

# RE ENERGEISE

#1 WINTER 2020



## REGIONAL GROWTH FUELLING FUTURE INNOVATION

### CHAMPIONING INNOVATION

Regional Centres of Excellence  
propelling future innovation

### CELTIC CONNECTIONS

Developing Welsh marine  
energy sources

### FLOATING OFFSHORE WIND

The key to unlocking 'Net-Zero'



# RE-ENERGISE PODCAST

Tune in to the people leading the UK's energy transition  
and the greatest innovation adventure of our time...

## LISTEN NOW!



### Episode 1. Renewable Energy, Business Opportunity of the Century?

Featuring Kenny Wiggins (SPAN Access), James Barry  
(Renewable Parts) and Mark Lawless (JBA Consulting)



### Episode 3. I, Engineer

Featuring engineers from across  
ORE Catapult's research teams



### Episode 2. Supersize Me, Offshore Wind Farms of the Future

Featuring Peter Greaves and Mark Forrest,  
ORE Catapult's blade experts



### Episode 4. How much can the Grid take?

Featuring Alex Hunter of Sherwood Power,  
with ORE Catapult's Ravneet Kaur and Dr Michael  
Smailes

## NEXT UP!



### Episode 5. Show Me the Data! The Secret Sauce for Wind Farm Innovation (January 2020)

Featuring Drs Conaill Soraghan (ORE Catapult), Jonathan  
Butler (SSE) and Iain Dinwoodie (Natural Power)



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or search **Re-Energise** on iTunes

# WELCOME

Welcome to Re-Energise, the new name for ORE Catapult's tri-annual magazine



## GUEST FOREWORD

**JULIA BROWN**

THE BARONESS BROWN OF CAMBRIDGE, DBE FRENG,  
OFFSHORE WIND SECTOR CHAMPION

Behind every successful industry is a strong, competitive supply chain of businesses providing the innovations, products and services needed to make that sector a global success story. The growth of the UK's offshore renewables sector in the last 20 years has been nothing short of remarkable, with offshore wind, in particular, set to become the backbone of the UK's future energy mix.

As the Offshore Wind Sector Champion, I'm pleased that the sector's focus is now firmly on building a robust domestic supply chain. This is what is needed to help maintain the UK as a world-leader in offshore renewables development and deployment. It will deliver UK economic benefit by regenerating coastal communities and developing clusters of activity built on regional strengths. Ultimately this has the potential to create thousands of jobs.

ORE Catapult's mission is to accelerate the creation and growth of UK companies in the offshore renewable energy sector, using its unique facilities and research and engineering capabilities to bring together industry and academia to drive innovation in renewable energy.

The Catapult is organising its activities around key areas for future innovation such as floating wind, marine energy, testing and demonstration, and operations and maintenance. The development of local Catapult Centres of Excellence will support the transformation of our coastal communities as well as delivering business improvement programmes such as the Offshore Wind Growth Partnership and the National Launch Academy. These programmes are supporting UK businesses looking to capitalise on the opportunities offered by the growth in offshore renewables around the world.

As low-carbon, clean, green energy generation matures as a UK industrial and global success story, we must ensure that we are well positioned to make the most of the huge opportunities on offer for a world-class supply chain developed in the UK and supplying to the world.



## CONTENTS

4

### CHAMPIONING INNOVATION FOR UK BENEFIT

Building our regional Centres of Excellence.

6

### ADVANCING NEXT GENERATION TECHNOLOGIES THROUGH TESTING, DEMONSTRATION AND VALIDATION

Operating world-leading test and demonstration facilities at our National Renewable Energy Centre.

9

### DELIVERING CLEAN GROWTH FROM WELSH MARINE ENERGY RESOURCES

Introducing ORE Catapult's Marine Energy Engineering Centre of Excellence.

10

### A VISION FOR REMOTE, SMART OPERATIONS

ORE Catapult's O&M Centre of Excellence is supporting innovations in operating and maintaining windfarms.

14

### FLOATING OFFSHORE WIND: THE KEY TO HELPING THE UK ACHIEVE NET-ZERO

Our Floating Offshore Wind Centre of Excellence will grow this future technology.

16

### PROJECT SNAPSHOTS

The lowdown on our collaborative robotics and autonomous systems research projects.

18

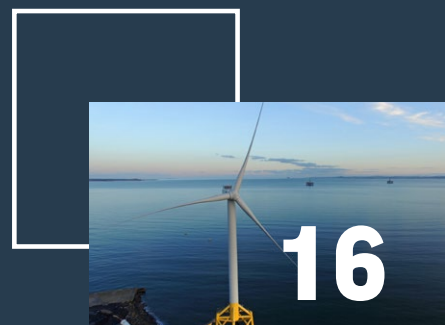
### NEWS ROUNDUP

The latest news and developments from the front line of offshore wind, wave and tidal innovation.

9



16





European Offshore Wind Deployment  
Centre, Aberdeen. (Credit: Vattenfall)



# CHAMPIONING INNOVATION FOR UK BENEFIT



**ANDREW JAMIESON** - Chief Executive of  
the Offshore Renewable Energy Catapult

The UK's offshore renewable energy sector has been one of the economic success stories of the last 10 years and is now on track to become the backbone of the UK's future energy mix. For the last six years, ORE Catapult has played a key role in that success, championing and driving innovation in the offshore wind, wave and tidal energy sectors - establishing global leadership, attracting investment, and supporting growth, productivity and job creation. The growth in offshore wind, in particular, has been enabled by the extraordinary cost reduction that the industry has delivered in recent years, largely driven by the speed of technology innovation.

