the direction of the UK and facilitate a collective effort to push the sector and supply chain forward.

Drive the execution & growth of the supply chain

The Delivery Body has the responsibility to get outcomes from the plan. This will include bringing people and organisations together to tackle sector challenges aligned to the sector priorities and drive the execution of the plan. This will be through existing relevant delivery groups and dedicated resources to ensure the plan succeeds. The Delivery Body will also be required to support organisations in achieving outcomes aligned with the Growth Plan, connecting them to relevant resources and organisations to facilitate growth across the sector.

Manage and distribute new industry funding associated with the Growth Plan

The industry is discussing a collaborative fund over a 5-year period to support the execution of the Growth Plan and compliment other sources of funding. A separate industry fund provides benefits over government funding due to greater flexibility in where it can allocated which can aide in de-risking investments by acting as a first funder, enabling wider funding to be secured. The Delivery Body will be responsible for the management and allocation of those funds in alignment with the determined priorities. The industry will continue to engage with Government on alignment of funding objectives with other initiatives, such as GIGA and Sustainable Industry Awards, pending final agreement.

Facilitate alignment of other sources of supply chain investment

Investment into the UK's offshore wind capability requires funding from multiple sources. The Delivery Body will act as a point of co-ordination for these sources, enabled by the establishment of close working relationship with the representative organisations, as well as outreach . Cross-sector government and industry representation on the Delivery Body's Board will also be an essential to manage the co-ordination and alignment.

Leverage demand and champion investment

Attracting inward investment and encouraging existing organisations to continue investment into the UK R&D is critical for the success of the UK supply chain and a key part of expanding our existing capability. The Delivery Body should provide a one stop shop for offshore wind supply chain investments (learning from or integrating the SIM), periodically undertaking co-ordination activity to collate demand requirements, foster joint industry commitments and provide supportive funding or underwriting mechanisms via Growth Plan funds.

Monitor and assess the impacts of plan actions

Effective implementation of the plan will lead to successful change in the sector. The Delivery Body will track the progress of the plan and take action to intervene if there is a lack of progress, periodically refreshing the Growth Plan. Alongside the individual actions, the Delivery Body will be responsible for monitoring the UK's offshore wind supply chain and assessing overall progress against the Growth Plan KPIs.

Help shape the future of the sector

Technology has the potential to alter the future of the sector. The Delivery Body will work closely across all parts of the supply chain, from initial research through to full scale deployment to understand the changes in the sector. The Growth Plan will be refined and adapted to address the changing requirements of the UK supply chain to continue to position the UK as an offshore wind supply chain leader and market shaper.

Funding & Investment

Investment of £1.2-2.5bn in the UK's offshore wind supply chain has the potential to unlock £14-26bn of additional GVA over ten year period. The identified investment need is split across infrastructure, enabling investment and technology, with:

- £0.8-1.4bn of investment in infrastructure for capacity expansion
- £430-£800m of investment in enabling infrastructure to support test and demonstration
- £110-330m for research and development to address current and anticipated technology challenges

Multiple sources of finance will be needed to facilitate the growth in the UK supply chain. The UK has a diverse set of finance options that will need to be leveraged to grow UK capacity and expand existing capabilities across the five priorities. It will take a mix of public and private funding, through grants, loans and guarantees to help address the current challenges in the sector.

Over the past 12 months there has announcements by governments to support the development of energy supply chains. With the right strategic alignment, these can play a critical role in the growth of the UK's offshore wind infrastructure and industrial capacity, as well as building on existing innovation initiatives.

A collaborative, joint industry fund to support IGP Delivery and investment over a 5-year period is under discussion to compliment additional funding sources. Industry and UK Government will continue to collaborate on how the Growth Plan, and associated funding, can best align with CfD Sustainable Industry Rewards and GIGA objectives.

Wider sources of funding through the UK Infrastructure Bank, Scottish National Investment Bank, UK Export Finance, private equity and commercial lenders will also need to be leveraged.

Potential sources to facilitate supply chain development

Up to £390m — DESNZ: Green Industries Growth Accelerator (GIGA)

Up to £390m across offshore wind and electricity networks , is expected to be provided over five years from 2025/2026 targeting capacity developments as part of the UK Governments Green Industries Growth Accelerator >£1bn fund.

Proposal — Industry: Offshore Wind Industrial Growth Fund

A funding amount is under discussion to support the Delivery of the Growth Plan and associated Delivery Body, investing across the supply chain to support R&D, demonstration, scale-up & capacity expansion

£50m+ — Innovate UK: Smart Grants, Innovation loans & others

Various funding opportunities through Innovate UK with £25m of loans for innovation, £25m in Smart Grants and other funding opportunities for research

£1bn — UK Government: Net Zero Innovation Portfolio

Wide portfolio fund of £1bn to support the development of low carbon technologies and systems. Future offshore wind has been identified as a priority.

