CATAPULT
Offshore Renewable Energy

TESTING, VALIDATION AND RESEARCH SERVICES

ORE.CATAPULT.ORG.UK

OPERATING THE MOST COMPREHENSIVE TEST, VALIDATION AND RESEARCH FACILITIES AND SERVICES ANYWHERE IN THE WORLD

ORE Catapult has established world class, validation and research services that are key to resolving the commercialisation of innovative technology for the offshore renewables industry. Highly experienced engineers, test technicians, as well as pre-eminent validation assets, remain at the disposal of the industry, offering the following services:

SERVICES:

- Testing and de-risking offshore renewable energy technology
- Accelerating new and innovative technology development
- Developing a quality, indigenous UK supply chain
- Supporting industry with world class expertise, facilities and research

PARTNERS:

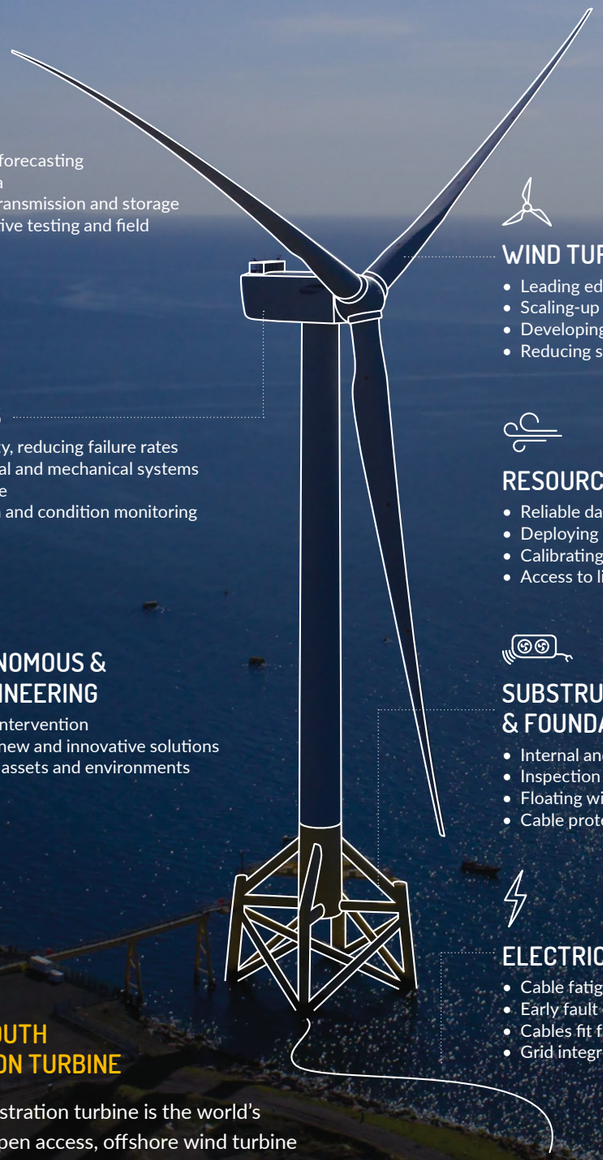
- OEMs, owners and developers
- Tier 1 supply chain
- UK SMEs and agile innovators
- Academia and research hubs

Achilles UVDB AUDITED

MANAGEMENT SYSTEM CERTIFICATION DNV·GL ISO 9001 = ISO 14001 ISO 45001

ADDRESSING INDUSTRY'S BIGGEST CHALLENGES

Our unique research and engineering capabilities brings industry and academia together to drive innovation and reduce cost from offshore renewable energy.



