FLOATING OFFSHORE WIND CENTRE OF EXCELLENCE

Delivered by CATAPULT Offshore Renewable Energy

# FLOATING OFFSHORE WIND CENTRE OF EXCELLENCE

## Impact Report 2019-2026


In partnership with:

Supergen Offshore Renewable Energy, Flotation Energy, nadara, The Crown Estate, Simply Blue Group, ScottishPower Renewables, OW Ocean Winds, ESB, CIP Copenhagen Infrastructure Partners, Crown Estate Scotland, EDF Energy, JERA NEX BP

Author:
FOW CoE Team

**Floating Offshore Wind Centre of Excellence**
**Impact Report 2019-2026**

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Cover photo credit: Equinor Hywind Floating Wind Farm

# FOREWORD

The Floating Offshore Wind Centre of Excellence (FOW CoE) has been at the heart of the floating wind sector for over six years. It provides evidence and research that continues to guide developers, supply chain and government on the engineering, cost and environmental realities of floating wind deployment. It has been a truly collaborative endeavour with initial funding from Scottish Government catalysing support from floating wind developers. Support from UK Government and Crown Estate Scotland has been crucial to maintain momentum and recent membership of The Crown Estate adds further strength to the organisation.

I am delighted to introduce this Impact Report and to reflect on the journey of floating offshore wind. Since the FOW CoE was established in 2019, the sector has moved from proving that floating wind can work, to the more demanding task of proving that it can be delivered repeatedly, competitively, and at scale. The work summarised here sits firmly in that transition: turning early experience into evidence and providing foresight that can be used by the wider sector.

The common thread across the programme is independent engineering evidence. Developers need clearer baselines for design choices, O&M and consenting pathways. Supply chain organisations need confidence in what will be built so they can invest in capability, capacity and people. Government and regulators need robust, independent insight to shape policy.

The FOW CoE's approach has been deliberately practical - convening industry and stakeholders around shared problems—cost reduction, dynamic cables, moorings and anchors, and environmental interactions. We have helped build a consistent evidence base that can be used across projects to reduce duplication and enable faster learning. Over time, these incremental gains will reduce costs and increase confidence.

This report also highlights something equally important: progress in floating wind requires a whole systems approach. It depends on alignment between technology developers, project developers, ports and vessels, insurers, banks, and public policy.

I would like to thank the Floating Wind Team at Offshore Renewable Energy (ORE) Catapult and the many specialist delivery partners who have contributed to the quality of the research. I would also like to thank the members for their willingness to put competition aside and collaborate on the core research required to make floating wind a success.

**Andrew Macdonald**
**Co-chair, FOWCoE**

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# NOMENCLATURE

| | |
|---|---|
| AUV | Autonomous Underwater Vehicle |
| CoE | Centre of Excellence |
| FOSS | Floating Offshore Substation |
| FOW | Floating Offshore Wind |
| FOWT | Floating Offshore Wind Turbine |
| HV | High Voltage |
| ORE | Offshore Renewable Energy |
| OSS | Offshore Substation |
| O&G | Oil and Gas |
| O&M | Operations and Maintenance |
| ROV | Remotely Operated Vehicle |
| TLP | Tension Leg Platform |
| ULS | Ultimate Limit State |

# 1 INTRODUCTION

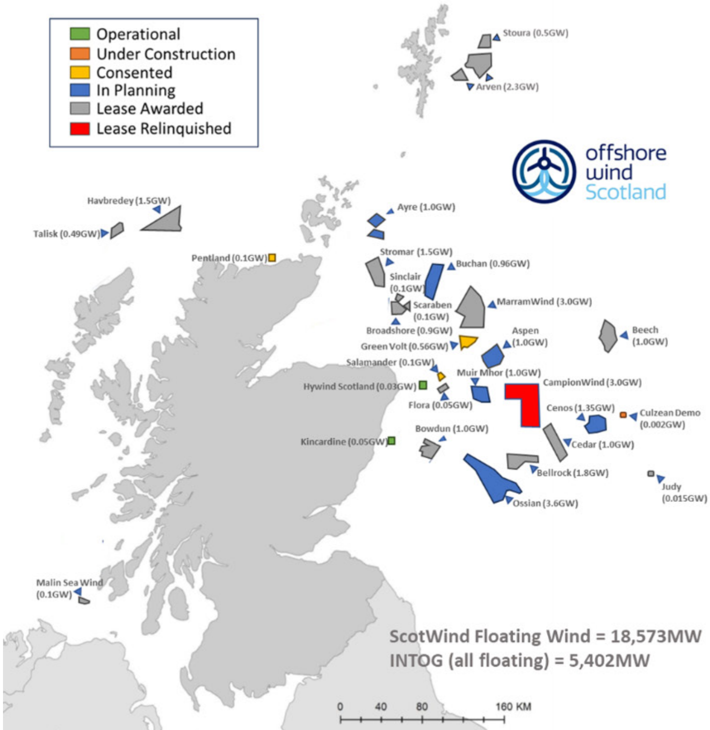
### 1.1 State of Industry

Floating offshore wind (FOW) is still in an early phase of deployment, where globally only about 277MW is fully operational. There are currently 16 projects which are currently producing power across seven countries with Norway (100W), UK (78MW) and China (40MW) leading the way – a fairly small amount when compared with fixed-bottom offshore wind at 88.9 GW.

There is however a huge global FOW project pipeline of 266GW under development (including planning, approvals, early stages) with  rapid expansion expected to take place in the coming decade. In Europe (especially in the UK and the Celtic Sea), major floating areas are being leased and developed under Government plans and auctions. Following the UK Contracts for Difference (CfD) allocation round AR6 (2025) and  AR7 (2026), there are now three UK FOW projects approved - GreenVolt (560MW), Erebus (100W) and Pentland (92MW).

In the past decade, floating offshore wind projects have evolved and are anticipated to grow in scale around the UK – from small demonstrator projects to full scale commercial projects.

From its inception in 2019, the Floating Offshore Wind Centre of Excellence (FOW CoE) joint industry programme has been present in this journey of development, and played its part in conducting valuable research, leading the debate on what challenges we have and how we must address them together.




**Floating Wind in Scotland (24GW)**

| SITE | DEVELOPERS | CAPACITY |
|---|---|---|
| Hywind | Equinor | 30MW |
| Kincardine | KOWL | 48MW |
| Pentland | Copenhagen Infrastructure Partners | 100MW |
| SCOTWIND | | |
| Ayre | Qair | 1,008MW |
| Buchan | Floating Energy Allyance (Baywa r.e. Elicio and BW Ideol) | 960MW |
| Muir Mhor | Vattenfall and Fred Olsen Renewables | 1,000MW |
| Ossian | SSE Renewables, CIP and Marubeni | 3,610MW |
| Bellrock | Nadara | 1,800MW |
| CampionWind | Shell | 3,000MW |
| Stromar | Orsted/BlueFloat Energy/Nadara | 1,500MW |
| Broadshore | Nadara | 900MW |
| MarramWind | ScottishPower Renewables | 3,000MW |
| Hevbredey | Northland Power and ESB | 1,500MW |
| Talisk | Magnora ASA and Technip UK | 495MW |
| Arwen | Ocean Winds | 2,300MW |
| Stoura | ESB Asset Management | 500MW |
| INTOG | | |
| Culzean Demo | TotalEnergies | 3MW |
| Green Volt | Flotation Energy/Vargrønn | 560MW |
| Salamander | Odfjell Oceanwind/Simply Blue Group | 100MW |
| Cenos | Flotation Energy/Vargrønn | 1,350MW |
| Aspen | Cerulean Winds | 1,008MW |
| Sinclair | Nadara | 100MW |
| Scaraben | Nadara | 100MW |
| Flora | bp Alternative Energy Investments | 50MW |
| Malin Sea Wind | ESB Asset Development | 100MW |
| Beech | Cerulean Winds | 1,008MW |
| Cedar | Cerulean Winds | 1,008MW |
| Judy | Harbour Energy | 15MW |

Correct as of December 2025

*Figure 1 - Floating Wind in Scotland (ScotWind and INTOG)*

One  fundamental challenge is that floating offshore wind is still much more expensive than fixed bottom offshore wind, due mainly to complex installation and operations, the mass and subsea systems required to ensure sufficient stability, complex electrical infrastructure, and the financial pressures that come with less proven technology.

The Offshore Renewable Energy (ORE) Catapult  established the Floating Offshore Wind Centre of Excellence (FOW CoE) in 2019, with a vision to create an internationally recognised centre of excellence in floating offshore wind, working towards reducing the Levelised Cost of Energy (LCOE) from floating wind to a commercially manageable rate, cutting back development time for FOW farms and developing opportunities for the local supply chain, and driving innovation in manufacturing, installation and Operations and Maintenance (O&M) methodologies in floating wind. The FOW CoE is a collaborative programme with industry, academic and stakeholder partners.

This report aims to reflect on the programme's journey so far, capturing a snapshot of what this collaborative endeavour has achieved for the floating wind sector.

### 1.2 Delivery Approach

Powered by the internal engineering resource of ORE Catapult, the FOW CoE strives to deliver a robust evidence base in addressing key sector challenges. Programme outputs are produced in various degrees of detail, to both programme partners and to a wider public audience. As such, the evidence provided is used to impact decision making across  project development, supply chain, academia and Government policy.

The breadth of the topics covered in the programme spans both technical and commercial fields, and are selected and driven  through discussion and constructive debate with  funders. This ensures the programme is  addressing the needs of key sector decision-makers,  supply chain and wider industry.