£500m — Scottish Government: Supply chain investment

Up to £500m has been announced to support supply chain development. The investment is expected to be delivered through the Scottish National Investment Bank and enterprise agencies, and will be made over the next five years.

£50m — The Crown Estate: Supply Chain Accelerator

The Crown Estate intends to launch a pilot £10 million fund in the first part of 2024, which will provide matched development expenditure funding to accelerate supply chain projects. A further £40 million has been earmarked.

The Delivery Body will work with other funding bodies to promote strategic alignment of funds to ensure coverage across the value chain, with the proposed Offshore Wind Growth Fund complementing existing initiatives, addressing current gaps to accelerate commercialisation or provide guarantees to underwrite future demand

Wider sources of funding (non-exhaustive)

£50m — The Crown Estate: Offshore Wind Evidence & Change Programme

£50million fund committed by The Crown Estate to support research projects aimed at accelerating offshore wind deployment with other parties co-funding collaborative projects

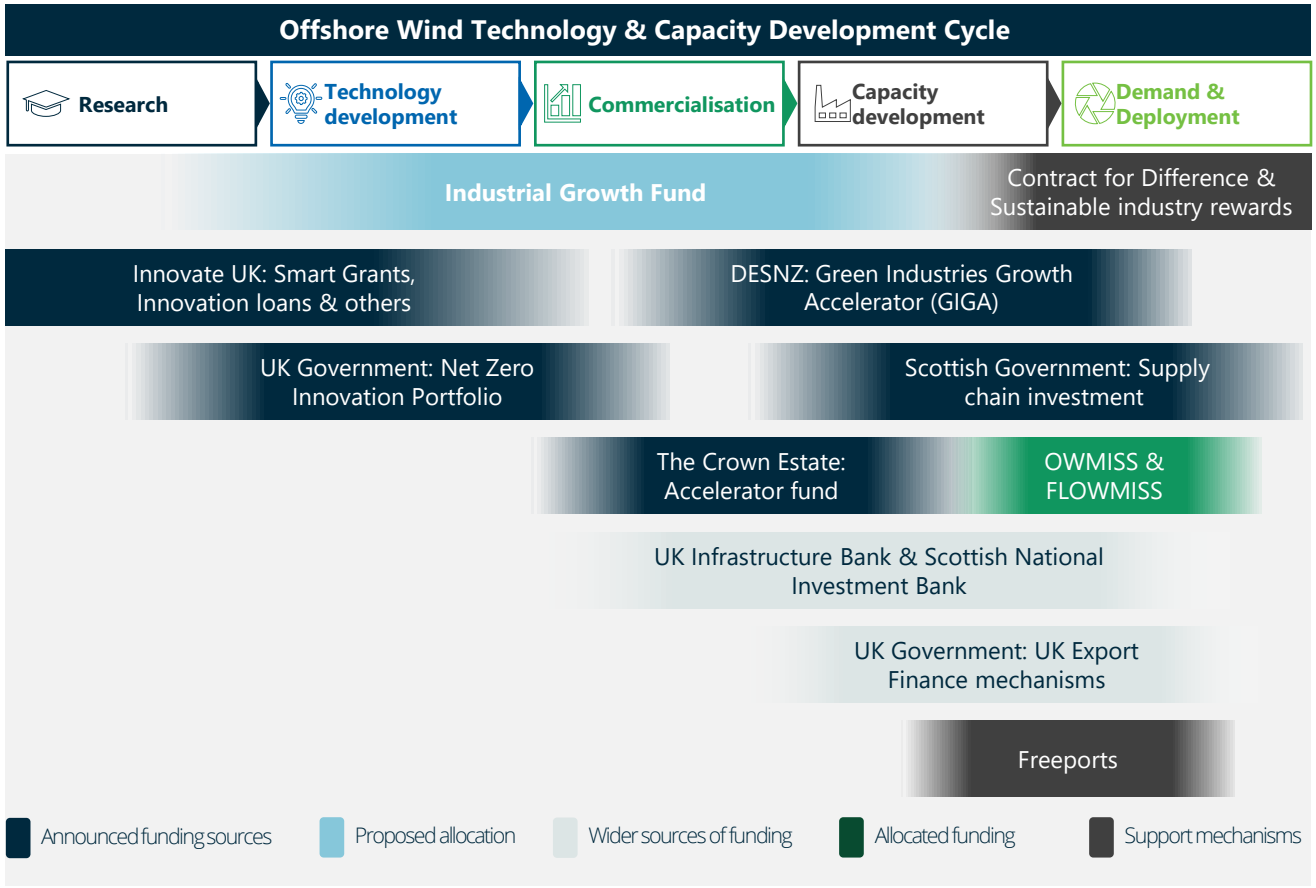
£bn — UK Infrastructure Bank & Scottish National Investment Bank: Credit guarantees & investment

Aims to deploy multi-billion £'s of debt, equity and guarantees to support clean technologies with Port Infrastructure for Floating identified as a priority

£m — UK Government: UK Export Finance mechanisms

Multiple programs of support through UK Export finance such as supply chain discount guarantee and other bonds to support the export of UK goods

Navigating the Funding Landscape



The investment requirements within this plan are estimates of funding, which will entail a mix of private and public sources, to deliver priorities and actions identified within the plan.