DATA

- Accurate weather forecasting and metocean data
- Data acquisition, transmission and storage
- Highly representative testing and field data analysis

POWERTRAINS

- Increasing reliability, reducing failure rates
- Enhancing electrical and mechanical systems
- Improve service life
- Remote inspection and condition monitoring

DIGITAL, AUTONOMOUS & ROBOTICS ENGINEERING

- Removing human intervention
- Market access for new and innovative solutions
- Accessing live test assets and environments

WIND TURBINE ROTOR BLADES

- Leading edge erosion
- Scaling-up and deploying blades over 1OOm
- Developing stronger and lighter design
- Reducing structural repairs & human intervention

RESOURCE ASSESSMENT

- Reliable data calibration
- Deploying robust and reliable lidar technology
- Calibrating against highly accurate wind data
- Access to live testing environments

SUBSTRUCTURES, SUBSEA & FOUNDATIONS

- Internal and external corrosion
- Inspection and surveying
- Floating wind solutions
- Cable protection

ELECTRICAL INFRASTRUCTURE

- Cable fatigue and failure rates
- Early fault detection and remote inspection
- Cables fit for floating wind
- Grid integration and energy storage

Pictured

7MW LEVENMOUTH DEMONSTRATION TURBINE

Our 7MW demonstration turbine is the world's most advanced, open access, offshore wind turbine dedicated to research, and offers complementary opportunities for training and development of skills vital for the future of the offshore wind industry.

TURBINE ROTOR BLADES

As blades scale up in length, presenting greater challenges in both weight and power curve efficiency, ORE Catapult provides solutions in both representative blade testing and performance optimisation. Our blade specialists, alongside cutting-edge test and research facilities, enable clients to not only certify blades to industry standards, but also understand and enhance their blade design, materials, manufacture and performance during operation.

TEST FACILITIES

100M+ BLADE TEST FACILITY
A world-leading facility, capable of testing next generation offshore wind rotor blades in excess of 100m

DISRUPTIVE INNOVATION TEST CENTRE
(DITC) A facility for R&D blade test programmes and upscaling new and innovative blade technologies up to 50m in length

BLADE RAIN EROSION TEST RIG AND COMPOSITES LABORATORY
State-of-the-art facility for simulating and analysing erosion of wind turbine blades during operation. Our composites laboratory also develops new material solutions for blade leading edge

CERTIFICATION

UKAS TESTING 2769 Accredited to: ISO/IEC 17025:2017

IECRE™

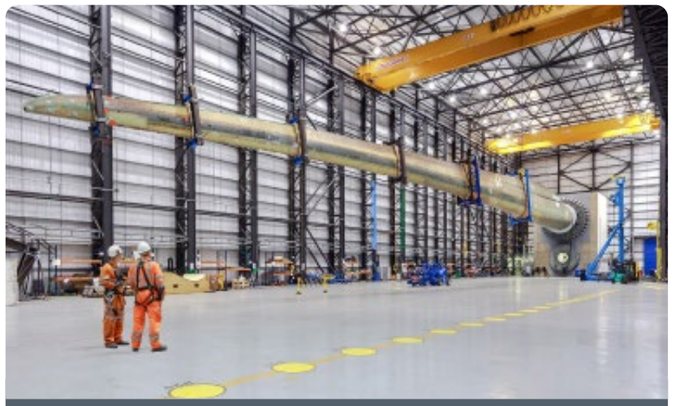
TEST SERVICES

- Dual-axis fatigue test
- Data acquisition and analysis
- Determination of natural frequencies
- Modal analysis
- Static, fatigue, post-fatigue and collapse test
- Rain erosion material testing
- Small scale and prototype blade testing

WIND BLADE RESEARCH HUB

The Wind Blades Research Hub (WBRH) is between ORE Catapult and the University of Bristol that could help unlock larger and more powerful wind turbines than ever before. The hub's main research focus areas include blade materials and manufacturing technology, blade integrity, blade design and performance.

Pictured: An 88m blade in ORE Catapult's blade test facility as part of the XL-Blade project



The XL-Blade project tested and demonstrated two next generation offshore wind turbine blades at 88m and 88.4m in length. The project was designed to construct longer, lighter and more cost effective blades. The project also successfully performed ORE Catapult's bi-axial fatigue test method on an 88.4m blade; the largest blade in the world to undergo such advanced testing.

POWERTRAINS

ORE Catapult is at the forefront of powertrain testing, validation and research. Our experienced powertrain specialists, engineering teams and project management teams work with clients to enhance and validate complex wind and tidal turbine powertrain systems, from small scale prototypes to full-scale, next generation machines.