### 1.3 Key Impact Statistics

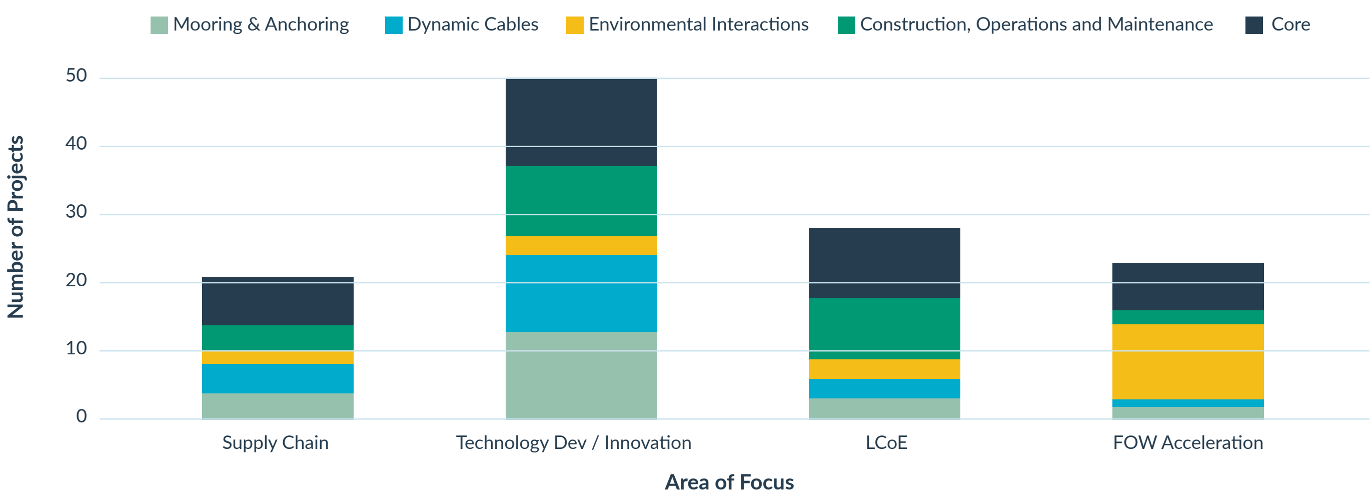



*Figure 2 - Graph of number of projects focusing on the following topics*

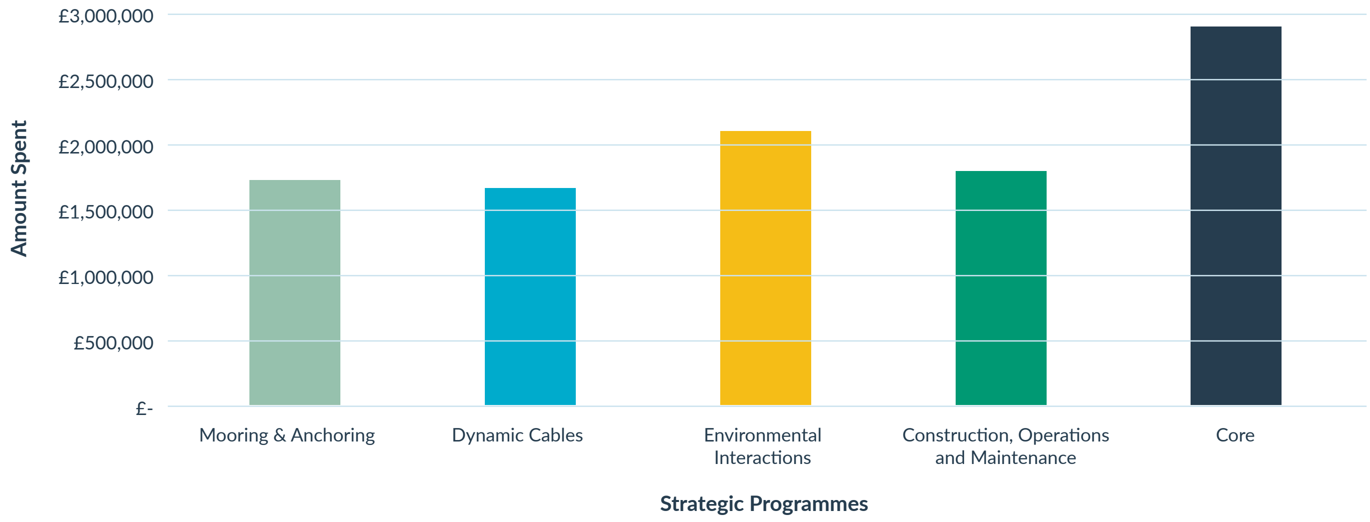



*Figure 3 - Total budget by Strategic Programme*

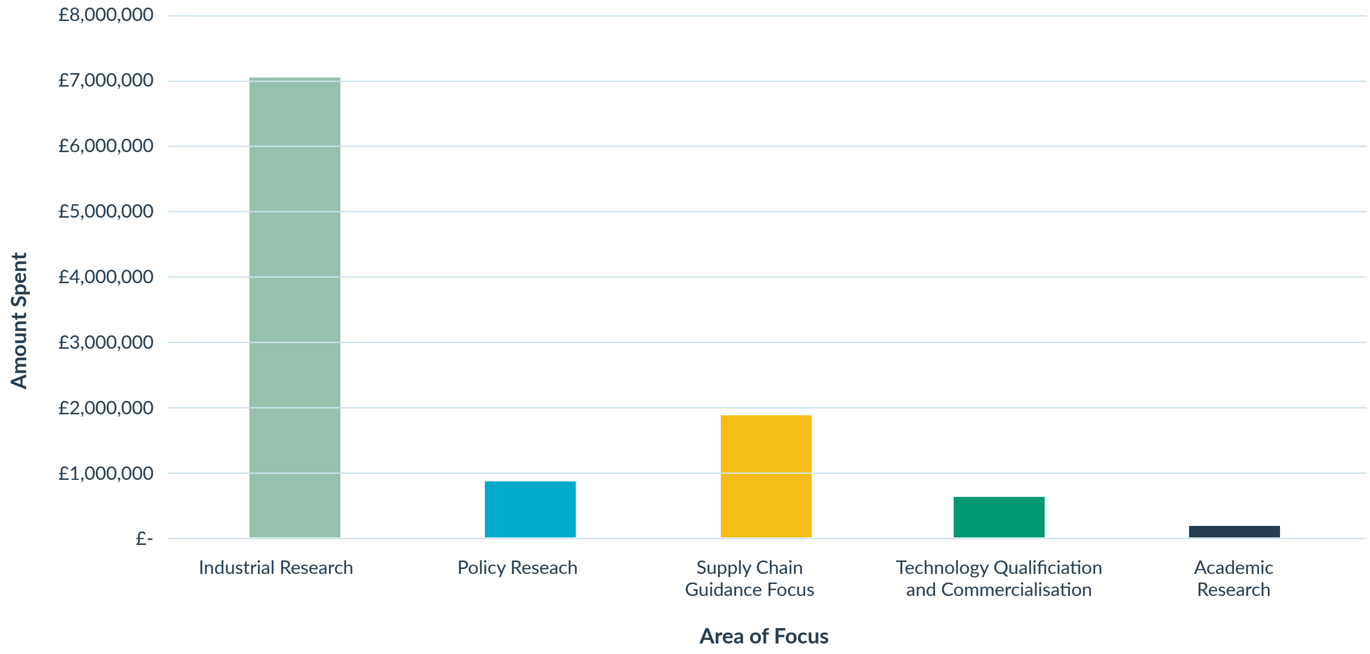



*Figure 4 - Total budget spend by area*

## Business Engagement

Since the FOW CoE inception in 2019, over **501** supply chain businesses have been engaged on specific project activity, and **52** businesses have been directly supported through Technology Qualification, research project partners and businesses contracted to deliver work.

## Public Summary Reports

To support the growth of FOW, we believe it is important to share some of our key insights gained via the delivery of our diverse project portfolio to the wider industry. We communicate this information via our Public Summary Reports and track the type of organisation that accesses our reports. Below are some examples of who's downloading our public reports.

### **Project - Tow to Port Offshore Management** – 605 Total Views

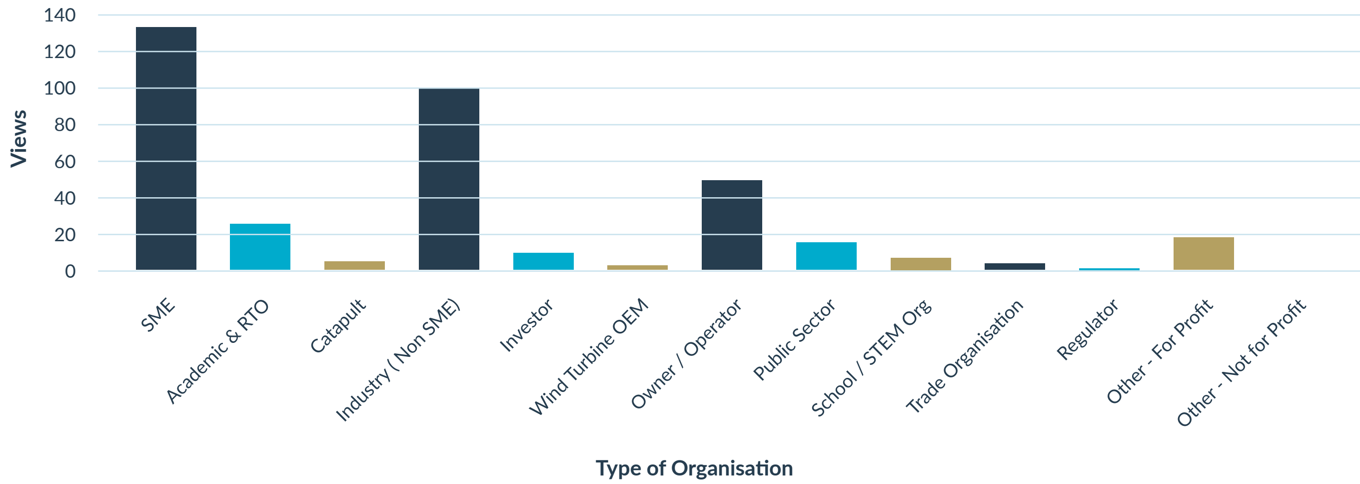



*Figure 5 - Public Report Statistics*

### **Project - Subsea Vs Floating Substations** – 328 Total Views

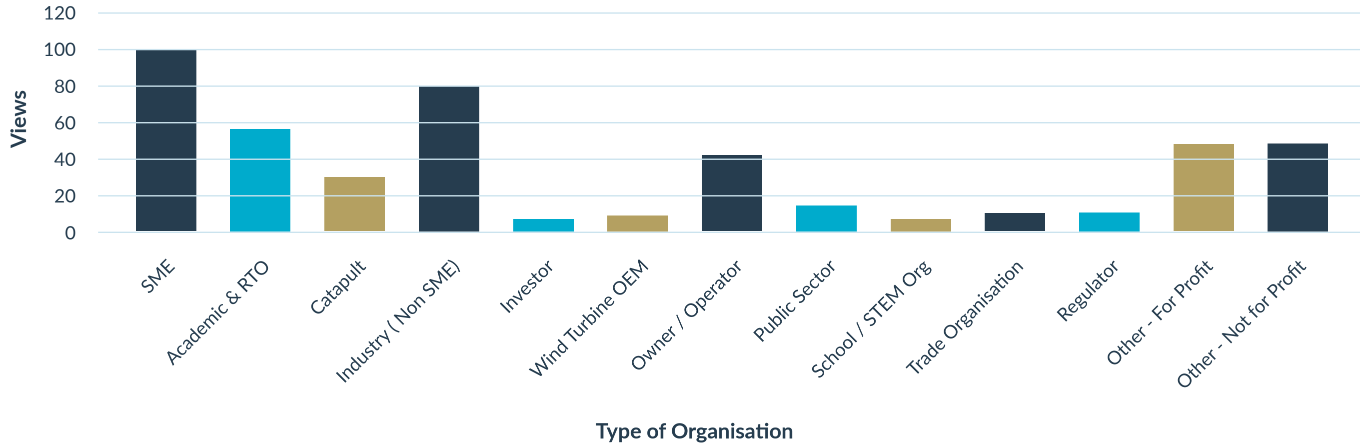



*Figure 6 - Public Report Statistics*

## 1.4 Partners

To deliver high quality outputs, the FOW CoE has relied on meaningful and enduring collaboration with several industry, stakeholder, academic and supply chain partners. Running the programme would not be possible without these organisations.