The commitments made in the Offshore Wind Sector Deal and the adoption of a 'net-zero' carbon emissions target by the UK Government herald ever more ambitious targets to increase installed renewable energy capacity to meet the UK's future low-carbon electricity demands, and I'm pleased that our Catapult is well positioned to contribute to this continued growth. The challenges facing all of us are large and many - but so too are the opportunities for the UK to maintain its world-leading status and for UK companies to reap the rewards domestically and in new global export markets.

We must continue to innovate to meet the challenges of the future, and this is where we are playing a sector-leading role - bigger turbines, new foundation designs and the adoption of novel operations and maintenance activities are exciting new frontiers being explored. We are establishing Centres of Excellence across the UK, closely aligned with regional strengths and priorities, in Testing & Validation, Operations & Maintenance,



ORE Catapult's presence across the UK

**WE MUST CONTINUE TO  
INNOVATE TO MEET THE  
CHALLENGES OF THE  
FUTURE.**

Floating Wind and Marine Energy Engineering to champion innovation in robotics, autonomous systems, big data and artificial intelligence, balance of plant - especially foundations - and next-generation technologies. Our work is paving the way for further cost reduction and growth in installed capacity, all vital in tackling global climate change and decarbonising our energy needs.

Our National Renewable Energy Centre in Blyth, Northumberland, combines the world's largest and most technically capable open-access test facilities in blades, powertrains, electrical and marine testing (for example, we can test blades larger than the wingspan of an A380) with unparalleled engineering knowledge and research expertise. Here, we are at the forefront of supporting the development of the industry's largest and most advanced technologies through agreements with GE Renewable Energy and LM Wind Power, including the world's largest wind turbine (12MW) and longest blade (107m), through to supporting the newest innovators commercialise their technologies.

In 2017, we established our Operations & Maintenance (O&M) Centre of Excellence for offshore wind in the Humber, building on the region's energy heritage and

extensive experience of servicing offshore wind farms, and our activities there continue to go from strength to strength. The Centre brings together Catapult O&M research and development activity across the UK, working with offshore wind owner/operators, supply chain, industry leaders, regulators and academia to drive solution-focused innovation and improvements in O&M. Projects range from better weather and wave height predictions to improving the health, safety and well-being of offshore personnel, and we have ambitious targets to grow our presence in the region to over 70 employees in the next five years.

I'm delighted that in 2019, we've put plans forward to establish two new Centres of Excellence to enhance our existing portfolio of activity. The advancement of floating wind technologies is vital if the UK is to deliver on its ambitious offshore wind growth targets, and that's why we are setting up the Floating Offshore Wind Centre of Excellence (FOWCoE), backed by industry powerhouses such as Equinor and Total and with the support of the Scottish and Welsh Governments and the Cornwall & South West LEP. Scotland, Wales and the South West of England are key areas that could benefit from the growth of floating offshore wind, creating 17,000 jobs and generating £33.6 billion for the UK economy by 2050. Our FOWCoE will work to reduce the cost of energy from floating wind, accelerate the build out of floating farms, create opportunities for the UK supply chain, and drive innovations in manufacturing, installation and operations and maintenance.

Lastly, in Wales we are establishing a Marine Energy Engineering Centre of Excellence (MEECE). Together with the Marine Energy Test Area, the Port of Milford Haven, local universities and the local supply chain, it will offer unique facilities and capabilities to marine energy developers, fostering innovation to reduce energy costs and de-risk innovation, capturing export opportunities.

To deliver a low-carbon future and meet the UK's 'net-zero' target by 2050 will require at least 75GW of installed offshore wind capacity - that's 10 times what we have installed today. The UK is going to need new innovative solutions and approaches to challenges, such as integrating renewable energy into the grid, in order to deliver that volume of production. In this edition of Re-Energise, we look at how the Catapult will continue to drive innovation and supply chain growth over the next five years.



# ADVANCING NEXT GENERATION TECHNOLOGIES THROUGH TESTING, DEMONSTRATION AND VALIDATION

**ORE Catapult's National Renewable Energy Centre is a Centre of Excellence in testing and validation. It is a concentration of leading expertise and infrastructure dedicated to the acceleration of new and innovative offshore renewable energy technology in order to drive down the cost of energy.**



The 1MW drive train test rig.



100m blade test facility.



Equipped to provide extensive test and validation services and support to the full breadth of industry – including owner/operators, equipment manufacturers, the supply chain and academia - we are a catalyst for collaboration, advancing technology readiness, commercialisation and growth.

Working at the National Renewable Energy Centre are highly experienced teams of technical researchers, test engineers and technology specialists. They deliver test, validation and applied research services across a broad spectrum of innovation challenges; from developing early-stage technology with small businesses, to full-scale certification testing vital in achieving commercialisation. The National Renewable Energy Centre is also an integral part of the UK's national infrastructure for offshore renewable energy. By working with key partners, it leverages its unique, specialist position to attract inward investment from major industry players, as well as develop the export potential of home-grown technology that has been tested and proven at the Centre.