TEST FACILITIES

15MW POWERTRAIN TEST FACILITY
Powertrain testing facility for offshore wind turbine systems, with 6 degrees of freedom loading and grid emulation

3MW POWERTRAIN TEST FACILITY
Horizontal axes powertrain testing facility for wind and tidal turbine systems, with 6 degrees of freedom loading and grid emulation

1MW POWERTRAIN TEST FACILITY
Sub-megawatt powertrain and component testing facility for small scale turbine powertrain systems

18MVA GRID EMULATION SYSTEM (EGRID)
One of the world's most advanced grid emulation systems, enabling simultaneous mechanical and electrical system testing in conjunction with ORE Catapult's powertrain test facilities

TEST SERVICES

- Highly Accelerated Lifetime Testing (HALT) with multi-axis loading
- System performance tests; power curve and efficiency assessments
- Design verification and model validation
- Worldwide grid compliant testing
- Component validation and conformance testing
- New supply chain validation

POWERTRAIN RESEARCH HUB

The Powertrain Research Hub is a £2.5m partnership between the University of Sheffield and GE Renewable Energy. The Hub focuses on the development of next generation and future technologies and research solutions for improving turbine reliability and performance.

Pictured: A Samsung 7MW nacelle in ORE Catapult's 15MW powertrain test facility

As the offshore wind industry enters the next generation of wind turbine at over 1OMW, ORE Catapult has established world-leading powertrain test and validation capabilities to support the deployment of highly reliable technology offshore at this scale. ORE Catapult has also integrated an 18MVA Grid Emulation system with its powertrain facilities, providing an even greater suite of mechanical and electrical testing.

"Testing at ORE Catapult is an important step in our engineering process and the data collected will play a critical role in future design considerations. We plan to continue to invest in both onshore and offshore testing."

SIMEC Atlantis Energy

ELECTRICAL INFRASTRUCTURE

As offshore wind develops into deeper, harsher environments, lifetime product performance of critical electrical infrastructure is vital to maintain cost effective levels of power efficiency to the grid. ORE Catapult conducts extensive test programmes across a wide variety of complex electrical transmission and distribution infrastructure, as well as grid compliant testing.

TEST FACILITIES

INDEPENDENTLY ACCREDITED HV POWER CABLE SYSTEMS
Testing of power cable systems through type testing services for underground, submarine

MATERIALS LABORATORY
Providing forensic analysis of materials, cable breakdowns and failures from within the High Voltage laboratories including microscopy and polymer studies

18MVA GRID EMULATION SYSTEM (EGRID)
One of the world's most advanced grid emulation systems, enabling simultaneous mechanical and electrical system testing in conjunction with ORE Catapult's powertrain test facilities

CERTIFICATION

UKAS TESTING
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TEST SERVICES

- Type certification of HV cable systems, switchgear and other HV insulation systems
- Assessment and breakdown of high voltage bushings
- Cable fatigue bend testing
- Export cable pre-qualification
- Grid emulation system testing
- Cable forensic analysis
- Asset life extension assessments
- Accelerated ageing

ELECTRICAL INFRASTRUCTURE RESEARCH HUB

Catapult and the Universities of Strathclyde and Manchester. The Hub will accelerate research and development activities, tackling the challenge of making the UK's electrical infrastructure systems future-proof to meet the needs of the growing offshore wind, wave and tidal industries.

Pictured: ORE Catapult's cable fatigue test rig, engineered by UK company, Osbit

Floating wind will unlock wind resource in deepwater sites, but one of its main challenges is cable fatigue. ORE Catapult's cable bend fatigue test rig is designed to test and validate the next generation of dynamic cables for floating wind. This service will bring more reliable and cost effective dynamic cable technology to the floating wind market.

"ORE Catapult's testing facilities, and their capability and expertise, were vital in allowing us to move to 66kV inter-array power supply – a key driver in ensuring future offshore renewable energy developments are cost-effective and reliable."

JDR Cables

RESOURCE ASSESSMENT

ORE Catapult's resource assessment platforms enables clients to test, calibrate and validate remote sensor technologies such as lidars in a representative environments. Clients can prove reliability, data availability and performance, as well as evaluate environmental conditions, observe marine conditions and collect wildlife data for R&D purposes.