*Figure 7 - Organisations that have supported the FOW CoE*

## 1.5 Work Programmes

The FOW CoE runs several work programmes, creating a broad and diverse portfolio of project activity. The programme covers our Core Work Programme, Dynamic Cables, Construction, Operations and Maintenance, Environmental Interactions and Mooring and Anchoring.

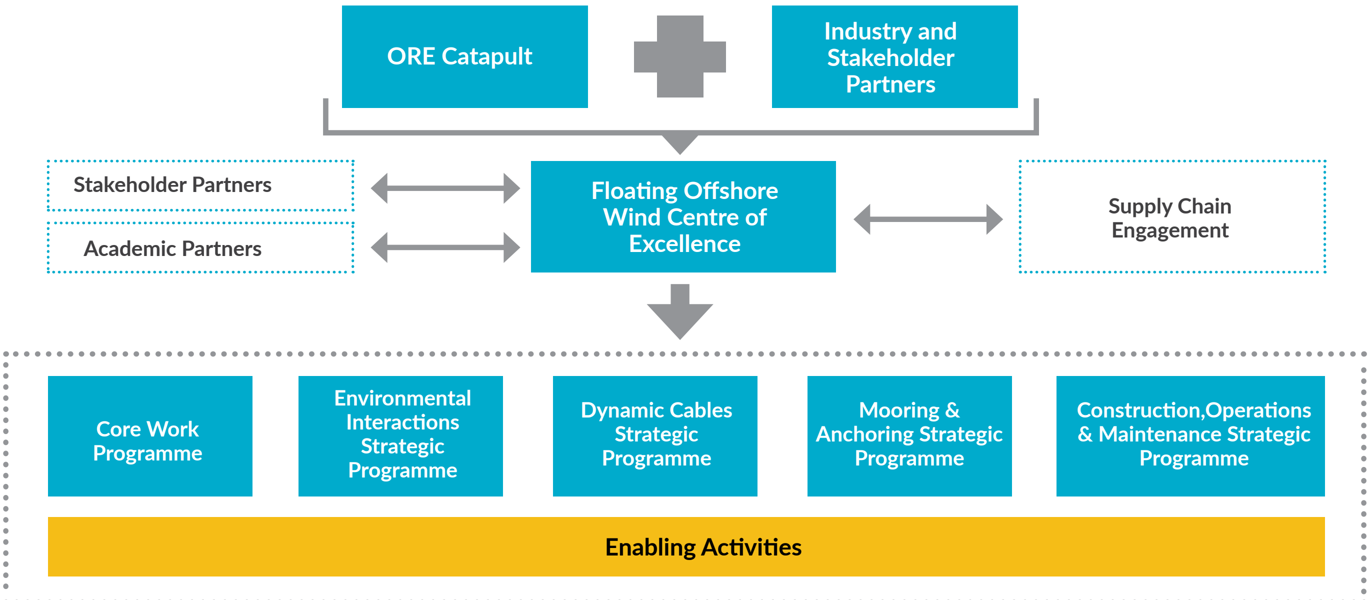



*Figure 8 - FOW CoE Operational Model*

# 2 CORE WORK PROGRAMME

**Background**

Since 2019, the Core Work Programme has explored key questions around supply chains, environmental considerations, platform design, port infrastructure, and long-term industry needs. These early insights laid the foundations for today's work and helped shape a clearer path for the future of floating offshore wind in the UK. Floating offshore wind is still a new and rapidly developing technology. The Core Programme focuses on helping the industry address several important challenges, including:

- The wide range of floating platform designs, which can create uncertainty for suppliers
- The need for new manufacturing facilities and upgraded ports
- Complex engineering requirements in deeper waters
- Turbine reliability and long-term performance
- Providing clearer information for investors, insurers, and lenders
- Bringing together different parts of the industry to align standards and expectations

## Case Study – Guide to Floating Offshore Wind

Over the past few years, the programme has delivered several tools, studies, and insights that are now used across the industry. One major achievement has been the Guide to Floating Offshore Wind, first published in the UK and now also released in Japan. This valuable resource is an open access repository of fundamental facts and figures for all to use. Key topics covered include  fecycle overview, floating technology, fixed versus floating, windfarm costs and supply chain.


*Figure 9 - Guide to Floating Offshore Wind online*

## Progress So Far

The Core programme has been the cornerstone of the FOW CoE and over six  years has also delivered important work on:

- Understanding future cost reduction opportunities
- Exploring both concrete and steel substructure solutions
- Improving knowledge of mooring lines, cables, port requirements, and maintenance needs
- Supporting the UK supply chain as it prepares for large-scale deployment

These efforts have strengthened confidence in floating offshore wind and helped industry partners plan, optimise their designs and delivery approaches, support their bids and inform their engagement with supply chain.

## A Sharpened Focus

As the sector has matured, the Core Programme now focuses on four main areas that help the industry grow in a coordinated and sustainable way:

### A) General Enabling Actions

- Broad areas of investigation that underpin the positive development of the sector, from cost reduction to international collaboration.

### B) Substructure Industrialisation

- Helping the UK get ready to manufacture floating platforms at scale and create opportunities for industry investment.

### C) Whole System Engineering

- Ensuring that all components of a floating wind farm—from turbines and foundations to station-keeping systems and cables —are designed effectively as a complete system. This field of activity also targets the inherent challenge of how to  integrate the wind turbine design process into this system.

### D) Commercial Insights

- Building a clearer understanding of financial and contractual risks, covering topics such as insurance.

| Project | Year of completion |
|---|---|
| Advanced Manufacturing of FOW Substructures | 2020 |
| FOW Supply Chain and Infrastructure | 2021 |
| FOW and Fishing Interaction Working Group and Road Map | 2021 |
| Project Finance and Insurance | 2022 |
| Energy System Benefits | 2022 |
| FOW Dynamic Cabling Systems - Technology Development | 2022 |
| FOW Spatial Planning and Deployment | 2022 |
| FOW Mooring and Anchoring System - Technology Development | 2022 |
| FOW Insurance | 2022 |
| FOW Construction, Operations and Maintenance Model Benchmarking | 2023 |
| Offshore Wind Port Infrastructure Investment Models | 2023 |
| Guide to A Floating Wind Farm | 2023 |
| Navigational Planning and Risk Assessment – Maritime and Aviation | 2023 |
| Cost Reduction through Technology Innovation | 2023 |
| Supply Chain Database Development | 2023 |
| FOW International Market and Opportunities Overview | 2023 |
| FOW Marshalling and Assembly in Restricted Ports | 2023 |
| Techno-economic Assessment of Hybrid Generation and Energy Storage Systems | 2024 |
| Coatings, Corrosion Protection and Management | 2024 |
| Offshore Wind Deployment Scenarios | 2024 |
| FOW Cost Reduction Pathways and Monitoring Framework | 2024 |
| Carbon Footprinting for Offshore Wind – Methodology, Case Study and Carbon | 2026 |
| Cost Reduction Monitoring Framework | 2026 |

*Table 1 - Core Projects completed to date*

# 3 CONSTRUCTION, OPERATIONS AND MAINTENANCE STRATEGIC PROGRAMME

## Background

The construction and subsequent operation of large, commercial-scale floating offshore wind farms presents a range of new challenges and considerations not found in fixed foundation offshore wind projects. The marshalling, assembly, and integration of commercial floating farms will drive new port requirements, and installation will require new vessels and procedures not used in existing fixed-foundation projects. Once installed, maintenance strategies must plan for the operation of new components and farther from shore locations.


*Figure 10 - Construction, Operations and Maintenance (credits: Floatgen TP - ECN S.ARCHEVEQUE)*

## Mission

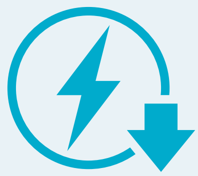
For the offshore wind industry to scale up the construction of FOW farms and to reduce the costs for operating and maintaining these large farms in the years ahead, there is a need to better understand these activities for floating wind, and to develop new technologies and optimised methodologies in de-risking construction, operation and maintenance activities. The construction, operations, and maintenance (COM) strategic programme aims to support the development of floating offshore wind through de-risking construction and O&M of future, commercial-scale FOW farms.

## Aims

Three key aims provide the framework for project development and selection:

### Reducing the LCOE

- Identify and support emerging technologies to support maintenance
- Provide cost modelling on varied O&M methodologies
- Expand understanding of major component replacement methodologie
- Support development of more cost-effective technologies
- Identify port requirements for tow to port planning



### Reducing hazards and promoting H&S

- Identify and support emerging technologies to support maintenance
- Provide cost modelling on varied O&M methodologies
- Expand understanding of major component replacement methodologie
- Support development of more cost-effective technologies
- Identify port requirements for tow to port planning

## Encouraging Cross-Industry Collaboration

- Facilitate discussions between developers to support knowledge sharing
- Engage with industry members to provide insight on real-world experiences
- Provide public summary reports for wider industry dissemination

FOW construction presents a complex series of activities with unique infrastructure and vessel requirements. Methodologies, regulation, and risks must be understood prior to commercial-scale development, as they will differ from fixed offshore wind.

FOW O&M presents uncertainties associated with different site conditions, new critical components, and methodologies. Risks and uncertainties must be identified, the impact on KPIs understood, and appropriate methodologies identified prior to commercial-scale development.

## Case Study – Major Component Replacement Phase 2

Over the past few years, the programme has delivered several tools, studies, and insights Major component replacement (MCR) is a key area of risk for floating offshore wind and is expected to be one of the most significant challenges for commercial-scale floating farms. The current approach of tow to port is restricted by access to suitable ports and has led to significant downtime for current demonstrator projects that have adopted this strategy.

ORE Catapult partnered with the National Decommissioning Centre and SolveWind (partnership between Liftra and Esteyco) to model a generator change out using a self-hoisting crane to change out a generator on a 20MW centre mounted FOW turbine and lower it to the ATOMs platform (an innovative platform that can be coupled directly to the turbine substructure).