Comprising a wealth of capability, the National Renewable Energy Centre is designed to address and overcome the industry's key challenges across major technology areas:

#### Wind Turbine Rotor Blades

Performing IECRE-accredited wind turbine blade testing, ORE Catapult has proven capability in increasing the reliability and efficiency of next generation rotor blades. To date, we have

sequentially tested the world's largest blades at 88m, 88.4m and 107m, as well as performing highly accelerated lifetime testing of scaled pitch bearings. In addition, we operate a blade rain erosion test rig and composite laboratory, working with the supply chain to uncover solutions to one of the industry's biggest challenges.

#### Powertrains

Operating a suite of powertrain test facilities, from <1MW to 15MW, ORE Catapult is optimising the lifetime performance of powertrain systems to de-risk their operation, reduce maintenance costs and improve reliability from the world's most advanced systems. This includes acceleration programmes for innovative powertrain systems for UK SMEs such as GreenSpur Renewables, Magnomatics and Nova Innovation, up to GE's Haliade-X 12MW turbine.

#### Electrical infrastructure

ORE Catapult's UKAS accredited High Voltage Laboratories and grid emulation system are established assets improving the efficiency and reliability of technology for electrical energy generated from offshore renewables. We specialise in inter-array, export and floating cable testing, while our materials laboratory provides forensic analysis of cable breakdown and failure. Our 18MVA grid emulation system (eGrid) is capable of simulating a wide variety of fault conditions that wind and tidal turbine powertrains may experience during operation, for example. It also supports the test, development and research of grid services, integration and energy storage.

**Subsea, foundations and substructures**

With harsh offshore environments taking a significant toll on offshore assets, and also making subsea operations difficult to perform, ORE Catapult provides access to a combination of live offshore assets, including our 7MW demonstration turbine and offshore meteorological mast, and controlled, still water docks. This enables extensive test and research activity in areas such as floating wind, anti-corrosion, cable systems, and operational maintenance.

**WE ARE A CATALYST FOR  
COLLABORATION, ADVANCING  
TECHNOLOGY READINESS,  
COMMERCIALISATION  
AND GROWTH.**

**Robotics and autonomous systems**

As robotic technologies become an essential feature in the operation and cost reduction of offshore renewable energy generation, the need for commercial test, demonstration and validation is increasing. The National Renewable Energy Centre provides a full range of testing and demonstration facilities for surface, subsea and aerial robotic systems.

**Resource and met-ocean assessment**

ORE Catapult's resource assessment platforms, including onshore and offshore meteorological masts, enable testing, calibration and validation of remote sensor technologies such as lidars in representative environments. Clients can prove reliability, data availability and performance as part of wind resource assessment campaigns and uncertainty studies; critical knowledge when developing offshore wind farms.

## CASE STUDIES

### GE Haliade-X 12MW

Representing a huge step forward for the offshore wind industry, and the 'double digit' era of wind turbine deployment, the nacelle of GE's Haliade-X 12MW was delivered to ORE Catapult in Blyth as part of the Haliade-X global testing programme. Throughout 2020, the nacelle, comparable in size to six double-decker London buses, will undergo full indoor testing in Catapult's 15MW test facility; part of an advanced technology programme to replicate real-world operational conditions. Catapult's state-of-the-art facilities and hugely experienced powertrain team will have critical input into validating the nacelle, getting it market ready ahead of deployment to 4.8GW worth of offshore wind farms in the US and UK from 2021.

### LM 107.0 P blade

A milestone was hit when LM Wind Power launched its 107m blade, surpassing the 100m mark for a blade that will be used on the world's largest offshore wind turbine – GE's Haliade-X 12MW. Having successfully tested LM's previous largest blade, at 88.4m, ORE Catapult has again been selected to put one of the largest man-made composite structures ever built through its paces. From Catapult's facilities in Blyth, the blade will undergo a full range of advanced testing procedures, demonstrating its ability to withstand peak wind conditions and simulating its readiness for years of operation at sea.

### GreenSpur Renewables

Having designed a permanent magnetic generator concept using abundant ferrite as opposed to rare earth magnets (widely used by the offshore wind industry), GreenSpur Renewables has spent four years developing its innovative concept with ORE Catapult. GreenSpur successfully tested a 75kW prototype using ORE Catapult's 1MW rig. The collaboration has led to £1.25m of Innovate UK funding enabling a 250kW prototype to undergo testing, providing confidence in a market-ready design by 2022 that could take 33% out of the capital cost of direct-drive generators.





# DELIVERING CLEAN GROWTH FROM WELSH MARINE ENERGY RESOURCES

With 600 miles of coastline, Wales has abundant natural resources from which to harness low carbon, clean wind, wave and tidal energy. The Welsh Government has set ambitious renewable energy and decarbonisation targets, including an aspiration to generate 70% of its electricity consumption from renewables by 2030, which would put it at the heart of the UK offshore renewable energy success story.

Building on over three and a half years of working closely with the Welsh Government to support the development of marine energy technologies, ORE Catapult has established the Marine Energy Engineering Centre of Excellence (MEECE) in Pembroke Dock, South West Wales, funded by the European Regional Development Fund (ERDF) and in partnership with the Welsh Government and the Universities of Swansea, Bangor, Cardiff and Cardiff Metropolitan.

The primary focus of the Centre is providing expert knowledge for the marine energy industry, supporting Welsh SMEs to develop new products and services, create new jobs and reduce the cost of marine energy, by carrying out collaborative marine energy research, development and demonstration (RD&D) projects. Working alongside the Marine Energy Test Area (META), a recently funded sister-project to MEECE, the Port of Milford Haven, local universities and the local supply chain, the Centre will offer unique facilities and capabilities to marine energy developers, fostering innovation to reduce the cost of marine energy, reduce risks and capture export opportunities.