TEST FACILITIES

OFFSHORE ANEMOMETRY HUB
Located 3nm off the coast of Blyth, Northumberland, the Offshore Anemometry Hub, with a 104m mast tip, provides wind resource and environmental data to validate floating lidar systems

ONSHORE METEOROLOGICAL MAST
Located on the site of our 7MW Levenmouth Demonstration Turbine, our onshore met mast enables the testing, calibration and verification of onshore lidar systems

TEST SERVICES

- Hosting onshore and floating lidar trials
- Data licensing for wind and ocean conditions
- Consenting and permitting
- Project support
- Collaborative R&D projects
- SME product development support
- Hosting instrumentation and monitoring of new equipment
- Providing third-party validation reports

Pictured: AXYS Technologies' floating lidar at ORE Catapult's offshore anemometry hub. Image courtesy of Saul Reynolds, AXYS Technologies

"Our clients demand state-of-the-art reference data during verification campaigns to quantify their measurement uncertainties and ultimately reduce their overall cost of capital, which is why we have chosen ORE Catapult for some key AXYS FLiDAR® verification and uncertainty classification studies."

AXYS Technologies

Accurate wind resource assessment campaigns and uncertainty studies are a critical feature of developing offshore wind farms. AXYS Technologies has undertaken floating lidar trials, benchmarking against the highly accurate data provided by ORE Catapult's offshore anemometry hub. This asset provides essential weather data and supports to industry to deploy floating lidars; a more cost effective option compared with fixed meteorological masts.

DIGITAL, AUTONOMOUS & ROBOTICS ENGINEERING

As robotics technologies become more established in the offshore renewables sector, the need for commercial test, demonstration and validation facilities will increase. ORE Catapult offers a full range of independent, state-of-the-art robotics and autonomous systems testing, demonstration and validation services.

TEST FACILITIES

7MW LEVENMOUTH DEMONSTRATION TURBINE
A live demonstration turbine providing the perfect platform to test, validate and demonstrate aerial technologies for remote turbine inspections and surface or subsea vehicles

DARE 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.

STILL WATER DOCK TEST FACILITIES
Our versatile still water dock testing facilities are ideal for robotic trials in a controlled, representative environment. Examples include a seabed survey using an Autonomous Underwater Vehicle (AUV) or Unmanned Surface Vehicle (USV) to conduct inspections. Buried cables and bespoke structures can also be placed into the docks.

OFFSHORE ANEMOMETRY HUB
A fixed platform located 3nm of the coast of Blyth provides representative conditions of a structure located adjacent to the Blyth Offshore Demonstrator windfarm

TRAINING TOWER
A 27m training tower replicating the conditions of a turbine tower, allowing robotic systems to scale and inspect at height from a safe area that experiences offshore North Sea weather conditions

BLADE TEST FACILITIES
With blade test facilities and blade sections available on site, robotic inspection of blades can be conducted within a controlled environment, either indoors or outdoors

TEST SERVICES

- Test and demonstrate robotics & autonomous systems
- Versatile test set ups at ORE Catapult's sites
- Subsea operations
- Inspections and repairs
- Aerial operations
- Instrumentation testing
- Market assessment

"The project management and support team at the ORE Catapult were great to work with and were responsive to all of our needs on site. We will look forward to working with them again in future projects."

Hydrason Solutions Ltd.

Pictured: Hydrason Solutions' autonomous surface vehicle in ORE Catapult's still water dock

Edinburgh-based Hydrason Solutions developed an innovative cable condition monitoring technology based on dolphin echolocation technology. To support the development of Hydrason's technology, testing was successfully undertaken in ORE Catapult's controlled, representative dock environment. This included the burying of cables for an autonomous surface vehicle to detect.

SUBSEA, FOUNDATIONS & SUBSTRUCTURES

ORE Catapult provides a range of testing and validation services for entire structures and foundations, with access to major assets deployed offshore, as well as components associated with the base of turbines, such as cable systems, ROVs and anti-corrosion technologies.

