CATAPULT
Offshore Renewable Energy

TESTING DIGITAL, AUTONOMOUS AND ROBOTICS ASSETS

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REMOTE ROBOTICS, ARTIFICIAL INTELLIGENCE AND AUTONOMOUS SYSTEMS OFFER A SIGNIFICANT OPPORTUNITY TO SUPPORT THE GROWING OFFSHORE RENEWABLE SECTOR.

They have the potential to reduce human deployment in increasingly hazardous conditions, improve efficiency and optimisation of specialist skills; ultimately reducing costs, improving reliability and reducing the carbon footprint of offshore renewable energy.

Questions remain around the standardisation and compatibility of robotics platforms across the offshore wind industry including:

- Can remote robotics perform tasks to the same standard as humans?
- Can the technology survive and perform as designed in the harsh offshore environment?
- How are the economic cases for the use of robotic system demonstrated, in terms of time or cost?
- How to demonstrate that the technology complies with regulatory requirements and operational performance requirements?
- What are the larger societal consequences – do we build trust and confidence in robotic solutions?

Pictured: Drone testing underway at Blyth

SUMMARY OF OFFERING:

ORE Catapult's service offering includes:

SERVICE OFFERINGS: (TRL 1-7)

- Technology assessment process
- Market condition assessment
- TRL development – Feasibility study
- Testing approval document – RAMs / Test plan development
- Test and Validation Plan and Report

ONSHORE TEST SITE: (TRL 4-7)

The new facilities and demonstration zones will provide environments for the full breadth of technological readiness: from benign conditions for early-stage technologies and prototypes, to access to operational assets. This will be supported by a robust, independent and transparent test and validation process that determines the operational performance characteristics for robotics and autonomous systems enroute to commercialisation. The Digital, Autonomous and Robotics Engineering (DARE) Centre will enable businesses to assess: manoeuvrability and control; detection sensor performance and accuracy; reliability; repeatability; operational windows; safety; and energy efficiency.

- Benign marine environments – Dry docks up to 20,000 m^3 of volume
- Representative seabed mounted structures – cable protection system / Monopile / bespoke visual and manipulation test pieces
- Blade structures for external and internal inspections – Full blade profile / Sectional blade
- Representative tower structures – Metallic structure
- Representative test components with simulated defects – Wind turbine blade field damages
- Command and Control centre – Live environmental data monitoring
- Drone flying zone – Aerial space for functional testing and onsite pilot for payload testing capability
- Mechanical / Electrical workshops c/w Lifting equipment
- Conference Centre with hosting facility

OFFSHORE TEST SITE: (TRL 4-7)

- River deployment access platform TBC
- Representative seabed mounted structures – bespoke visual and manipulation test pieces
- Subsea access – Up to 40metre water depth
- Five pre-consented mooring bays for LiDAR
- Subsea structure inspection – Surface defects / biofouling
- Interchangeable testing panels

DEMONSTRATION ZONES: (TRL 4-7,8-9)

- Onshore Demonstration Turbine – Myers Hill
- Port of Blyth Training Turbine
- Offshore met mast
- Offshore inspection and manipulation test pieces
- Offshore demonstration turbine – Levenmouth
- Snowdonia Aerospace partnership supporting BVLOS drones

Pictured: Computer image of the facilities on site at the National Renewable Energy Centre in Blyth

TECHNOLOGY READINESS LEVELS

ORE Catapult have the expertise to lead and support in all TRL progressions.

TRL 1-3	**CONCEPT DEVELOPMENT**
	• Industry needs/ Market research/ Desktop studies/ Analytical tools • Funding application support • Proof of concept and laboratory studies
TRL 4-5	**PROTOTYPE TRIALS**
	• System and subsystem demonstration in controlled and benign environments • Basic functionality testing • Dry docks, onshore testing, and demonstration
TRL 6-7	**ADVANCED PROTOTYPE TRIALS**
	• System and subsystem demonstration in representative and operational environments • Advanced functionality testing • Offshore trials in demonstration zone
TRL 8	**SYSTEM QUALIFICATION**
	• Full system testing of operational and functional performance • Robust testing of real-life operation and in-service performance needs • Independent and traceable assessment against performance standards
TRL 9	**POST QUALIFICATION AND COMMERCIAL OPERATIONS**
	• Controlled field trials on operational assets • Onshore demonstration turbine • Offshore demonstration zone

DIGITAL, AUTONOMOUS AND ROBOTICS ENGINEERING CENTRE

Opened in 2023, the Digital, Autonomous and Robotics Engineering Centre, or DARE as it is known, is located at the ORE Catapult's Blyth facility. It is a centre of excellence for robotic innovations and through collaboration with industry is accelerating the UK's Smart O&M sector.