As the graphic shows, there are multiple stages of technology and industrial capacity development in the offshore wind value chain. Equally, there are multiple funding sources and initiatives targeted at different parts of the cycle.

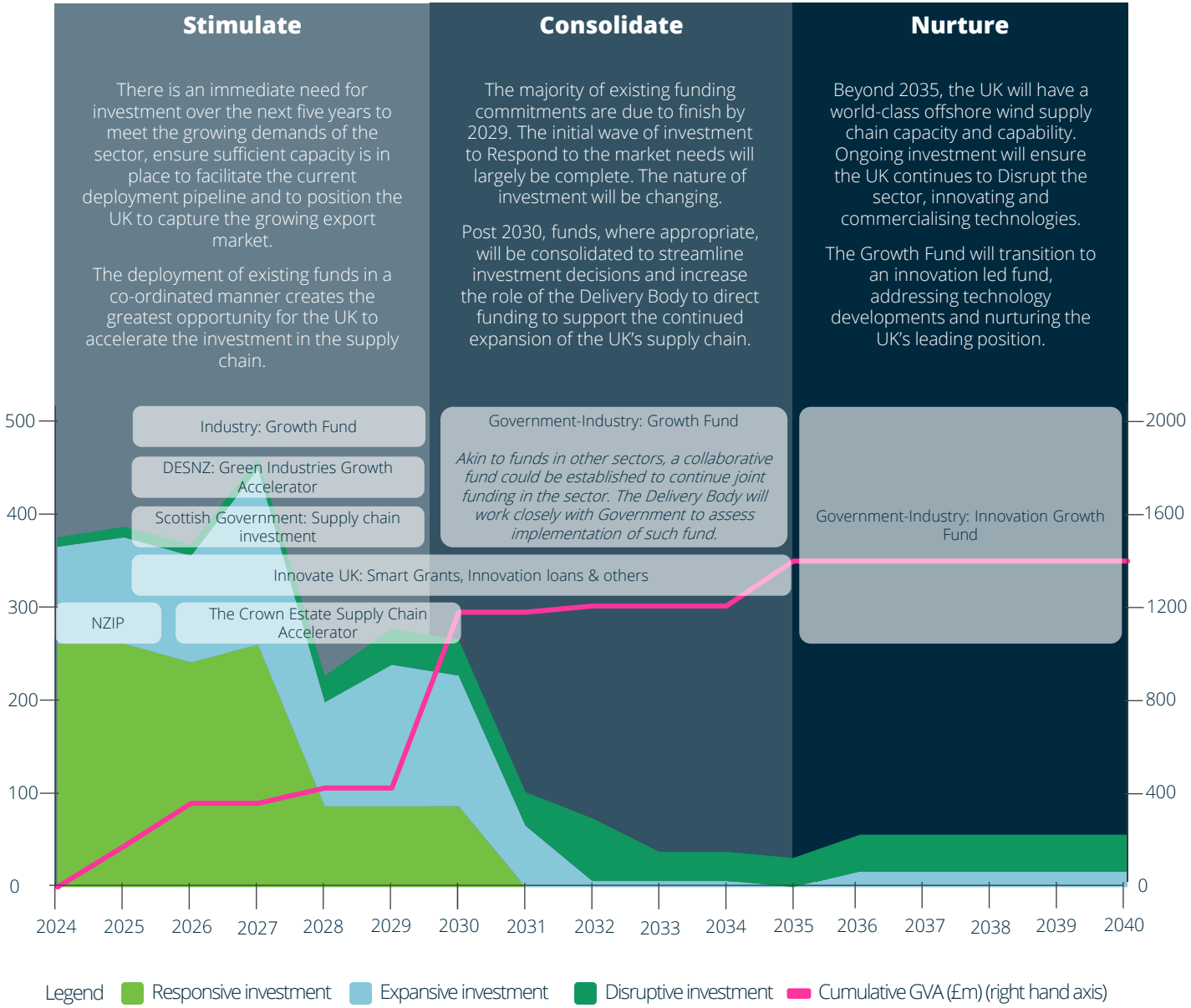
Public or collaborative industry funding acts as a catalyst to unlock private funding, alongside the wider support for investment through schemes such as Freeports, capital allowances, CfDs and the Sustainable Industry Rewards. The quantum, source and proportion of public v. private funding will depend on where in the value chain the investment is required. And the various funding sources available are often geared to different outcomes, over different timeframes.

As the graphic shows, the **Industrial Growth Fund can, aligned with this Plan, support multiple stages of the offshore value chain** - from technology R&D, through to commercialisation and capacity development. The latter is expected to be the primary focus of GIGA and the Scottish Government's £500m funding.