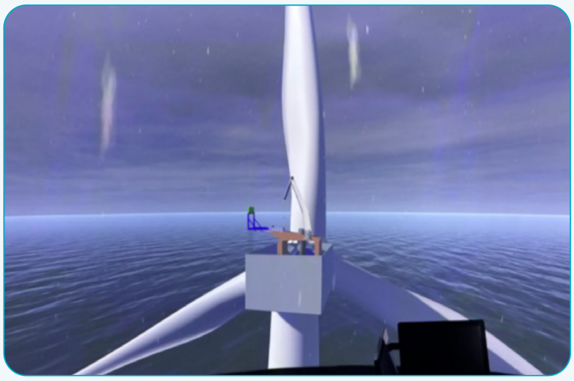


*Figure 11 - Simulated Generator change out modelling*

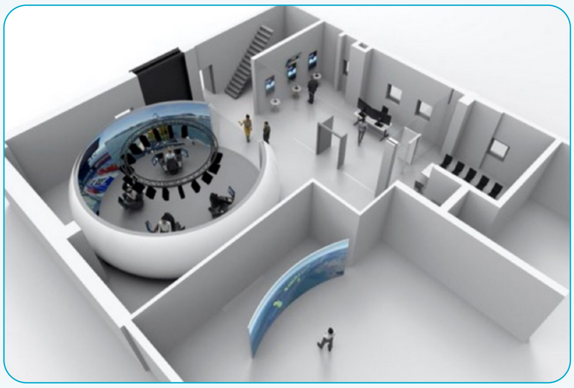
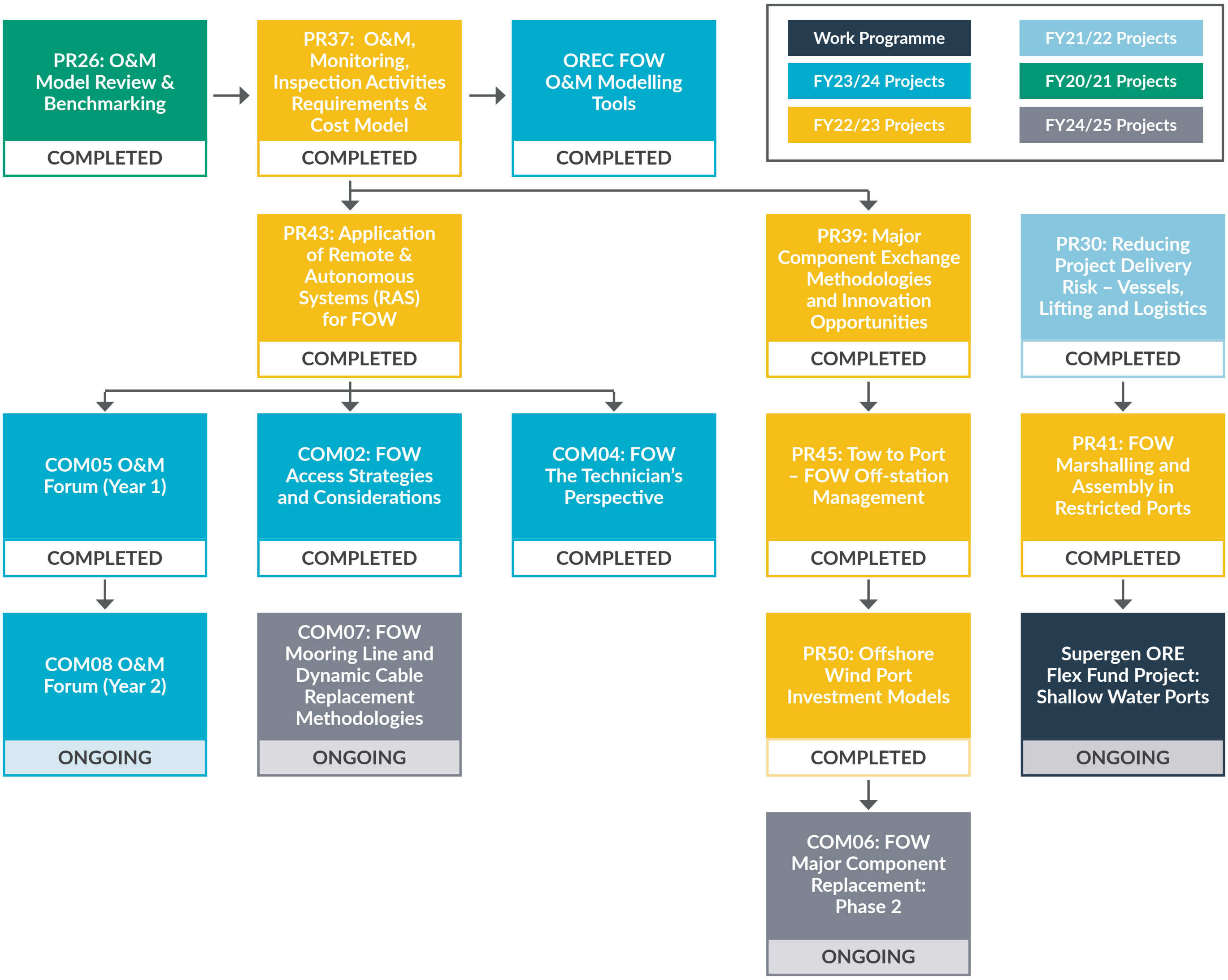


*Figure 12 - Decommissioning Centre simulator suite*

## Construction, Operations and Maintenance Strategic Programme Project Overview



# 4 DYNAMIC CABLE STRATEGIC PROGRAMME

## Background


*Figure 13 - Dynamic cable test rig (credit: ORE Catapult)*

Dynamic cables and their supporting technologies are an essential part of floating offshore wind (FOW) farms, as they transfer power from the wind turbine generator (WTG) to the offshore substation. Unlike conventional submarine power cables, which lie static on the seabed, dynamic cables extend from the floating substructure through the water column. This means they are continuously subjected to bending, twisting and cyclic loading caused by metocean conditions and the movement of the floating platform, making them more vulnerable to mechanical fatigue.

Dynamic cables also experience additional electrical stresses due to constant motion, variations in electrical loading and the higher voltage requirements of modern FOW turbines. These combined mechanical and electrical demands mean that improving reliability is essential as the industry scales up. Because each turbine relies on its own dynamic cable to export power, the cable system effectively acts as a single point of failure within the turbine–substation link. Any failure can therefore result in significant downtime and costly repair operations affecting multiple turbines.

A significant number of cable issues experienced in offshore wind are linked to challenges during installation. Dynamic cables are particularly sensitive to handling practices, bend-radius control, clamping forces and vessel operations, meaning that well-defined installation, maintenance and replacement procedures are essential for reducing long-term risks.

Overall system design also plays a crucial role in ensuring reliable operation. This includes decisions around array topology, cable routing between turbines, and selecting an appropriate dynamic cable configuration such as lazy-wave or catenary designs, based on site conditions and floater motions. Ensuring the robustness of connectors and terminations is equally important, as these components must withstand both electrical loading and continuous movement and can be challenging to repair offshore.

## Mission

The main aim of the dynamic cable strategic programme is to improve the FOW industry's access to suitable, reliable and cost-effective dynamic cable technologies.

## Aim

The FOW CoE has carried out extensive work on dynamic cables with objectives to:

- Assess and define technology requirements of dynamic cables and associated components;
- Deliver key enabling research, addressing knowledge gaps to inform design and application of dynamic cable technologies;
- Communicate technology requirements, scale and scope of opportunity to the supply chain to unlock investment in product development and increase supply chain capacity;
- Find ways to optimise the application of dynamic cable technologies and system designs.

## Case Study – Seabed Vs Floating Substations Technoeconomic Comparison

There are currently three potential options for substations to be used in floating wind: above surface bottom fixed, floating, or subsea substations  situated on the seabed.

Floating substations require HV dynamic export cables not yet available; while subsea substations require subsea connectors.

This project defined the floating and subsea systems for two case study sites. Gaps in knowledge and technology were identified to define a roadmap towards commercial readiness from 2025 to 2030.

A cost comparison was also carried out to determine which option would be preferable for a range of potential UK project configurations, subjected to a range of assumptions and sensitivities.

*Figure 14 - Star 1 Saipem Foundations*

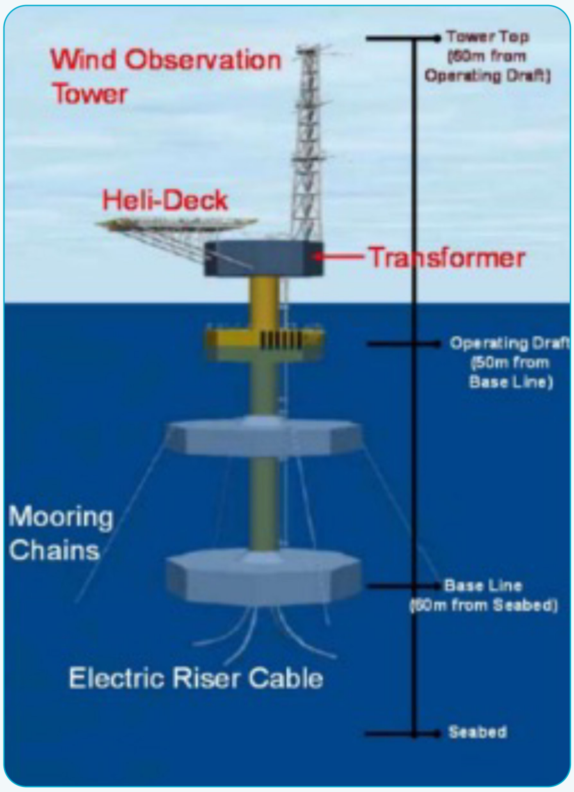
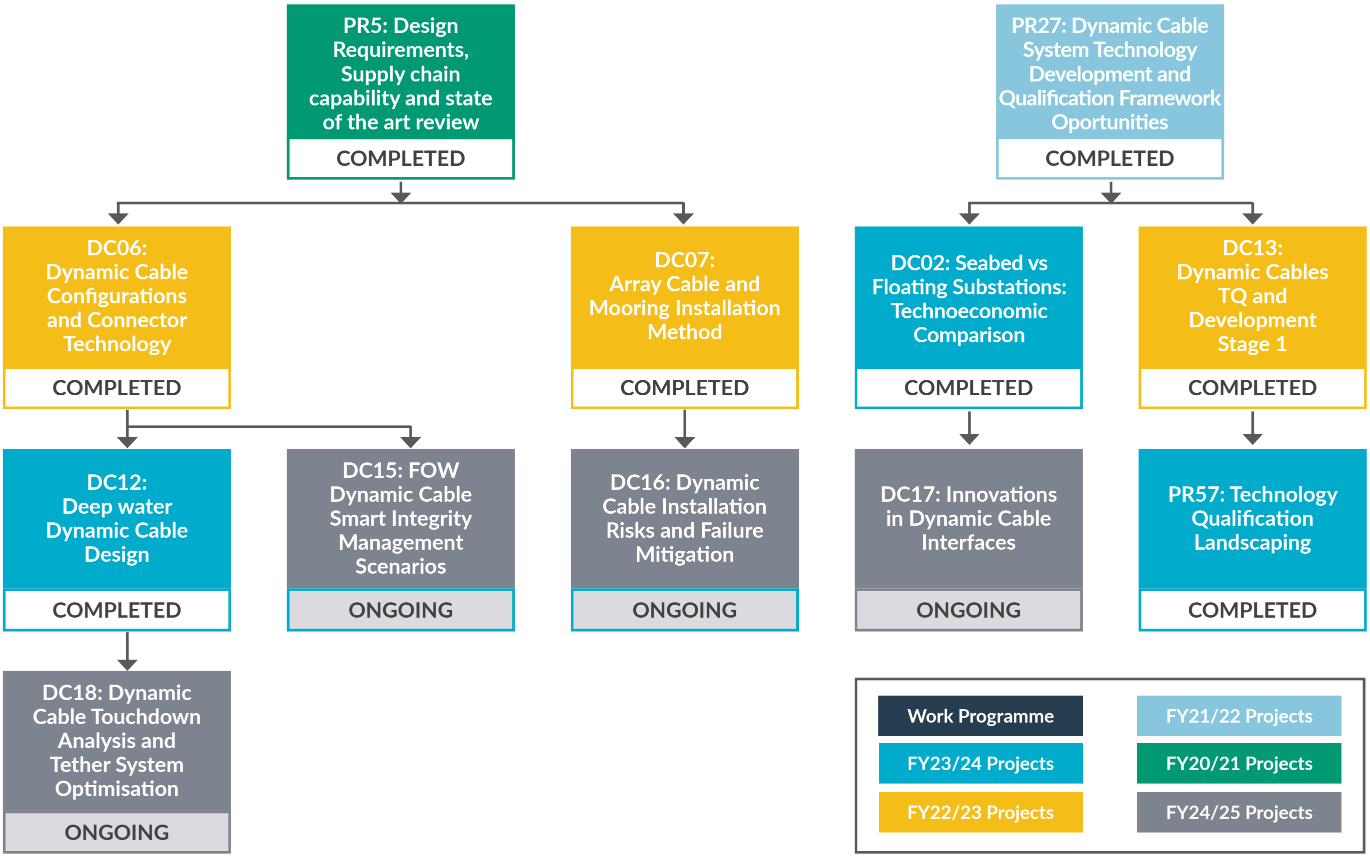