TEST FACILITIES

STILL WATER DOCK TEST FACILITIES
Our versatile still water dock testing facilities provide an ideal testing ground for structures, foundations, materials and technology related to enhancing turbine endurance and performance

7MW LEVENMOUTH DEMONSTRATION TURBINE
A live offshore wind turbine with foundations experiencing offshore wind conditions

OFFSHORE ANEMOMETRY HUB
A fixed platform located 3nm of the coast of Blyth provides representative conditions of a structure located adjacent to the Blyth Offshore Demonstrator windfarm

TEST SERVICES

- Condition monitoring
- Controlled dry or wet testing of subsea systems and technologies
- Prototype subsea system deployment // Subsea and surface survey and/or inspection equipment
- Foundation testing, including piling, noise mitigation and anchoring
- Hydrodynamic stability analysis and testing

Pictured: Trelleborg's NjordGuard™ solution during set up in ORE Catapult's docks

With developers under increasing pressure to reduce costs and de-risk offshore wind farm power cable installation, Trelleborg Applied Technologies' innovative NjordGuard™ solution underwent a series of wet tests in ORE Catapult's still water docks to prove its capability of installing and removing offshore cables into both monopile and J-tube openings, without the need for intervention by remotely operated vehicles (ROVs).

"The test results demonstrated the ability of Trelleborg's NjordGuard™ system to be installed quickly and easily, without any lost time or delay, during this operation which would be on the critical path of an offshore wind farm construction project."

Trelleborg Applied Technologies

DISRUPTIVE INNOVATION

In response to the challenges faced by offshore renewable energy industries, accelerating innovation to market is critical in supporting the operation of offshore assets and reducing the cost of energy. ORE Catapult has dedicated expertise and support services specifically for disruptive innovators and early stage technology developers. Our test and validation facilities and business support services help to develop and accelerate high potential, innovative technology, from early stage development to commercially viable, market ready products or services.

TEST FACILITIES

DISRUPTIVE INNOVATION TEST CENTRE (DITC)
The DITC is a versatile workspace containing a 1MW powertrain rig and 50m blade test hubs. It also has shop floor space and facilities, crane lifting, large payload access and office space.

STILL WATER DOCKS
Three versatile still water dock facilities provide a representative outdoor environment for technology test and demonstration. Undertake controlled and bespoke test set ups in wet or dry conditions with seabed, subsea and floating technology.

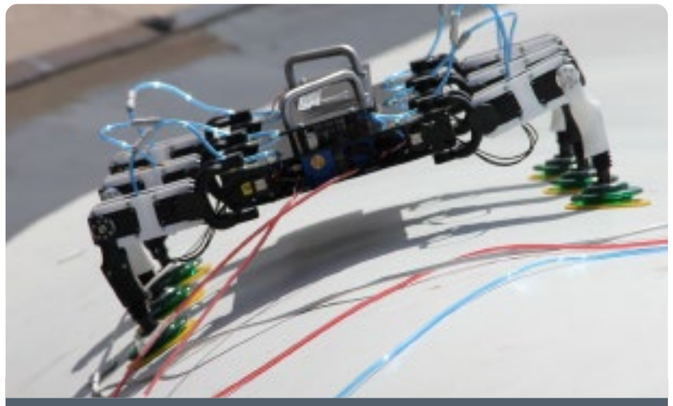
TRAINING TOWER
A 27m training tower replicating the conditions of a turbine tower, enabling working from heights. The tower is ideal for testing innovations such as robotics, safety and inspection.

NORTH SEA ACCESS
For technology requiring direct access to sea conditions, our position adjacent to the Blyth Estuary, and a great relationship with the Port of Blyth, makes access to the North Sea possible for live test and demonstration purposes.

TEST SERVICES

- Test and demonstrate Robotics and Autonomous Systems
- Blade product and innovation support and testing services
- Powertrain product and innovation support and testing services
- Market assessment and advisory services
- Functional facility access for technology build/strip down
- Technology, engineering, research and test specialists

Pictured: BladeBug's robotic crawler during demonstration at ORE Catapult's site in Blyth



Innovation is absolutely critical to advancing offshore renewable energy and reducing operational costs. London-based SME, BladeBug, has developed a robotic blade crawler, using novel adhesion technology to walk along the surface of a wind turbine blade, collecting data on the blade's condition. BladeBug used ORE Catapult's facilities to test and demonstration the operation of the crawler, helping to accelerate the technology and support its market readiness.

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