TECHNICAL DATA

Facility includes

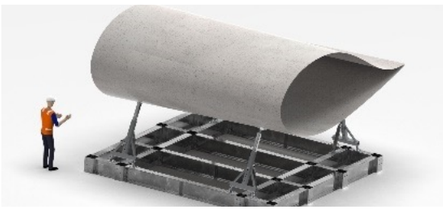
- Command and control rooms
- Live environmental monitoring system (Outdoor camera systems / Temperature and water condition data)
- Plug and Play interface system
- Indoor assembly stations
- Indoor secure storage
- Mechanical and electrical workshop
- Office space and meeting rooms
- Conferencing & Networking spaces with welfare facility

BLADE SECTIONS

As a market-leading, IECRE-accredited wind turbine blade testing facility, the Catapult works tirelessly towards increasing the reliability and efficiency of the longest blades in the world as well as supporting the technological development of innovative solutions at a smaller scale with UK SMEs.

TECHNICAL DATA

- Full blades (From 25metre to 65metre)
- Horizontal and vertical blade frames (Variable angle orientations)
- Sectional Blade samples (Root / Mid / Tip)
- Simulated surface and structural damages
- External and Internal blade access (Inspection / Mission type testing)



DRONE FLYING ZONE / PILOT / PAYLOAD DEMO

The ORE Catapult has the capacity to support technology developers operating in the instrumentation / control / data processing sector, through the utilisation of its dock located drone flying zone and the support of qualified personnel.

TECHNICAL DATA

- Three house drones available to carry out inspections
  - DJI MATRICE 210 RTK
  - DJI MATRICE 100
  - DJI Mini 3 Pro
- Customer payload test (Sensors/ equipment attachment)
- Inhouse qualified drone pilot for testing and demonstration
- Designated indoor / outdoor drone flying zones
- BVLOS (Snowdonia Aerospace)
- De-risking / demonstration of TRL development

Snowdonia Aerospace Centre

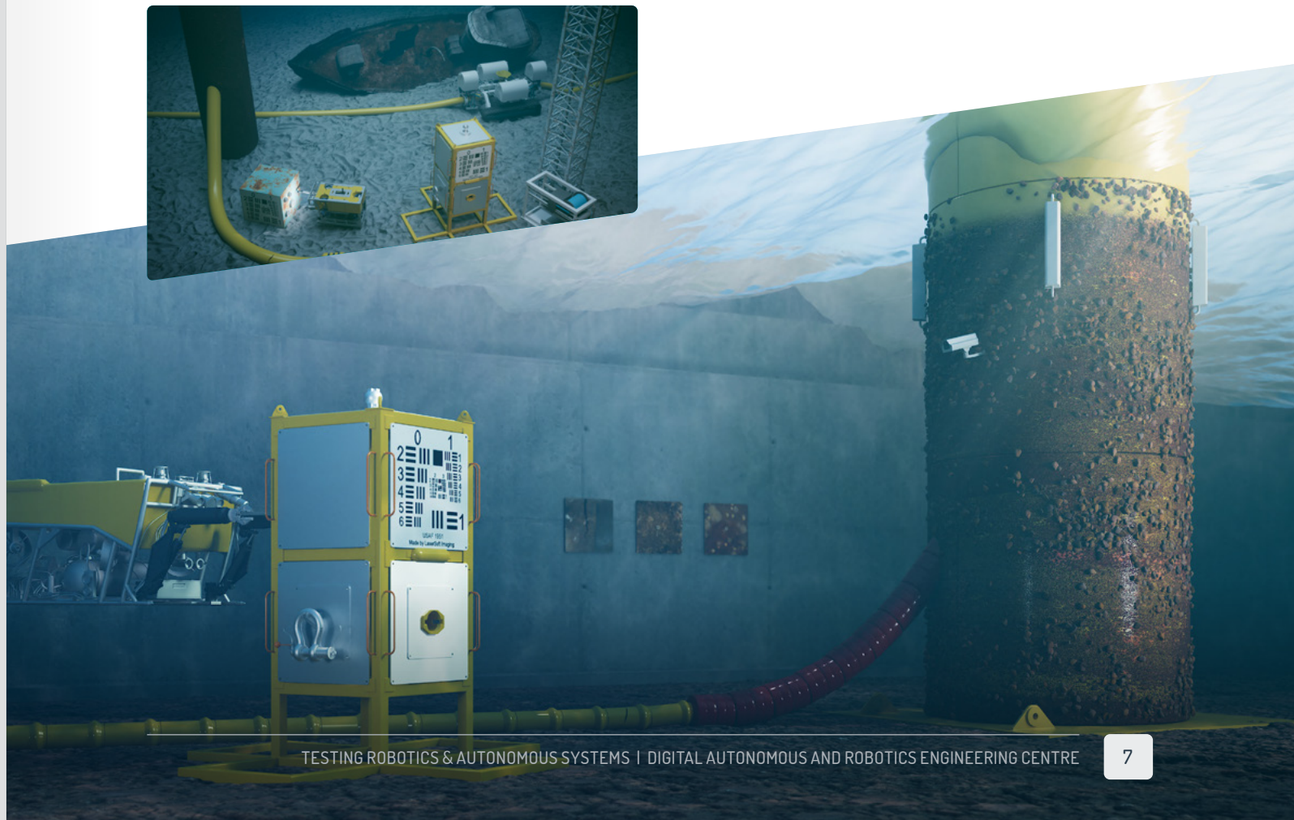
ORE Catapult is partnered with the Snowdonia Aerospace Centre, the UK's premier Beyond Visual Line-of-Sight (BVLOS) flight test centre which supports the development of next-generation drone systems and services by providing access to a 10 nautical mile-wide permanent Danger Area that enables testing and evaluation of systems and sensors in a range of maritime/offshore use cases.