Wider **public funding for innovation** plays a crucial role supporting technology research and development, which is a significant existing strength of the UK economy, supported by public investment in R&D and a world-leading ecosystem of academic and specialist RTOs.

To maximise the benefits of the available funding to accelerate investment and development in the UK's offshore wind supply chain, the multiple sources of funding need to work together. **The Delivery Body will work to facilitate strategic alignment across the offshore wind funding schemes to maximise gains and secure the objectives of the Growth Plan.**

Funding, Investment & Benefit Evolution



For the UK to respond to the market need, expand existing capacity and capture the growing export opportunity a large proportion of investment is required over the next five years. This allows the UK to create a clear position to establish a strong market position and have a lasting impact on the UK's economy. Without the investment, the UK risks losing the opportunity to the USA and Europe.

The focus of this Growth Plan is on the development of UK expertise across the identified and continually monitored priorities over the next 5-10 year period. This requires an estimated investment of:

- 2025-2029: £1,200-£2,200m
- 2030-2035: £110-330m

The supply chain will need continued investment and will depend on how the sector progresses. As it matures, the nature and source of funding will change. Subsequent iterations of the Growth Plan will explore the additional investment requirements.

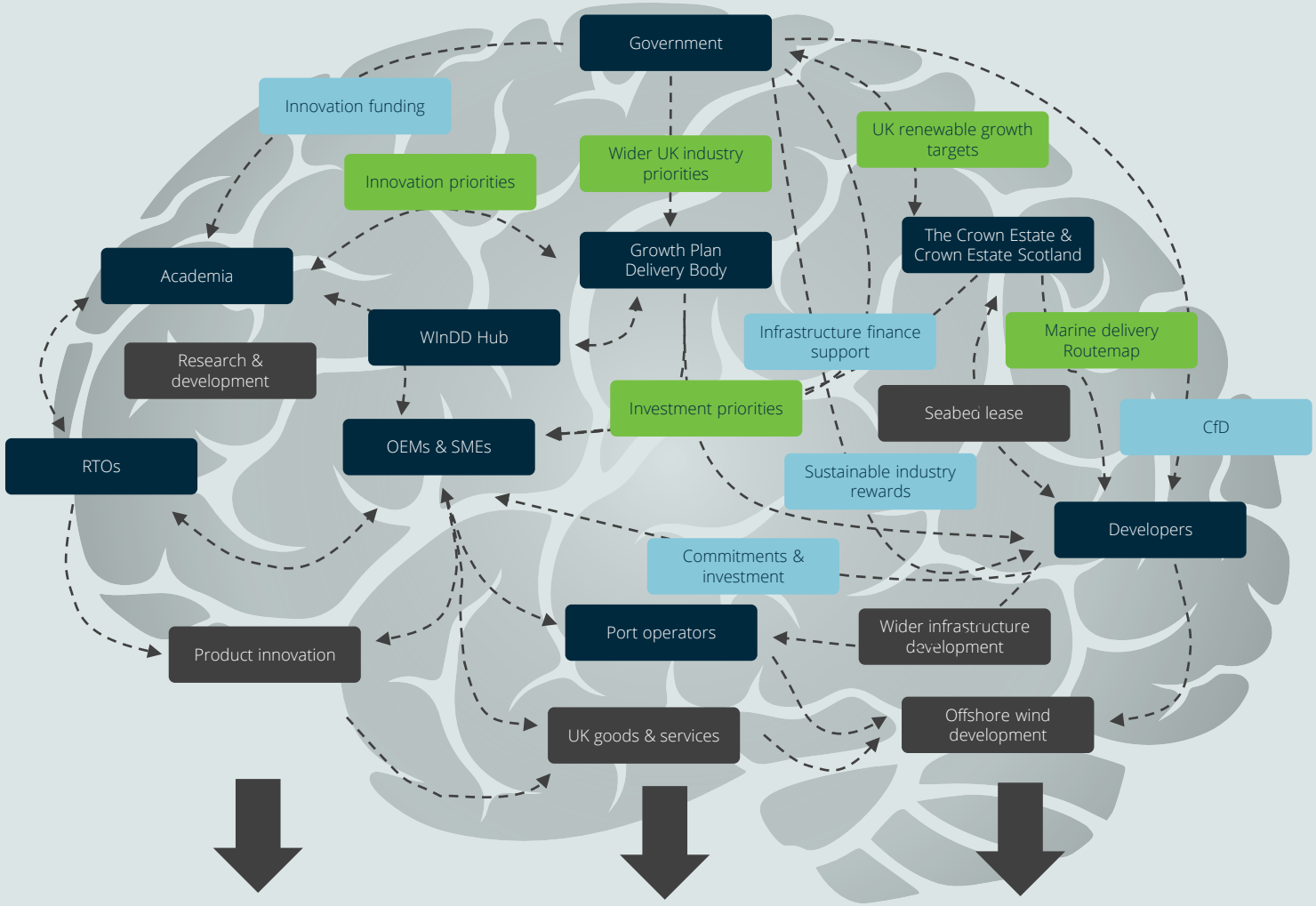
Aligned to other sectors in the UK, a single consolidated fund may allow for future innovation and development to continually nurture the sector. Through active monitoring of the sector and success of the plan, the Delivery Body will work across the sector to determine the appropriate timing to consolidate funding. With the evolution of government policy and the implementation of sustainable industry rewards as part of allocation round 7, a natural development cycle can form.