The Centre will also drive forward the development of offshore and floating offshore wind in Wales. The £60m Pembroke Dock Marine City Deal project, of which MEECE is a part, will support the development of a 90MW licensed and consented demo zone

for floating wind, and will see Pembroke Port's infrastructure upgraded to allow it to deploy large floating structures, such as floating wind foundations, much more effectively. With MEECE co-located in Pembroke Dock, it will be able to support floating wind developers, and their supply chain, to develop new manufacturing processes, deployment techniques and O&M procedures.

Dr Stephen Wyatt, ORE Catapult's Research & Innovation Director, said: "Wales has an important role to play in the development of clean energy. It is home to a number of wave and tidal developers and the waters off Wales are a prime location for floating wind. There is huge potential for existing businesses to supply the marine energy industry and for new companies setting up in the region to grasp the opportunity. Drawing on the Catapult's existing expertise and those of our partners, MEECE is well-placed to help both."





ORE Catapult's engineers capturing drone footage of our National Renewable Energy Centre.

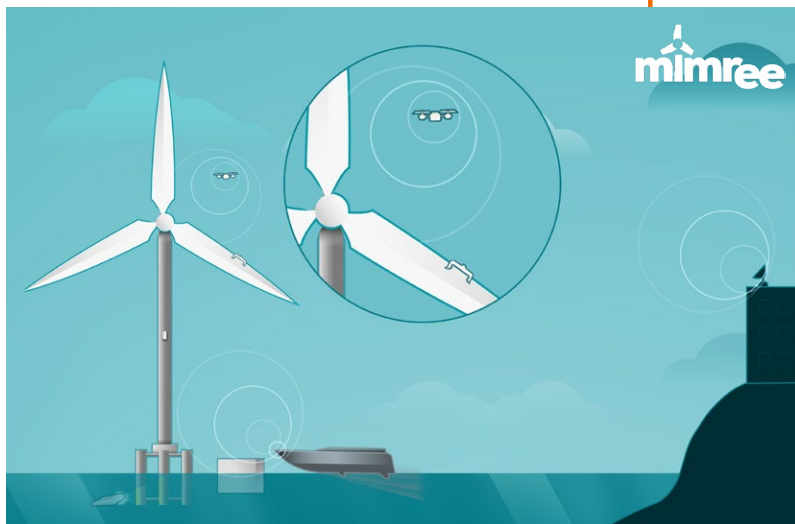
# A VISION FOR REMOTE, SMART OPERATIONS

**The UK's status as the largest deployer of offshore wind cannot last much beyond 2027. If we want to lead this market into the next decade, we need to make rapid, targeted and significant investment in UK innovation now.**

Since ORE Catapult was established in 2013, UK offshore wind has become an international success story. We have built significant experience and achieved a global leadership position in offshore wind operations and maintenance. Seventy-five per cent of capacity installed in our waters is now serviced by UK businesses, allowing us to showcase UK innovation and our achievements in driving down costs for operators. If we can capitalise on this experience, one of the world's most promising global export markets awaits as the energy transition deepens.

We are not the only ones with this opportunity in our sights, however. Ambitious new players are emerging across Europe, the USA, China, Taiwan and Japan – and they are capitalising heavily and rapidly. This means that our status as the largest deployer of offshore wind cannot last much beyond 2027. If we want to lead this market into the next decade, we need to make rapid, targeted and significant investment in UK innovation now.

That is why ORE Catapult has developed a national Operations and Maintenance Centre of Excellence (O&M CoE) that specialises in helping UK businesses create and commercialise technologies for the offshore renewables sector. Based in the Humber, the Centre sits amidst one of the world's biggest offshore wind clusters, where 22 local businesses are gearing up to service 11GW of planned future installed capacity in nearby waters.



Visualisation of the MIMRee system



This central hub reaches out to other regional clusters of activity as defined in the Offshore Wind Sector Deal. We operate an international academic-industry network that includes Aura and our TUS Wind in China partnership that provides UK businesses with access to China's future renewables market.

As we enter 2020, the Centre has a portfolio of more than 70 research and innovation projects that represent a total investment of £40 million in UK innovation. They address a variety of urgent O&M priorities, including data and digitalisation, robotics and automation, health and safety, and lifetime extension of turbines and components.

Through these projects, UK SMEs and other suppliers gain unique access to the world's most advanced testing and validation facilities, in-house expertise from our engineering and innovation teams, and access to an international partner network.

The O&M CoE is now increasing its focus on embedding autonomous systems and artificial intelligence in offshore wind operations, stimulating the creation of data-driven jobs in the UK and innovation-based export markets.

To achieve this, we are growing our team from 30 to 70 full-time employees dedicated to operational performance projects, with new recruitment centred upon a new Grimsby office. We are also developing new facilities, which include:

- An immersive technologies laboratory for the development of artificial intelligence, machine learning tools, artificially intelligent solutions and digital twins.
- A next generation control room simulator for remote operations (being developed in partnership with the Digital and Satellite Applications Catapults).
- Decarbonised vessel integration capabilities.
- Development and testing of remote and autonomous systems.
- Systems, life cycle and cross-sector integration environment.

Offshore wind's future will be one of rapid technological change as we head towards 2030. Keep up by downloading the latest O&M CoE research reports at [ore.catapult.org.uk](http://ore.catapult.org.uk) and watch this space for updates on the Centre's growing portfolio of projects and facilities.