*Figure 15 - Fukushima FORWARD FOSS*

# Dynamic Cable Strategic Programme Project Overview



# 5 ENVIRONMENTAL STRATEGIC PROGRAMME

## Background

The Environmental Interactions Strategic Programme (EISP), was launched in 2022 with the aim to coordinate and deliver a range of activities to address FOW-specific environmental and consenting knowledge gaps. This programme is guided by two primary roadmaps that were delivered in 2021 and 2022 by the FOW CoE - the FOW Environmental Interactions Roadmap and the FOW and Fishing Interaction Roadmap. Additionally, the FOW CoE's Navigational Planning and Risk Assessment project has informed the EISP's approach towards maritime navigation and aviation coexistence. Using these roadmaps, we created a priority list of topics that needed to be addressed.

*Figure 16 - Environmental Interactions*

| | |
|---|---|
| Aviation Safety | Habitats Regulations Assessment (HRA) |
| Co-location and Coexistence | Navigational Risk |
| Cumulative Impacts | Ornithology |
| Electro Magnetic Field (EMF) | Skills Gaps |
| Fisheries Access | Underwater Noise |

*Figure 17 - Floating Offshore Wind Environmental Interactions Priority Themes*

To facilitate additional strategic guidance and input during the development and delivery of the EISP's project portfolio, a Steering Group was established including Crown Estate Scotland, Defra, DESNZ, Marine Scotland, Natural Resources Wales and The Crown Estate. The programme meets with these organisations to ensure work delivered has maximum impact, as well as seeking to ensure minimal duplication of work across the sector.

Crown Estate Scotland
Oighreachd a' Chrùin Alba

Department for Energy Security & Net Zero

Department for Environment Food & Rural Affairs

gov.scot

Cyfoeth Naturiol Cymru
Natural Resources Wales

THE CROWN ESTATE

*Figure 16 - Project Steering Group Members*

### Misson

The intended mission of the Environmental Interactions Programme is as follows:

1. **Address environmental uncertainties in advance of full-scale commercial FOW deployment to anticipate and mitigate key consenting challenges, thereby reducing the time, cost and risk associated with the development process;**

2. **Strengthen the shared understanding of the environmental interactions specific to FOW to enable both the FOW industry and key environmental stakeholders to mitigate the potential impacts of FOW, thereby supporting sustainable development;**

3. **Hold early discussions with key regulatory bodies and work toward agreement on key FOW issues, driving efficiencies in the consenting process for future large scale FOW farms.**

## Case Study – Fisheries Access in FOW

A key consideration within the consenting process is understanding if and how commercial fisheries can access the area allocated for offshore wind developments. This is more cross industry experience concerning fisheries coexistence with fixed bottom wind farms, but with the expansion of offshore wind and the development of floating offshore wind (FOW), this is a topic that has attracted renewed interest.

Our programme undertook a series of technical, cross-industry engagements between UK commercial fisheries and the floating offshore wind sector. These discussions initially focussed on how decisions made during the FOW farm design stage, post-lease award, could influence the potential for coexistence. Outcomes of those discussions have now been carried forward into a new project undertaking fishing simulations within virtual FOW farm environments.

The analysis undertaken during these projects, and the engagement provided by all parties involved, has supported a growing understanding of the risks and opportunities associated with potential FOW-fishing coexistence, particularly regarding the key technical and operational considerations. These insights are intended to assist current and future engagements between FOW farm developers and commercial fisheries, and to provide relevant public stakeholders with resources to support their decision making processes.

The study which focuses on simulation of fishing within a floating offshore windfarm array will conclude in late 2026.

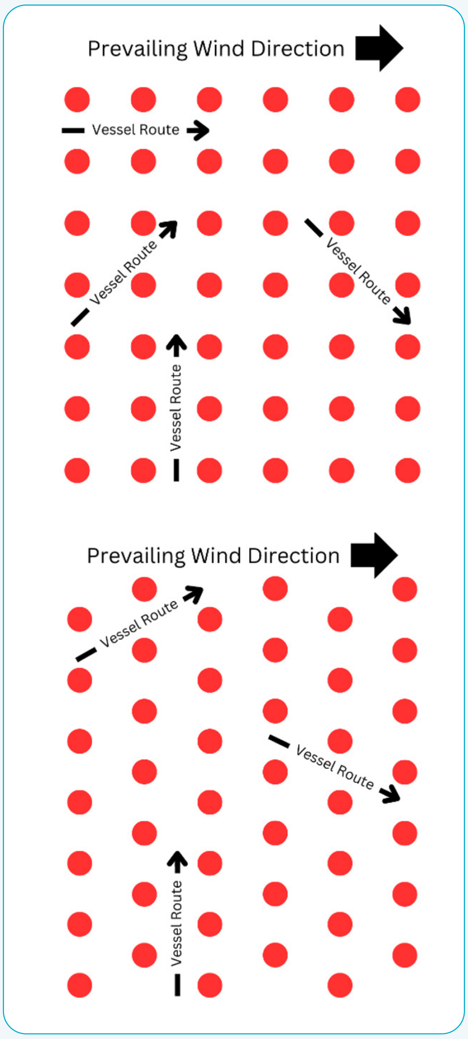
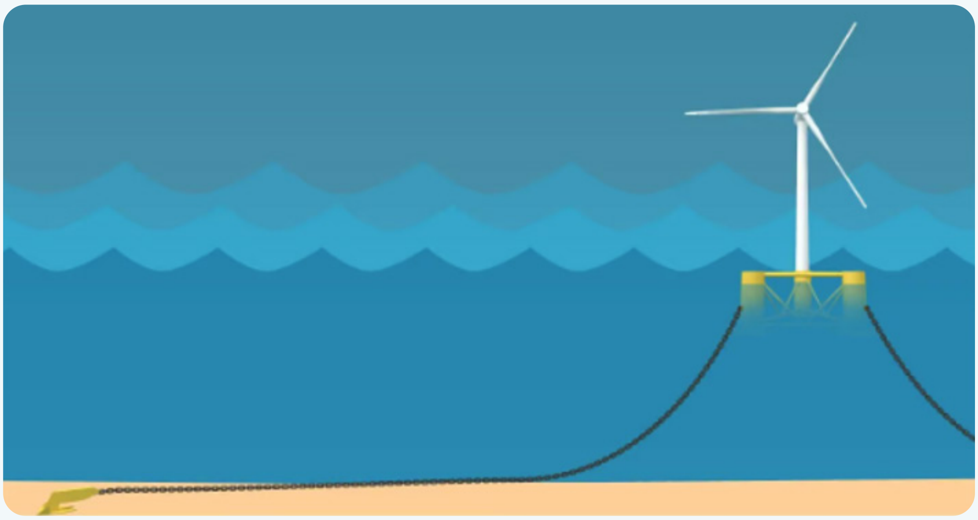
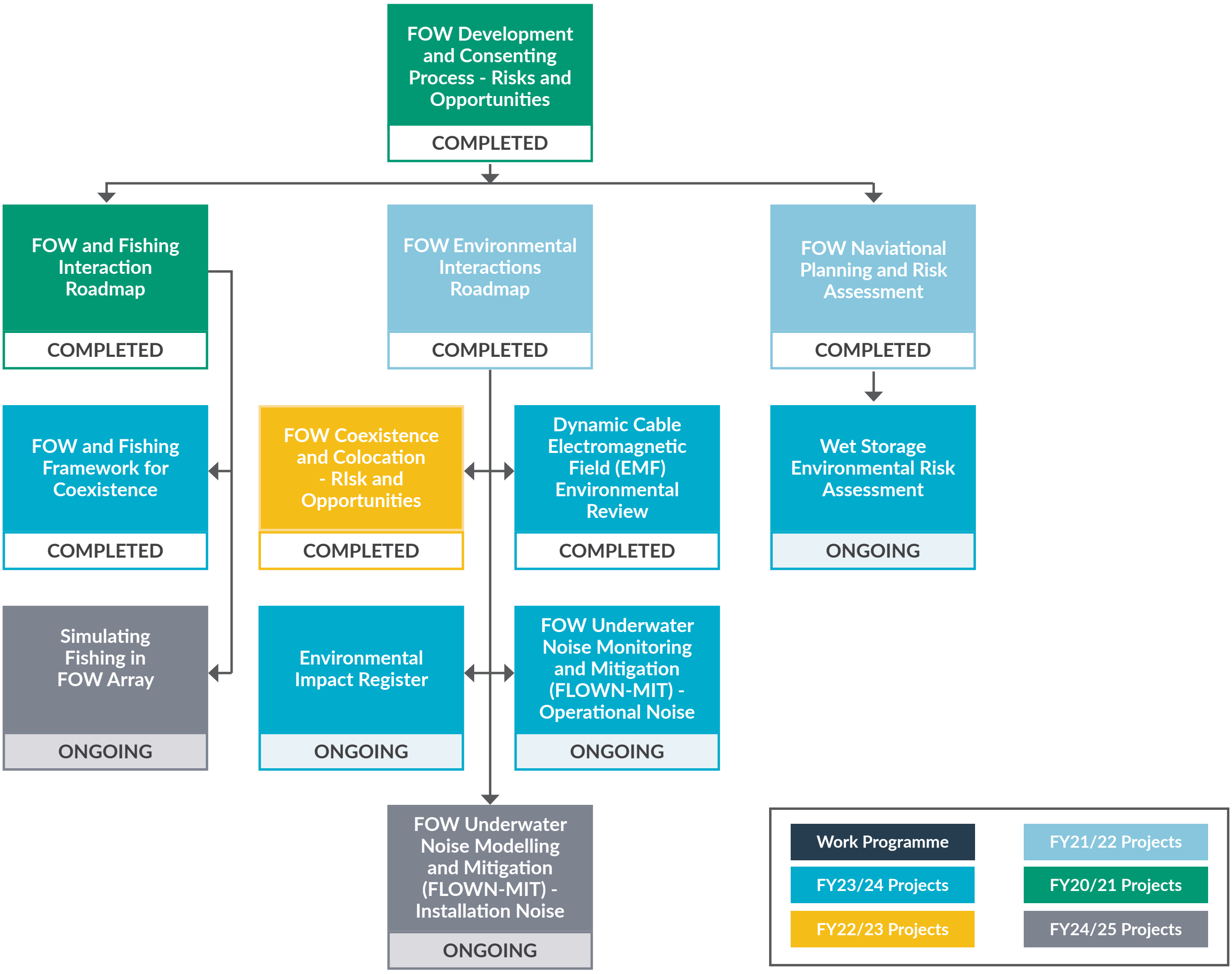