A Future Offshore Wind Ecosystem

The offshore wind supply chain is still developing, with technology innovation happening at a pace that is impacting the requirement for continued capital investment in manufacturing facilities. Whilst the UK Contract for Difference mechanism has facilitated growth in installed operating capacity, it has not succeeded in ensuring the UK is maximising the benefits of the activity and developing appropriate supply chains. Existing supply chain plans have not fully materialised into the growth required.

With the proposed Sustainability Industry Rewards from Allocation Round 7, the Supply Chain Development Statements by Crown Estate Scotland and supply chain requirements from The Crown Estate's Leasing Round 5 there is an opportunity to create a development cycle that fosters the development of the UK supply chain in competitive and regionally diverse areas. This can support the acceleration of research and development which can ensure the UK is continuing to innovate and be at the forefront of offshore wind excellence.

The Growth Plan sets out key investment opportunities to enhance the UK's capability, with a Delivery Body to co-ordinate investment from multiple parties across the sector. Appropriate policies, increased investment and industry commitments will help enhance the links throughout the sector. This will allow the UK to create an ecosystem that nurtures, expands and disrupts the sector rather than just responding to it.



Measuring Success

Successful execution of the plan will result in impacts across several dimensions. These impacts may not be immediately obvious due to the timeframe of actions. Nine performance measures and supporting metrics have been identified that to facilitate the monitoring of progress and impact of the plan.

It will be the responsibility of the Delivery Body to monitor the progress of the Growth Plan, how the sector is developing and articulate the quantitative and qualitative impacts on the sector. However, the responsibility for some of these metrics sit with different parties and collaboration will be required to facilitate transparency on how the sector is developing and where additional action is needed.

As the sector and supply chain develops, there is an opportunity to review the metrics and assess regional impacts to further understand the benefits being realised through the execution of targeted action into the UK offshore wind supply chain.

The performance measures align with the vision for the UK and the expectations of what success will look like if the UK takes action now. The indicators will help guide decision making during the ongoing delivery of the plan and support the assessment of the direction of the industry.

Measure	Metric	Responsible
GVA	• Total gross value add from offshore wind (£)	Delivery Body
	• Regional GVA relative to the national GVA (%)	Delivery Body
	• GVA per installed capacity (£/MW)	Delivery Body
Export	• Value of exports (£)	Delivery Body
	• Proportion of contracts being won by UK based suppliers	Delivery Body
	• % of international /domestic markets supplied from UK content	Delivery Body
	• Global market share (%)	Delivery Body
Capacity	• Total annual capacity (MW, # of blades, # of towers, kms of cable) of the sector	Delivery Body
Investment	• Total amount (£) invested in the supply chain from all available sources	Delivery Body
	• Proportion of total private investment involved (%)	Delivery Body
	• Total amount of foreign direct investment (£)	DBT
Technology & Innovation	• Number of collaborative research partnerships, projects, and demonstrations	Delivery Body
	• Total (public & private) investment into RD&D (£) and Proportion (%) of total private investment involved	Delivery Body
	• UK patented products & services commercially deployed in overseas markets	Delivery Body
Jobs	• Total number of jobs in the sector & Average salary (£) within the sector	OWIC
	• The split (%) between direct and indirect jobs	OWIC
	• Productivity of the workforce	OWIC
Floating	• Proportion (%) of floating projects	Delivery Body
	• Total funding (£) toward floating project development	Delivery Body
LCOE reduction	• Levelized cost of energy (£/MWh)	DESNZ
	• CfD strike prices for fixed and floating offshore wind (£/MWh)	DESNZ
Sustainable development	• The total number of distinct species within a local community	The Crown Estate
	• Average emissions per MW over the development stage	Developers
	• Proportion (%) of the supply chain being recycled	Developers

Growth Plan driven outcomes | Targets from Growth Plan action | Wider impacts enabled by the Growth Plan