BladeBUG

THE CENTRE HAS A PORTFOLIO OF MORE THAN 70 RESEARCH AND INNOVATION PROJECTS THAT REPRESENT A TOTAL INVESTMENT OF £40 MILLION IN UK INNOVATION.

## O&M CoE IN ACTION

### Extreme Environments

Today's offshore wind farms are largely manual operations reliant upon human access to turbines for inspection, maintenance and repair. SPOWTT is a £2.8 million project funded by the European Research Area Network through DemoWind and includes Siemens Gamesa Renewable Energy and the University of Hull amongst the project partners. It is the world's first major research study into the safety and wellbeing of workers at offshore sites. The result is a digital tool that will allow marine coordinators to make a more informed approach to crew transfers, balancing environmental, physiological and psychological factors. SPOWTT brings cost as well as safety benefits too. Simply by adopting this system, we estimate an average 500MW wind farm can reduce operational costs by more than £1 million per year, achieving a 1% reduction on the levelised cost of energy to the consumer as well as improving the welfare of people working in wind farms.

### Setting Standards for Work in Spearheading the Industry's Digital Revolution

While we can improve conditions for people offshore, the ultimate goal is for greater remote operation of offshore windfarms. ORE Catapult's Data and Digitalisation Team leads a research portfolio that aims to apply digitalisation best practice to all O&M processes.

Digital trials currently underway at our Levenmouth Demonstration Turbine include novel lightning strike detection systems, lidar-based control and bolt condition sensors. These innovations and the deeper drive towards digitalisation are promoted through the Wind Digital Innovations Forum too, which is a partnership with the Digital Catapult for bringing the UK's digital and renewables industries together.

A lack of data sharing in the industry is the key barrier to its digitalisation. In response, we have launched several unique wind farm performance benchmarking systems. The SPARTA database provides anonymised key performance indicators from 60% of the UK's operational capacity, with plans now afoot to bring in international capacity too. Meanwhile, WEBS (Wind Energy Benchmarking Service) provides benchmark data and reporting from over 70 European onshore windfarms. Many real data sets are now available through the Platform for Operational Data ([pod.ore.catapult.org.uk](http://pod.ore.catapult.org.uk)) drawn from our own Levenmouth Turbine too.

### Developing Robotics and Automated Systems

Robotics offer another route towards greater remote operation at wind farms. The O&M CoE works closely with ORCA Hub, one of three hubs for promoting robotics and AI in extreme environments. As a result, we are developing a dedicated autonomous vessel demonstration zone and a road-map for automation of wind farm operations envisioning the introduction of robotic inspect-and-repair teams that will reside at wind farms.

Technologies we are supporting include a blade crawler for inspection and repair by London's BladeBUG, RADBLAD - a climbing robot for x-ray scanning of defects and iFROG - a novel inspection robot for monopiles.

The most ambitious project undertaken by ORE Catapult is MIMRee (Multi-Platform Inspection, Maintenance and Repair in Extreme Environments), a £4.2 million consortium research project funded by Innovate UK. By 2022, the project aims to demonstrate how a chain of robotic drones, inspect-and-repair robots and autonomous vessels can plan and implement operations intelligently. A UK-grown system like this is likely to be in high demand from the global industry given the estimated £26 million cost saving over the lifetime of a wind farm.

## Building the momentum behind offshore renewables

### **ABERDEEN**

ORE Catapult Regional Office

Supporting cross sector innovation and demonstration opportunities

### **FIFE**

Levenmouth Demonstration Turbine (LDT)

### **GLASGOW**

ORE Catapult HQ

Floating Offshore Wind Centre of Excellence (FOWCoE)

### **BLYTH**

National Renewable Energy Centre

including the Grid Emulation System (eGrid) and facilities for Powertrain, Electrical Infrastructure, Robotics and Autonomous Systems, Subsea Foundations and Structures and Turbine Blade Testing

### **MANCHESTER**

Electrical Infrastructure Research Hub

with the Universities of Strathclyde and Manchester

### **THE HUMBER**

Operations and Maintenance Centre of Excellence (O&M CoE)

with the University of Hull

### **SHEFFIELD**

Powertrains Research Hub

with the University of Sheffield

### **LOWESTOFT**

ORE Catapult Regional Office

### **PEMBROKE**

Marine Energy Centre of Excellence (MEECE)

### **BRISTOL**

Blades Research Hub

with the University of Bristol

### **HAYLE**

ORE Catapult Regional Office in Cornwall

### **YANTAI, CHINA**

TUS-ORE Catapult Research Centre (TORC)





# FLOATING OFFSHORE WIND: THE KEY TO HELPING THE UK ACHIEVE NET-ZERO

The Catapult is developing a new multi-million pound Floating Offshore Wind Centre of Excellence (FOWCoE) to drive forward the development of next generation offshore wind technologies that could help tackle the climate emergency.