*Figure 19 - Implications of turbine row alignment on vessel route options through a floating offshore wind farm*

*Figure 20 - Example – Mooring Footprint on Seabed – 15MW Catenary*



## Environmental Interactions Strategic Programme Project Overview



# 6 MOORING AND ANCHORING STRATEGIC PROGRAMME

## Background

Mooring and anchoring systems are critical components in a floating offshore wind farm which ensure station keeping and stability of the platforms. The ability for project developers to design, procure, own, operate and maintain these systems cost effectively and reliably is vital to reducing the cost of floating offshore wind both directly (reduced CAPEX) and indirectly (reduced OPEX, insurance etc).

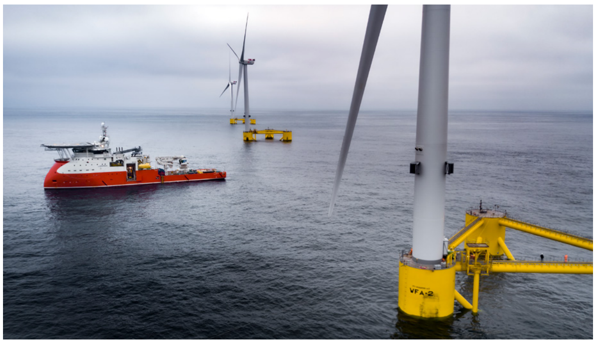


*Figure 21 - Mooring and Anchoring*

Mooring and anchoring systems- while a relatively small share of the overall Floating Offshore Wind project costs, remain a critical component. The introduction of an operating turbine creates a new loading regime, and for the UK Continental Shelf, the combination of shallow water, severe metocean conditions and the need to protect dynamic cable integrity presents a complex challenge.

Early deployment has benefitted from oil and gas experience, and the UK is home to leading expertise, technologies, products and services in mooring and anchoring. However, further cost reduction is needed. Achieving this will require targeted identification, development and qualification of key technologies that can reduce both risk and cost.

Developers and substructure designers have also identified mooring and anchoring as an area with strong potential for collaboration. The increasing number of components, together with certification and qualification requirements, creates opportunities for practical testing and demonstration.

## Mission

Improve the FOW industry's access to suitable, reliable and cost-effective mooring and anchoring technologies.

## Aims

Although mooring and anchoring systems account for a small proportion of overall FOWT costs, they directly influence LCOE and present complex installation risks. Failures can also cause significant damage to substructures, turbines and cables, with far greater cost implications. Delivery of the MA20 programme will ensure that future funding is directed toward relevant, high-impact activities that:

- Reduce mooring and anchoring costs and operational risks.
- Accelerate deployment readiness for commercial-scale floating wind.
- Strengthen the UK's mooring and anchoring supply chain.
- Foster collaboration between developers, OEMs and research partners.

## Case Study – Shared Anchors for Floating Offshore Wind

The feasibility of shared anchor systems for commercial floating offshore wind was assessed on wh  on whether they offer genuine cost and performance benefits.

Shared anchors can reduce anchor counts by 40-50%, lowering fabrication, transport and installation costs. However, these savings are not always proportional, as shared systems may require larger anchors, more complex designs and stricter installation procedures.

A key finding is the trade-off between anchor reduction and energy yield. While partially shared layouts have minimal impact on AEP (≈1%), fully shared configurations can reduce AEP by 2-3% due to tighter turbine spacing, potentially negating any CAPEX benefit over a project lifetime.

Feasibility is highly dependent on water depth, mooring behaviour and seabed conditions. Shared anchors are best suited to intermediate depths and mooring systems with sufficient compliance. Suction buckets typically adapt well to multi-line loading, whereas slender pile solutions may require redesign. In complex seabeds, shared anchors can reduce the number of installation events, but multi-line cyclic loading introduces added geotechnical challenges.

The study emphasised the need for early integrated design, as shared anchors reduce layout flexibility and increase system coupling, raising the consequence of failure and reinforcing the importance of robust reliability planning.

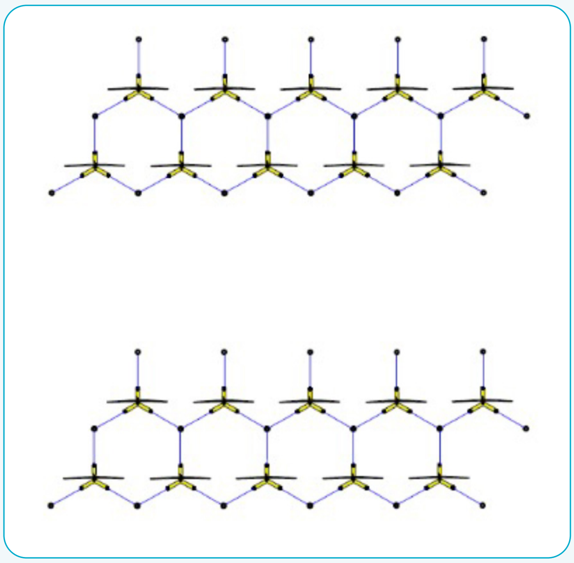


*Figure 22 - Partially shared anchor array*

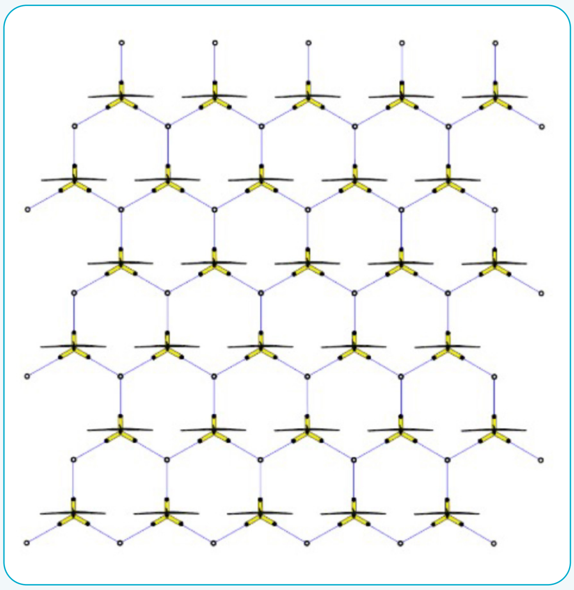
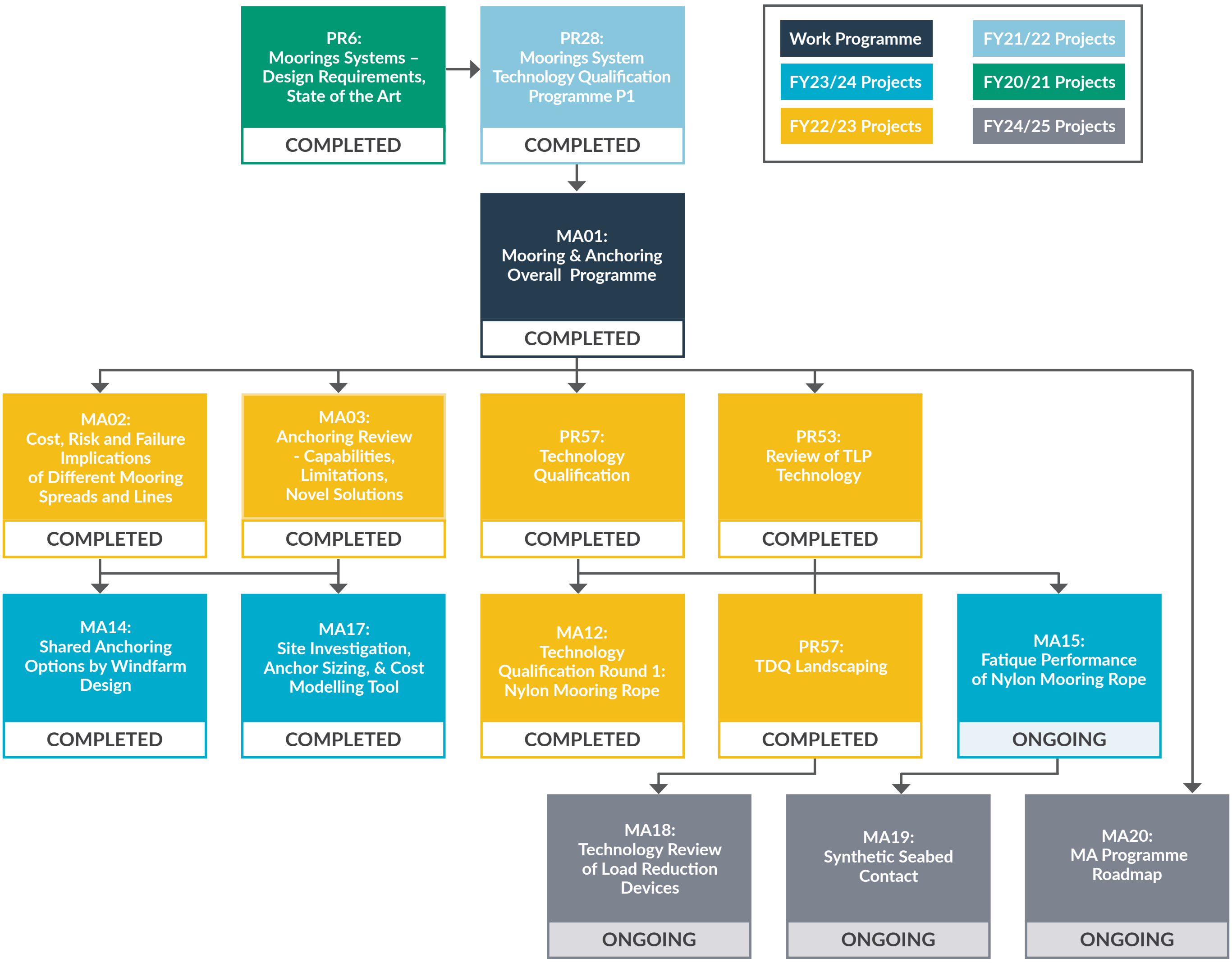