Performance Indicators

	Today	By 2030	By 2035
GVA	The offshore wind sector contributes about £2-3bn per GW installed of gross value add to the UK.	Investment in the supply chain has resulted in £1bn of incremental (from 2024) annual GVA to the UK economy	Investment in the supply chain has resulted in over £2bn of incremental (from 2024) annual GVA to the UK economy from domestic and export sales
Export	Total UK exports are estimated at £1-2bn and the UK is winning contracts in around 50% of package areas, by value[3]	Total UK exports across all components have increased by 20%, with UK priorities accounting for 50% of exports.	Total UK exports across all components have increased by 40%, with UK priorities accounting for 50% of exports.
Capacity	UK has a degree of capacity across blades (3 GW), cables (2000 km) and electrical systems with more than 4 manufacturing units of key suppliers	UK capacity has increased by 1.5x with additional expansions across other areas committed or in advanced stages	UK capacity has increased by 3x with new and innovative manufacturing techniques incorporated into UK production
Investment	Investment in the UK has been limited to a handful of opportunities and has faced challenges in securing the necessary commitments to reach final investment decisions.	Incremental investment (from 2024) in the UK supply reached more than £1bn in the priority areas to allow UK to develop additional capacity.	Incremental investment (from 2024) in the UK supply reached more than £2bn in the priority areas to allow UK to develop additional capacity and undertake new research.
Technology & Innovation	The UK public sector spend on R&D in for wind energy 2022 was £c.38m[26] with the UK accounting for 7% of global offshore wind research output.	Public sector RD&D on offshore wind has doubled over 2022 values to over £80m and is at least matched by industry.	Public sector RD&D on offshore wind has tripled to over £120m and is at least double matched by industry with the UK now accounting for 14% of global offshore wind research output.
Jobs	Total UK offshore wind workforce is estimated at over 30,000 with 17,394 and 14,863 direct and indirect jobs respectively[2]	Investment in the supply chain has added 6,000 jobs over 2023 with total UK offshore wind workforce at ~100,000 with more than 50,000 and 50,000 direct and indirect jobs respectively.	Investment in the supply chain has added 7,000 jobs over 2023 with total UK offshore wind workforce at ~120,000 with more than 70,000 and 50,000 direct and indirect jobs respectively.
Floating	Floating represents a key opportunity however today there is only 78 MW of floating offshore wind[12]	Floating offshore wind meets the UK government target of [5 GW] of capacity across operational and construction stages.	Floating offshore wind continues to accelerate and UK has more than [20 GW] of operational capacity.
LCOE reduction	No current floating offshore wind commercially deployed, however estimated LCOE for commercial floating offshore wind is around £120/MWh[1,51]	Floating offshore wind LCOE has reduced by [30%] on the first commercial strike price and is trending below [£90 /MWh]	Floating offshore wind LCOE has reduced a further [30%] from first commercial CfD and is now within [25%] of current fixed prices
Sustainable development	Offshore wind emissions intensity is not yet uniformly measured with emissions intensity ranging between 6-8gCO_2/KWh[52]	Innovations in UK offshore wind has supported reduction in emissions intensity of UK developments by 35% over an agreed 2024 baseline.	Further advances in offshore wind technology and materials supports a reduction of more than 50% over the agreed baseline.

Growth Plan driven outcomes | Targets from Growth Plan action | Wider impacts enabled by the Growth Plan

Note: [a] GVA for the offshore wind sector has been estimated based on previously published reports and has not been quantified for this Growth Plan however the intention will be to baseline the industry to support future tracking

Next Steps

To facilitate the execution of the plan, the following immediate next steps will undertaken:

1. Secure industry funding commitments (ongoing)

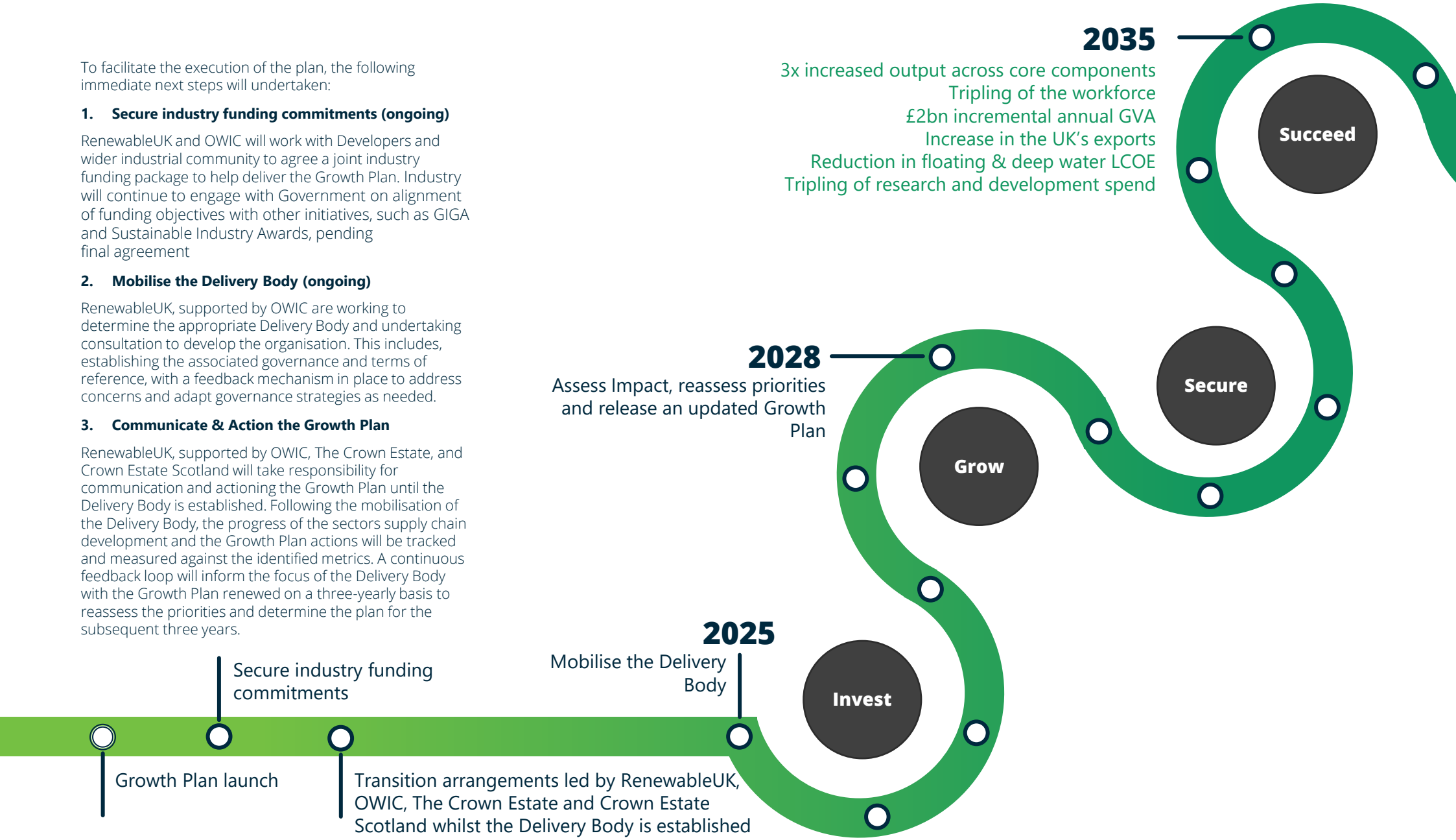
RenewableUK and OWIC will work with Developers and wider industrial community to agree a joint industry funding package to help deliver the Growth Plan. Industry will continue to engage with Government on alignment of funding objectives with other initiatives, such as GIGA and Sustainable Industry Awards, pending final agreement

2. Mobilise the Delivery Body (ongoing)

RenewableUK, supported by OWIC are working to determine the appropriate Delivery Body and undertaking consultation to develop the organisation. This includes, establishing the associated governance and terms of reference, with a feedback mechanism in place to address concerns and adapt governance strategies as needed.

3. Communicate & Action the Growth Plan

RenewableUK, supported by OWIC, The Crown Estate, and Crown Estate Scotland will take responsibility for communication and actioning the Growth Plan until the Delivery Body is established. Following the mobilisation of the Delivery Body, the progress of the sectors supply chain development and the Growth Plan actions will be tracked and measured against the identified metrics. A continuous feedback loop will inform the focus of the Delivery Body with the Growth Plan renewed on a three-yearly basis to reassess the priorities and determine the plan for the subsequent three years.



Acknowledgements

Commissioned by:

RenewableUK is the leading renewable energy trade association in the UK representing members with over 250,000 people. from international energy companies to small companies keen to build new markets and ready to disrupt our energy market with new products and services. Our role is to maximise this opportunity and create the conditions that will see the renewable sector continue to thrive here.

The Offshore Wind Industry Council (OWIC), a senior Government and industry forum, was established in May 2013 to drive the development of the world leading offshore wind sector in the UK. It is comprised of members drawn from the leading UK and global firms in the offshore wind industry, including developers and original equipment manufacturers. The Council oversees and drives the implementation of the Offshore Wind Sector Deal, co-Chaired by Industry and the UK Minister of State for Energy Security and Net Zero.

The Crown Estate is a significant national landowner creating financial, environmental and social value for the nation, both for now and for the long term. The Crown Estate is responsible for the holistic management of the seabed around England and Wales. The Crown Estate's role is to unlock the potential of our seabed, sea and coastline to support the nation's transition to a resilient, sustainable and decarbonised future.

Crown Estate Scotland is a self-financing public corporation which invests in property, natural resources and people to create lasting value for Scotland. Crown Estate Scotland is responsible for the management of land, property and the seabed in Scotland to promote social, economic and environmental benefit. Through awarding and managing seabed leases, along with strategic collaboration and enabling functions, Crown Estate Scotland contributes to the achievement of key climate and energy transition ambitions.