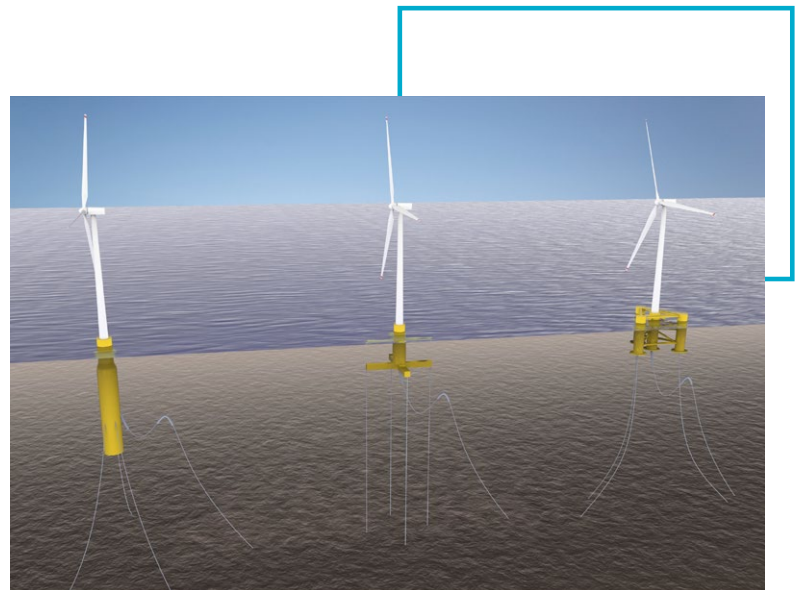
The development of floating offshore wind technology is going to be vital in the fight against climate change and in helping the UK meet its carbon reduction commitment targets by 2050.

In the race to become a global leader in floating wind, the UK is out in front, generating 56% of a currently modest global capacity (32MW) through projects such as Hywind Scotland and Kincardine Offshore Wind Farm. However, without investment in floating offshore wind, there is a risk that the UK may fall prey to its European competitors in the race to commercialise the technology.

In an effort to boost the UK's floating offshore wind industry, we are developing the Floating Offshore Wind Centre of Excellence, aiming to develop an internationally recognised initiative that will work to reduce the cost of energy from floating wind, accelerate the build out of floating farms, create opportunities for the UK supply chain and drive innovations in manufacturing, installation and operations and maintenance.

The FOWCoE looks to support the wider economy, creating immense opportunities for the UK supply chain. ORE Catapult's Macroeconomic Benefits report (September 2018) identified that Scotland and South West England have a huge potential for this next-generation technology. 70% of the waters encompassing Scotland are classed as 'deep water sites' and are therefore primed for the mass-deployment of floating wind. These locations will benefit tremendously from floating offshore wind, that could create an estimated 17,000 jobs and generate a staggering £33.6 billion for the UK economy by 2050.

Like any new innovation or next-generation technology, the seemingly exciting journey to market can sometimes be long and winding. This is where the Centre of Excellence comes in, bringing together businesses



Potential foundation designs for floating offshore wind turbines.



Hywind Scotland turbine being towed into position. (Credit: Equinor)

and experts from multiple industries including oil & gas and energy, as well as academia, to accelerate the commercialisation of floating offshore wind. There are eight initial projects which will kick-start the Centre of Excellence's activities including:

- Powering Offshore Oil Platforms Using Floating Offshore Wind Turbines;
- Hybrid Bottom Fixed/Floating Offshore Wind Sites;
- Grid Connection for Scottish Offshore Wind / Off Grid opportunities including H2;
- Floating Substructures for Fabrication in Scotland;
- Mapping Scotland's Floating Offshore Wind Supply Chain;
- Scottish Aquaculture and Floating Wind Synergies;
- Mapping Cornwall and Wales Floating Offshore Wind Supply Chain;
- Site Characterisation of Atlantic Approaches and Celtic Sea

Through these initial pilot projects, our team of innovation experts will unite industry and academia to accelerate floating offshore wind technology deployment and de-risk innovation to ensure we deliver UK economic benefit from its global growth.

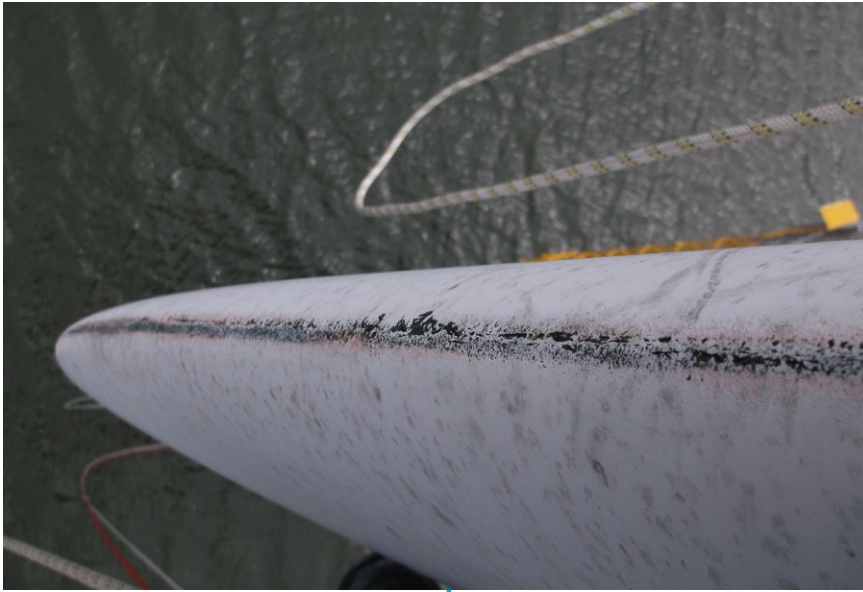
The Centre of Excellence has already attracted a huge amount of industry interest from more than 10 offshore wind developers, including Equinor, and three major UK universities to join the initiative. The Centre's activities closely align with stakeholders including the Scottish Government, Opportunity North East (ONE), the Oil and Gas Technology Centre (OGTC), the Deepwind Offshore Wind Cluster, Scottish Enterprise, Cornwall & Isles of Scilly Local Enterprise Partnership, Welsh Government, Highlands and Islands Enterprise and Crown Estate Scotland.