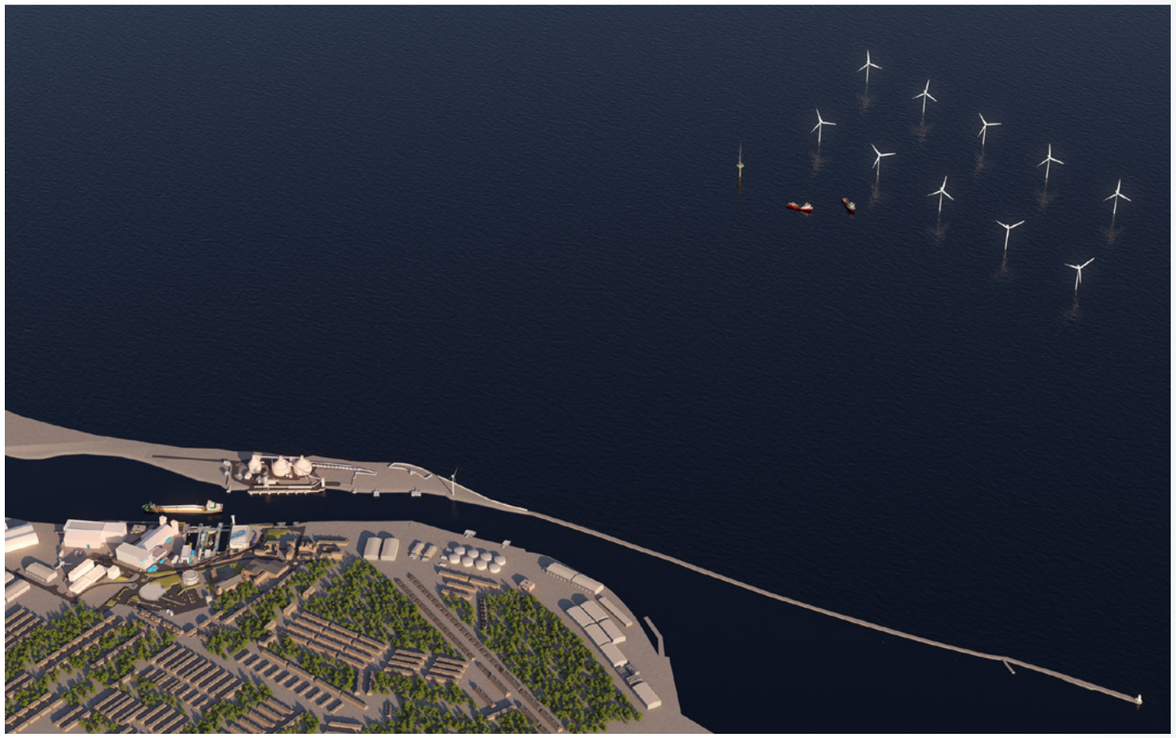
DOCKS AND DOCK TEST PIECE

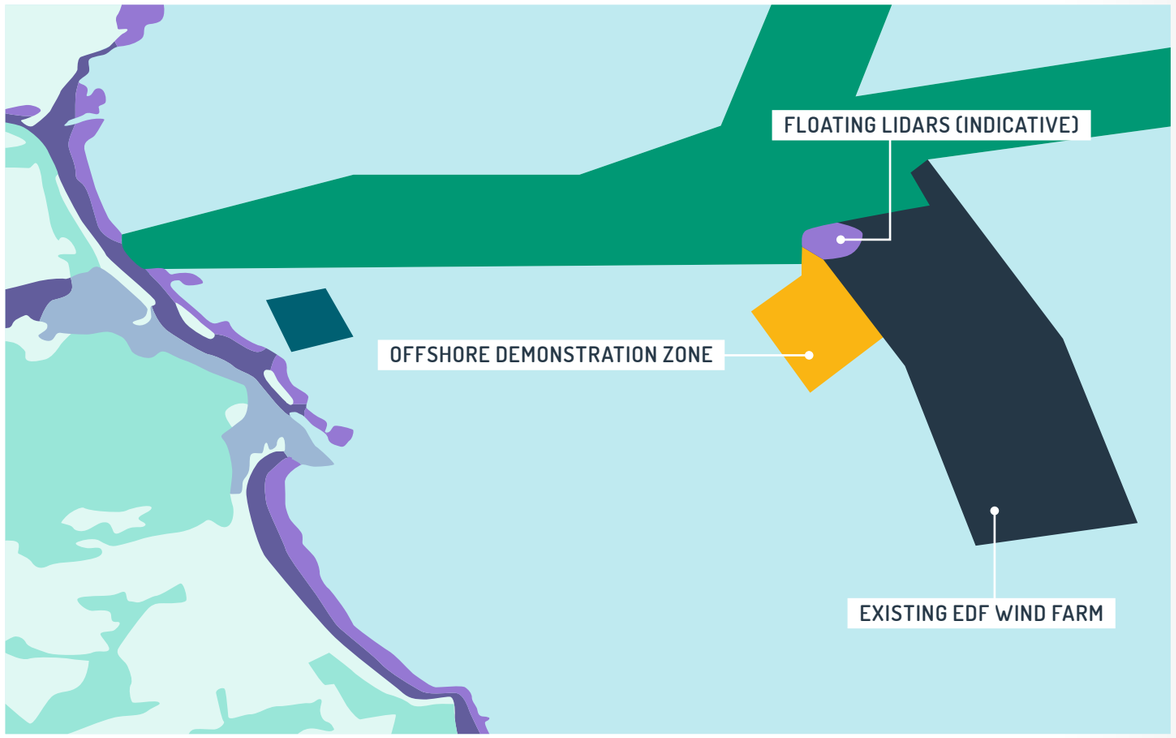
Having previously been the location for the construction of the original HMS Ark Royal, the Catapult's docks have a rich maritime history steeped in innovation and progress. Today the area is available for use for a wide range of testing activities. The three dry docks offer a significant volume of water and feature a number of test pieces, tracking and monitoring systems and lifting equipment all supported by qualified staff.

TECHNICAL DATA

- 3 dry docks with up to 20,000m³ volume of spaces
- Scaled monopiles around 9m tall 3m diameter with Cathodic Protection
- Cables and Cable Protection System
- Test piece with interchangeable panels.
- Inspection and manipulation panel
- Biofouling panels
- USBL tracking system
- Continuous environmental condition monitoring system (Water temperature / Turbidity / conductivity / pressure levels)
- Visual Monitoring system
- Dockside office and control room
- Dock deployment and lifting equipment
- Bespoke test pieces available







OFFSHORE DEMONSTRATION ZONE

The offshore test site provides technology developers with the opportunity to trial their deployment methods, navigation, control and recovery methods as well as completing testing activities in representative conditions to those at offshore wind farms.

The Offshore Demonstration Zone is approximately 1km² and is located just south of the Blyth NOAH met mast and inshore of the existing EDF Windfarm. The zone houses test pieces including scaled monopile structures and visual/manipulation test pieces. It is also fully licensed for non (seabed) intrusive testing activities.

TECHNICAL DATA

- New test area approx. 1km² adjoining to current Met Mast lease area.
- The area houses test pieces including structures on the seabed at various heights.

LICENCED ACTIVITIES

- Navigation
- Near target positioning
- Sensor and instrument function
- Object detection
- Status analysis
- Structural inspection
- Scanning and data gathering
- USBL
- Biofouling removal

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