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- Net Zero Technology Centre
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- Tekmar
- Total
- Vestas

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Glossary

AI	Artificial Intelligence
AR	Allocation Round
APAC	Asia Pacific
CAGR	Compound Annual Growth Rate
CAPEX	Capital Expenditure
CDMC	Clean Maritime Demonstration Competition
CfD	Contracts for Difference
DARE	Digital Autonomous Robotics Engineering
DBT	Department for Business and Trade
DESNZ	Department for Energy Security and Net Zero
DEVEX	Development Expenditure
Devolved regions	Scottish and Welsh governments
EIA	Environmental Impact Assessment
EPC	Engineering, Procurement and Construction
EPCI	Engineering, Procurement, Construction and Installation
GDP	Gross Domestic Product
GVA	Gross Value Add
HVM Catapult	High Value Manufacturing Catapult
HVAC	High Voltage Alternative Current
HVDC	High Voltage Direct Current
IP	Intellectual Property
KPI	Key Performance Indicator
LATAM	Latin America
LCOE	Levelised Cost of Electricity
Leading edge erosion	Erosion caused by particles (such as raindrops) on the leading edge of the wind turbine blade
MASS	Maritime Autonomous Surface Ships

Glossary

MCA	Maritime Coastguard Agency
ML	Machine Learning
O&M	Operations and Maintenance
OEM	Original Equipment Manufacturer
OpEx	Operation Expenditure
ORE Catapult	Offshore Renewable Energy Catapult
OSW	Offshore Wind
OWIC	Offshore Wind Industry Council
R&D	Research and Development
RD&D	Research, Development & Demonstration
RTO	Research Technology Organisation
SME	Small and Medium-Sized Enterprises
SPARTA	System, Performance , Availability and Reliability Trend Analysis
Supergen ORE Hub	Supergen Offshore Renewable Energy Hub
UKEF	UK Export Finance
WTG	Wind Turbine Generator

Appendix-I (Programme Investment & Impacts)

Priority	Goal	Investment	10-Year GVA	10-Year GVA Multiplier
Blades & Towers	Increase UK manufacturing capacity of offshore wind blades by 50%	£200-400m	£1.8-2.7bn	8x
Subsea Foundations & Substructures	Expand UK foundations manufacturing for designs catering to deep waters	£70-100m	£1.2–2.0bn	18x
	Increase UK capacity of mooring and anchors by 50% from 2023	£20-50m	£0.3-0.5bn	12x
	Support acceleration of floating technology maturity	-	-	-
	Add floating foundation manufacturing capacity	£100-£200m	£4.0-8.1bn	40x
Electrical & Cables	Increase HVDC cables manufacturing capacity	£200-400m	£1.5-2.9bn	12x
Environmental services	Build extensive marine datasets	£1-10m	£80-120m	14x
Installation, O&M	Increase supplier base of EPC companies	£1-5m	£0.4-0.8bn	274x
	Upgrade fleet of cable laying vessel	£100-200m	£0.6-1.2bn	6x
Innovation hub	Establish a late stage test & demonstration facility	£100-300m	-	Tbc
Blades & Towers	Double UK manufacturing capacity of offshore wind blades	£200-400m	£1.8-2.7bn	15x
	Incorporate new composite-based components in the next generation of offshore wind turbine blades	£20-30m	-	-
	Establish one new tower manufacturing facility focused on using composite material	£150-250m	£1.1-2.1bn	8x
Subsea Foundations	Manufacture advanced material for mooring and anchors	£10-20m	-	-
Electrical & Cables	Manufacture dynamic inter-array cable at 132kv or more	£30-50m	£0.2-0.3bn	5x
Environmental services	Develop advanced robotics solution for autonomous surveying	£10-20m	£0.2-0.3bn	16x
Installation, O&M	Deploy new cable installation technique reducing cable damage	£1-10m	-	-
	Deploy Low carbon vessels for installation and O&M services (CTVs and SOVs)	£10-20m	-	-
Blades & Towers	Increase automation of wind turbine blade manufacturing process	£20-80m	£0.3-0.5bn	6x
	Develop automated processes for high value component manufacturing	£10-40m		
	Advance leading edge blade protection	£30-90m		
Subsea Foundations	Produce advanced material for part of floating substructure production	£20-50m	£0.8 – 1.6bn	32x
Electrical & Cables	Reduce number of cable related failures/reliability issues	£1-5m		
	Develop mutually compatible and interoperable HVDC systems	£10-30m	£0.1 – 0.2bn	6x
	Develop new wet and dry cable designs	-	-	-
Environmental services	Develop machine learning techniques optimising environmental surveys	£1-10m		
Installation, O&M	Integrate machine learning algorithms in O&M services	£1- 5m		
	Commercialise next generation inspection, monitoring and installation services	£10- 25m		

Disclaimer

The information contained herein is of a general nature and is not intended to address the circumstances of any particular individual or entity. Although we endeavour to provide accurate and timely information, there can be no guarantee that such information is accurate as of the date it is received or that it will continue to be accurate in the future. No one should act on such information without appropriate professional advice after a thorough examination of the particular situation.

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