As part of the FOWCoE, the Catapult will use its world-class skills and expertise to benchmark global standards for floating offshore wind and reinforce the UK's position as global leader. The Centre aims to disrupt the current pattern of behaviour and accelerate the commercialisation of floating wind technology. The programme will work closely with our O&M Centre of Excellence to advance innovative O&M solutions.

The advantages of investing in floating offshore wind are clear: it captures higher wind power currently unreachable by fixed-bottom wind turbines; costs of installation can be reduced while increasing the flexibility of installation procedures; and the health and safety of technicians can be improved by replacing current offshore roles with onshore maintenance.

The Catapult's Centre of Excellence will also help to build these floating wind farms faster. As the urgency of tackling the climate crisis becomes universally recognised, offshore wind has the challenge of adapting its offering to suit the overwhelming need to develop additional energy capacity. If the UK is to meet and surpass the Committee on Climate Change's ambitious target of 75GW of offshore renewable energy by 2050, floating offshore wind is essential. This therefore requires investment in facilities and the supply chain. The FOWCoE will unlock the wind power potential of deep-water sites across the UK over the coming years in order to achieve the net-zero targets.

For more information and to find out how you can get involved, contact Andy Martin. [andy.martin@ore.catapult.org.uk](mailto:andy.martin@ore.catapult.org.uk)



RADBLAD will carry out turbine blade surface inspections.



# PROJECT SNAPSHOTS

## The Launch Academy

In October 2019, ORE Catapult launched a new industry-backed national technology accelerator programme, the Launch Academy, which is designed to help SMEs commercialise new technologies for the offshore wind supply chain.

The Academy will focus on near-market solutions and is backed by a heady mix of SME support specialists and some of the world's biggest renewable energy companies, including Siemens Gamesa and Red Rock Power Ltd.

The Academy is a bespoke nine-month programme that will culminate in participants pitching their product or service to the strategic partners and the Catapult's network of investors with the aim of securing finance and a route to market for their products.

Applicants can find out more and apply at [ore.catapult.org.uk/launch-academy](http://ore.catapult.org.uk/launch-academy)

## RADBLAD

The latest robotics project to join the Catapult's portfolio, RADBLAD stands for In-Service X-Ray Radiography of Offshore Wind Blades. This robotic system will be capable of climbing wind turbines using novel magnetic adhesion technologies and then conducting x-ray radiography of blade surfaces. Crucially, it will be able to eliminate interference from blade movements and vibrations.

The novel feature of this project is that blades will be x-ray scanned on the turbines at their offshore sites, rather than being dismantled and transported to test facilities. If successful, RADBLAD will reduce turbine downtime drastically – from an average of 10 days per inspection to a few hours, and without the associated transportation and test facility costs.

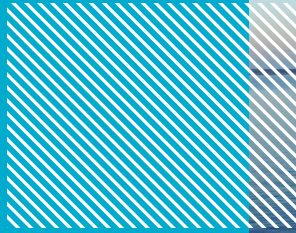
**PROJECT PARTNERS:** *Innvotek, Computerised Information Technology (CIT), London South Bank University, ORE Catapult, Renewable Advice and Forth Engineering.*

## Ocean Energy Scale Up Alliance (OESA)

OESA is a £5.6 million investment by the European Regional Development Fund that is aimed at accelerating the deployment of marine energy technologies in the North Sea region. Despite a vast capacity for generating renewable energy, the North Sea region remains a high emitter of CO2 and its green energy potential is vastly under-exploited. It is this situation that OESA will address.

The OESA Pilot Accelerator Programme convenes an international group of 13 academic-industry partners, eight service providers and five technology companies. Through its international collaboration, OESA strives to build and develop the ocean energy sector, share lessons learned, and ultimately lead to the deployment of more renewable energy projects in the North Sea region.

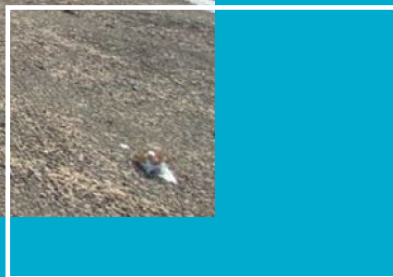




The Levenmouth  
Demonstration Turbine.



Anakata's 'winglets' technology being fitted to a wind turbine blade.



## ECHOBOLT

A new project, EchoBolt is a technology concept promising to reduce the cost of inspecting and retorquing wind turbine bolts – saving the European wind industry an estimated £250 million per year.

The project, which is funded by Innovate UK, will develop the existing Echobolt prototype for deployment and testing at ORE Catapult's Levenmouth Demonstration Turbine and then on one of GE's operational wind turbines by mid-2021.

In a world-first, the technology uses ultrasonics to test the tension on the bolts that hold wind turbine structures together. Currently, each turbine has approximately 1,000 bolts, which require regular, manual tests by offshore technicians using heavy-duty hydraulic wrenches. Echobolt, a hand-held sensor, eliminates the need to loosen each bolt individually.