*Figure 23 - A fully shared anchor layout with condensed power density*

## Mooring & Anchoring Strategic Programme Project Overview



# 7 TECHNOLOGY QUALIFICATION & DEVELOPMENT

*Figure 24 - Cables at the Floating Wind Innovation Centre in Aberdeen (credit: ORE Catapult)*


*Figure 25 - Dynamic cable test rig at the Floating Wind Innovation Centre in Aberdeen (credit: ORE Catapult)*

### Background

Floating offshore wind (FOW) requires the development of new critical components and the qualification of technologies for application in FOW scenarios. To support this, the FOW CoE has created the Technology Qualification and Development (TQ&D) programme, which operates across strategic programmes within the Centre of Excellence. The programme focuses on accelerating the development of dynamic cable, mooring, and anchoring technologies, helping to reduce the cost and risk of deploying these components in the first large-scale FOW projects. Participating supply chain companies have the opportunity to collaborate directly with FOW CoE industry and stakeholder partners.

### Mission

The TQ&D programme assesses industry needs to ensure support is directed toward technologies that will have the greatest impact on FOW commercialisation and lowering LCoE. Once priority technologies are identified, the programme provides tailored support to supply chain companies to help them develop certification-body-approved technology qualification test plans.

### Aims

The objectives of the TQ&D programme are:

- Accelerate technology development of key technologies required for cost effective, reliable critical component system in FOW;
- Assist the qualification of key critical component technologies for their application in FOW projects specifically, reducing associated risks;
- Support the introduction of new critical component system manufacturers and suppliers into the FOW supply chain, boosting supply chain capacity and competitiveness.

## Projects

Projects within the FOW CoE technology qualification and development programme often sit within the core programme or the relevant strategic programme. A list of the projects which specifically look at technology qualification and development can be found in Table 2 below.

| Project | | | | |
|---|---|---|---|---|
| **PR27:** Dynamic Cable System Technology Development and Qualification Framework | **PR28:** Moorings Systems Technology Qualification Programme | **DC13:** Dynamic Cables TQ and Development Stage 1- Bend Stiffener Connector Qualification Framework Development | **MA12:** Technology Qualification Round 1: Nylon Mooring Rope | **PR57:** Technology Qualification Landscaping |
| Core Programme | Core Programme | Dynamic Cable Programme | Mooring and Anchoring Programme | Core Programme |
| **Completed** | **Completed** | **Completed** | **Completed** | **Completed** |

*Figure 26 - TQ&D projects*

# 8 CASE STUDIES

**The FOW CoE has three fundamental objectives: Lowering LCoE, Boosting UK Supply Chain and Accelerating floating wind development. Here we look at examples of work we've done to meet each of these**

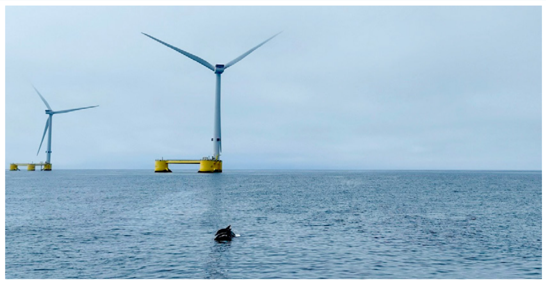


*Figure 27 - Photo of the WindFloat Atlantic project courtesy of Principle Power-Ocean Winds*

## 8.1 Lowering LCoE

Cost Reduction Monitoring Framework (CRMF)

**Aim**

To establish the foundations of a Floating Offshore Wind (FOW) Cost Reduction Monitoring Framework by assessing current costs, defining reference projects, and developing a robust methodology that will enable ongoing tracking of cost-reduction progress toward commercial viability.

**Overview**

This project will initiate the development of a tailored CRMF for Floating Offshore Wind, recognising the emerging nature of the technology and the limited availability of mature project data. Building on principles established for fixed-bottom offshore wind, the project will conduct a short-term assessment of current FOW costs, create credible reference projects, and establish a methodology for future quantitative evaluations. This work will form the basis of a future long-term CRMF process that regularly assesses industry-wide LCOE trends, identifies cost drivers, and provides policymakers and industry stakeholders with evidence-based insights to support deployment, supply chain growth, and progress toward Clean Power.

**What CRMF Provides**

- A clear, evidence-based picture of current FOW costs.
- Defined and validated reference projects suitable for consistent future benchmarking.
- A robust methodology and structure for operating a recurring CRMF tailored to FOW.
- Early insights into the factors influencing LCOE and potential cost-reduction pathways.
- A foundation for Phase 2, which will deliver full industry-wide quantitative cost assessments.

**Funder Contribution - Floating Offshore Wind Centre of Excellence and Floating Offshore Wind Executive (FLOWEX)**

Funding for this project enables the creation of a robust, evidence-based framework that will give Government and industry clear visibility of current and future cost trajectories. It ensures that reference projects are properly defined, that cost data is captured consistently, and that a transparent methodology is established for long-term tracking. Ultimately, funding secures the strategic foundations needed to turn FOW from a promising technology into a cost-effective, large-scale contributor to Clean Power.

### Impact

- Enables policymakers to set more accurate and effective CfD budgets and parameters.
- Provides developers and the supply chain with transparency on expected cost trajectories.
- Increases investor and industry confidence through consistent, independent tracking of progress.
- Supports large-scale deployment of FOW by identifying technical, regulatory, and financial levers to reduce cost and risk.
- Strengthens the UK's ability to compete globally in an emerging high-value offshore wind market.

### Why It Matters

As Floating Offshore Wind is key to achieving our Clean Power targets, FOW must reach cost competitiveness to unlock the levels of deployment required for national decarbonisation targets. However, the sector is still nascent and without transparent, credible, and consistent cost tracking. A dedicated CRMF plays a critical role in filling this gap in building confidence, reducing uncertainty, and accelerating learning cycles across the industry.

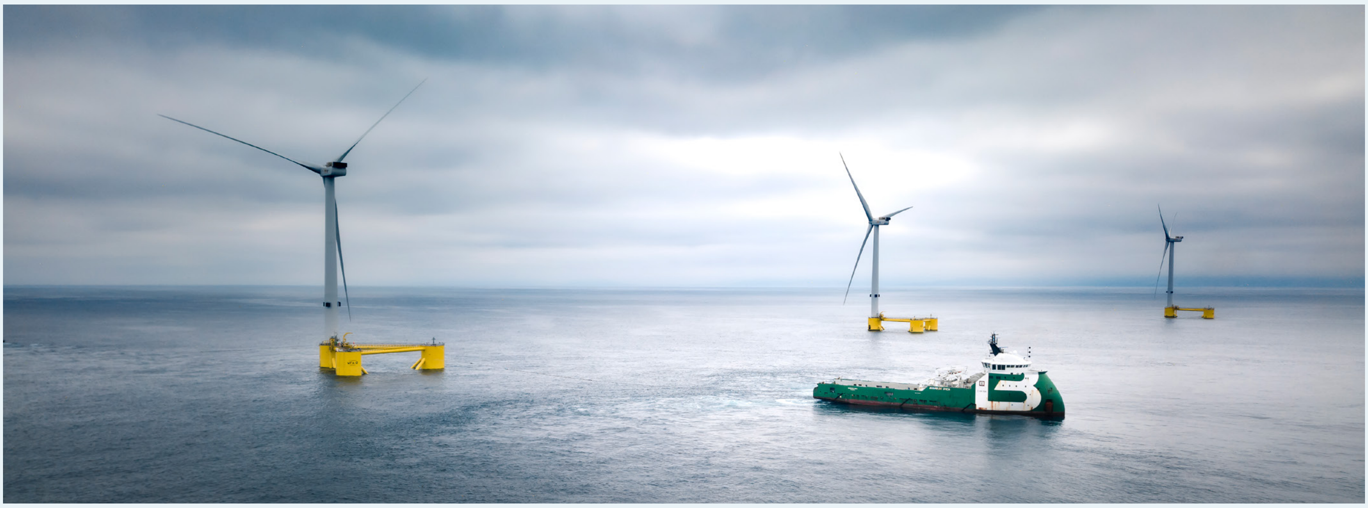


*Figure 28 - WindFloat Atlantic project (courtesy of Principle Power-Ocean Winds)*

*Figure 29 - Kincardine Offshore Wind Farm project (courtesy of Principal Power)*

*Figure 30 - Hywind Scotland (courtesy of Equinor)*

## 8.2 Boosting UK Supply Chain

UK Offshore Wind Directory (UOWD)

**Aim**

Strengthening the offshore wind supply chain with support from the Floating Offshore Wind Centre of Excellence

**Overview**

The UK Offshore Wind Directory (UOWD) is a free national platform that maps the capabilities of companies operating across the UK offshore wind sector. It helps developers, buyers and suppliers quickly identify partners, understand market capacity and plan projects with confidence. By making supply chain expertise visible and accessible, the Directory supports collaboration, innovation and sector growth.

**What UOWD Provides**

- A structured database of UK offshore wind suppliers
- Visibility for companies across the value chain
- Insight into existing capability and future gaps
- Opportunities for partnerships and business growth

**Funder Contribution - Floating Offshore Wind Centre of Excellence**

Alongside other key partners OWGP and Crown Estate Scotland support from the Floating Offshore Wind Centre of Excellence helps ensure the Directory remains accessible, relevant and useful to industry. This backing strengthens supply chain readiness for floating wind projects and increases visibility of specialist organisations contributing to innovation in deep water technologies.