**PROJECT PARTNERS:** *EchoBolt, GE Renewable Energy, ORE Catapult*

## SeaWynd

MarynSol has partnered with HydroSurv and ORE Catapult to extend its autonomous inspection and data collection capabilities through the development of SeaWynd. SeaWynd is a novel, integrated, multi-sensory payload that will enable the remote inspection of turbine marine structures, from seabed to the splash-zone.

Deploying the sensor payload on unmanned surface vehicles (USVs) makes it possible to detect abnormal changes in the structure while also providing a consistent, measurement-based representation of the structure for operators to interrogate.

MarynSol will test SeaWynd at our Levenmouth Demonstration Turbine and take advantage of existing Catapult collaborations with industry and end-users to facilitate further demonstration of the technology at an operational offshore wind array.

**PROJECT PARTNERS:** *MarynSol, HydroSurv*

## Anakata Wind Power

Oxford's Anakata Wind Power is one of the companies being supported through the £2m TUS-ORE Catapult Research Centre (TORC) which provides entry points for British technologies to the Chinese market. As a result, in December 2019, it successfully installed its innovative wind turbine blade system at China's Gansu Changma wind farm.

Anakata's blade winglets are inspired by rotor add-on devices used in Formula 1. They can improve energy output of wind turbines by 10% and can mitigate blade leading edge erosion. They have so far been retrofitted onto a variety of turbine models and in a variety of locations.

We estimate that there are more than 20,000 wind turbines in China that could be retrofitted with Anakata rotor upgrades. Many of the parts will continue to be manufactured in the UK, enabling further investment in UK manufacturing and the continued development of enhanced technology solutions for offshore wind, both in the UK and globally.



# NEWS ROUNDUP



## Largest ever Interreg project will prove to be game-changing for European tidal stream energy

The Tidal Stream Industry Energiser Project (TIGER) is a €46.8m project with the overall objective of making a stronger, more cost-effective case to utilise the tidal energy capacity in the Channel Region.

The TIGER project aims to drive the growth of marine energy by installing up to 8MW of new tidal energy capacity at sites in and around the Channel region.

Led by ORE Catapult, TIGER brings together multiple partners from across the UK and French offshore renewable supply chains to work towards validating the commercialisation of marine energy technology.

Dr Stephen Wyatt, ORE Catapult's Research & Innovation Director, said: "We are delighted to be spear-heading this game-changing tidal energy project. Developing successful UK and European collaborations is important for the UK tidal energy industry and will help accelerate the economic, environmental and societal benefits which can be derived from this emerging sector."

## ORE Catapult launches new multi-million-pound Floating Wind Centre of Excellence

The new Floating Offshore Wind Centre of Excellence will drive forward the development of next generation offshore wind technology.

The Programme aims to develop an internationally recognised centre that will work to reduce costs, accelerate the build out of floating offshore wind farms, create opportunities for the UK supply chain and drive innovations in manufacturing, installation and O&M.

The Centre of Excellence will cover all areas of floating wind activity in the UK – aligning activity nationally as well developing projects at a regional level based on localised priorities.

Advancements in floating offshore wind are essential if the UK is to reach its targets of 30GW by 2030 and 'net-zero' by 2050.

## Vattenfall and ORE Catapult deepen agreement to support UK supply chain development

The collaboration between Vattenfall and ORE Catapult offers a new £1.5m programme for UK offshore innovators to test and demonstrate their technology on one of the world's most cutting-edge renewable energy projects – the European Offshore Wind Deployment Centre (EOWDC).

Access to real-world testing facilities is often a barrier to commercialisation for SMEs. Providing facilities that replicate real-world offshore conditions boosts bankability and investor confidence in innovative solutions, thereby giving UK companies a crucial edge in developing game-changing technology.

Chris Hill, ORE Catapult's Operational Performance Director, said: "This new £1.5 million programme with Vattenfall and the EOWDC provides a unique opportunity for UK innovators to work with ORE Catapult and Vattenfall to bring new technologies to market through testing in a controlled real-world environment."

## GE's 12MW Haliade-X nacelle and blade arrive in Blyth

The world's largest offshore wind turbine blade and nacelle arrived at ORE Catapult's testing facilities in 2019 to undergo rigorous testing procedures that replicate real-world offshore conditions. The testing will demonstrate the turbine's ability to withstand the harsh conditions offshore by simulating its readiness for years of operation at sea.

"Testing these world-leading technologies cements our position as a global leader in offshore wind," said Andrew Jamieson, CEO of ORE Catapult.

With the 107m blade longer than the wingspan of an A830 aircraft and the nacelle the size of six London double decker buses, it represents a huge milestone for the industry as the energy capacity of one turbine alone can power 16,000 homes with clean energy.



The Haliade-X nacelle arrives at our National Renewable Energy Centre.



Biral's lightning detection system.

## ORE Catapult provides support for its 600th SME

In 2019, ORE Catapult celebrated providing technology innovation and business growth support to its 600th SME – Bristol Industrial & Research Associates Ltd (Biral).

In 2018-2019 alone, ORE Catapult has supported more than 158 SMEs and 35 companies with product development as well as facilitating 120 industry collaborations, highlighting our commitment to making offshore renewable energy the backbone of the UK's future energy mix.

This milestone comes in a year that highlighted several successes from ORE Catapult including a ground-breaking £9m industrial partnership to develop next-gen offshore wind technologies, an industry leading robotics project and administrating a 10-year, £100m supply chain growth support programme – the Offshore Wind Growth Partnership.

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