**Impact**

- Greater exposure for UK suppliers of all sizes
- Improved collaboration across industry
- Faster identification of suitable project partners
- Stronger preparedness for future offshore wind deployment

**Why It Matters**

As offshore wind expands rapidly, particularly floating wind, reliable supply chain intelligence is essential. UOWD provides a practical, trusted resource that helps the sector coordinate growth, reduce risk and deliver projects more efficiently.

# 8.3 Accelerating Deployment

FLOWN-MIT (Operational and Installation)

### Aim

The characteristics of FOW underwater noise emissions – particularly during a wind farm's operational phase – are subject to knowledge gaps. The presence of this uncertainty creates the potential for consenting risk and project development delays. The Floating Offshore Wind Underwater Noise Monitoring and Mitigation (FLOWN-MIT) project was therefore established to gather real world monitoring data, assess the potential impact of this noise on key species, and to determine what might be required in innovation and design-based solutions.

### Overview

Part of the delivery remit of the Environmental Interaction Strategic Programme is to help accelerate deployment. This is achieved by better understanding the key risks and consenting hurdles that new developments need to overcome.

The FLOWN-MIT project delivered monitoring campaigns at two FOW Arrays (Hywind Tampen and Kincardine) to gather acoustic data to assess the potential impact and risks associated with operational underwater noise in FOW. The aim is to help mitigate any environmental and consenting risks associated with this interaction, and  work collaboratively with regulators to develop appropriate solutions.

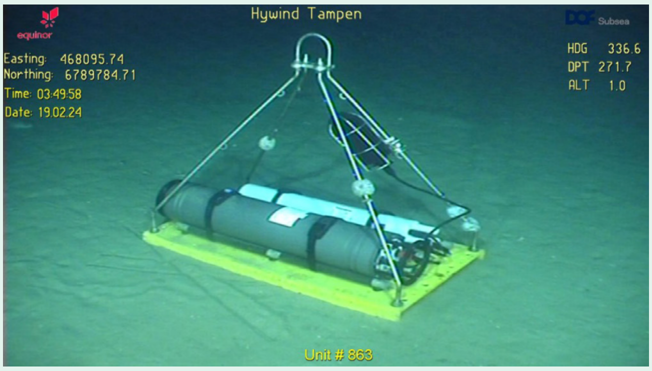



*Figure 31 - Hywind Tampen acoustic monitoring*

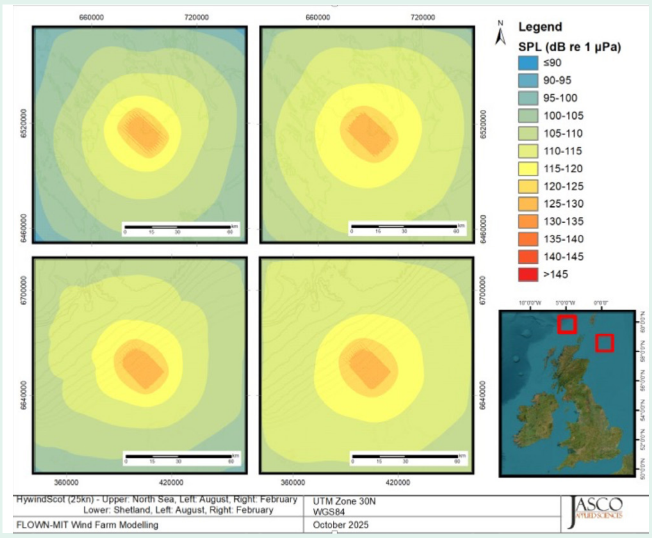



*Figure 32 - Noise propagation simulations*

**What FLOWN-MIT provides**

- Real world underwater noise data collected over two FOW windfarms
- Acoustic analysis for two sites
- Propagation modelling for two commercial scale sites
- Ecological assessment
- Mitigation assessment on possible innovations to reduce noise during the operational phase
- A framework for assessing the impact of underwater noise of FOW sites and updated guidance to consenting authorities

**Funder Contribution - Floating Offshore Wind Centre of Excellence and Offshore Wind Evidence and Change (OWEC)**

This project was fully funded by a collaboration between the  Floating Offshore Wind Centre of Excellence and The Crown Estate's Offshore Wind Evidence and Change Programme, which ensures key stakeholders across the industry are engaged and involved in this project. This collaboration allowed a much more ambitious project that went beyond desk-based studies, and will contribute additional data into the public Evidence and Change database raun by The Crown Estate.

**Impact**

- New data sets for two key demonstration sites
- Strong collaboration between the FOW CoE, our Environmental Interaction Steering Committee(includes external stakeholders comprising of The Crown Estate, Crown Estate Scotland and The Scottish Government's Marine Directorate who perform an advisory role) and TCE's Offshore Evidence and Change Programme
- Updated guidance for industry and reduced risk on a topic where  impact is less understood.
- Increased evidence for developers to help reduce consenting times

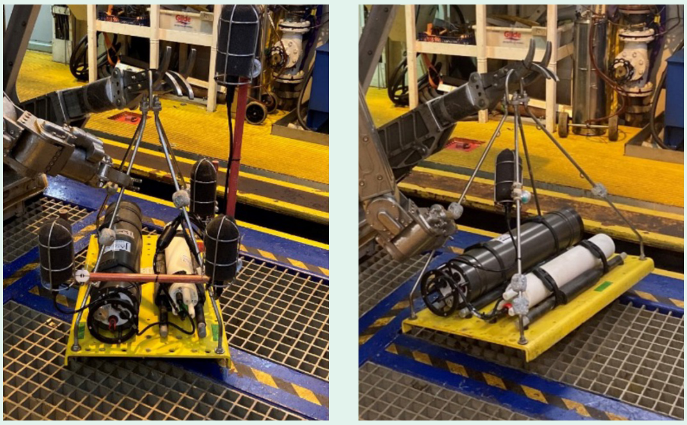


*Figure 33 - Acoustic recorders*

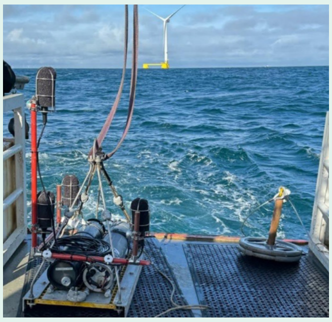


*Figure 34 - Recorders being deployed at Kincardine (courtesy of JASCO Applied Sciences)*

*Figure 35 - Modelled structure of Kincardine substructure to model how sound radiates off steel surfaces*

# 9 GETTING THE MESSAGE OUT

*Figure 36 - Deep Dive FOW Conference Aberdeen 2024*

*Figure 37 - Global Offshore Wind 2024*

*Figure 38 - O&M Forum 2024*


*Figure 39 - COM Deep Dive FOW Aberdeen conference 2025*

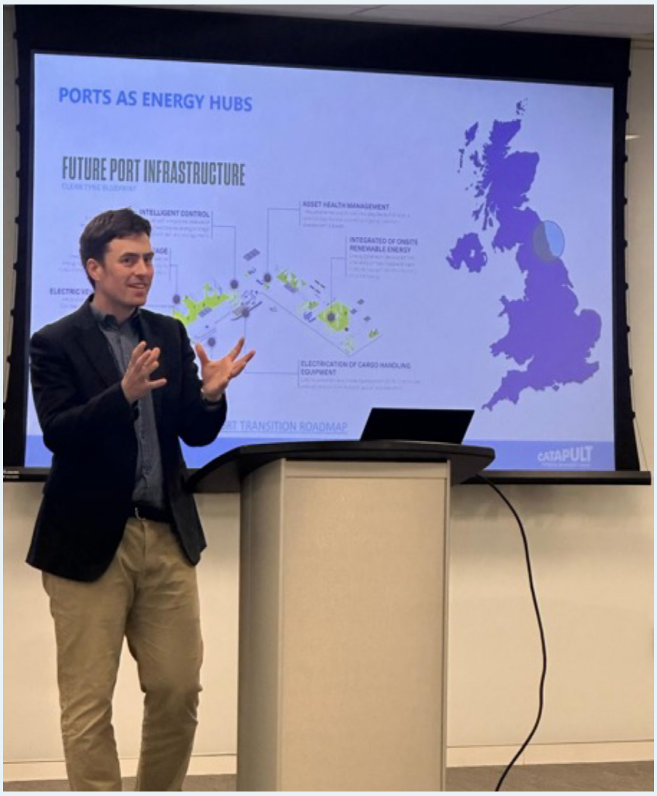



*Figure 40 - UK Consulate in Los Angeles 2025*

*Figure 41 - FOW CoE visit to Nigg Port 2025*


*Figure 42 - FOW CoE visit to Port of Cromarty Firth 2025*


*Figure 43 - Global Offshore Wind 2025*

*Figure 44 - National Decommissioning Centre Major Component Exchange Phase 2 Final Presentation 2026*


*Figure 45 - Taiwan Conference 2026*

# 10 LOOK AHEAD AND NEXT STEPS

As we consider the future direction of the programme, it is evident that the existing structure and focus areas remain relevant and will continue to create impact for our partners and wider stakeholders. That being said, there are fundamental questions being asked of the floating wind sector, which the programme needs to tackle head on.

*Figure 46 - The WindFloat Atlantic offshore wind farm (courtesy of Principle Power-Ocean Winds)*

We need to make sure that we are playing our part, alongside a range of other key players and initiatives, to focus on reducing cost, de-risking delivery and improving the bankability of floating technologies. As such, we expect to continue the cost reduction monitoring work that has run since 2023, with the role out and implementation of the monitoring framework itself. This will allow us to share a common view across the sector on our progress against key metrics in bringing down LCoE – something that is essential if we are to maintain confidence in our collective progress and targeted in our interventions and support.

Alongside this, we are very much aware of the challenges in the abundance of floater designs and other deepwater designs being developed. Here, we need to strike a balance. Firstly, we need to continue to refine the first generation of floater types, learning from their deployment and increasing confidence as we derisk delivery and evidence their reliability. With enough scale of demand, we should be able to see the cost reduction benefits of industrialising at least parts of the supply chain – which may require standardisation of component designs. Secondly, we shouldn't take our foot off the pedal when it comes to innovation. There are different ways of doing things which may offer  a step change in cost reduction. This may be the use of different materials, or assembly methods, or alternative tower and drivetrain designs that bring us something new. But these two tracks need to continue in parallel, one for reliability, confidence and industrialisation, and the other to test different ideas.

Related to this is the complexity in the supply of wind turbines, and the ability to ensure that we optimise the entire floating system, from anchors and other station-keeping systems, right up to the tip of the blades. We intend to work more closely with the wind turbine OEMs and other key partners to understand and address their critical challenges in a proactive and collaborative manner.

We will continue to investigate and provide the evidence base to inform those deploying this exciting technology, and will continue to collaborate with developers, supply chain, public sector bodies and international stakeholders.

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