



Offshore Wind Meets... Opportunities

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6th December 2016



Agenda

1. Offshore Renewable Energy Catapult
 2. Opportunities
 3. Challenges
 4. Examples
 5. Ideas
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Mission:

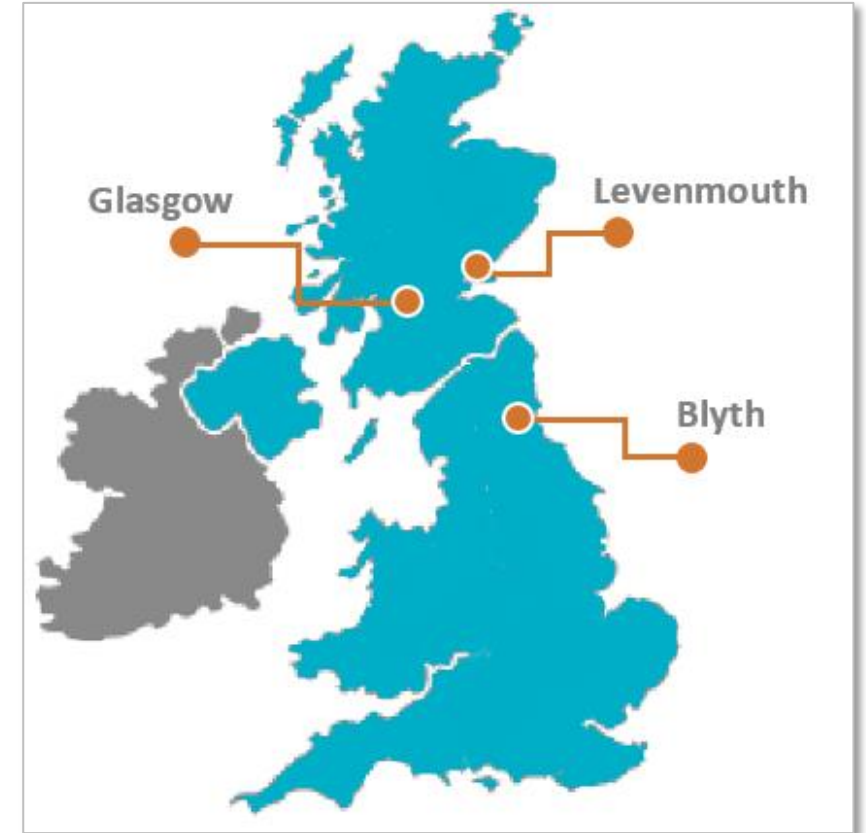
- Abundant, affordable energy from offshore wind, wave and tide.

Aims:

- Reduce the cost of offshore renewable energy
- Deliver UK economic benefit

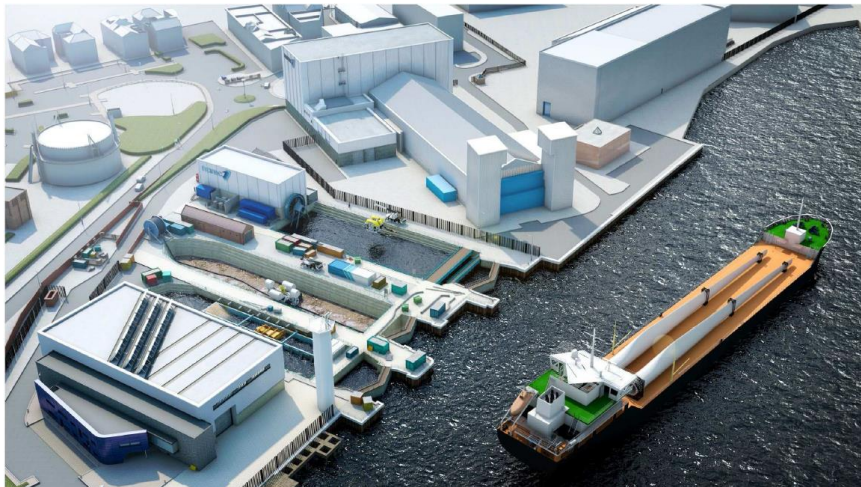
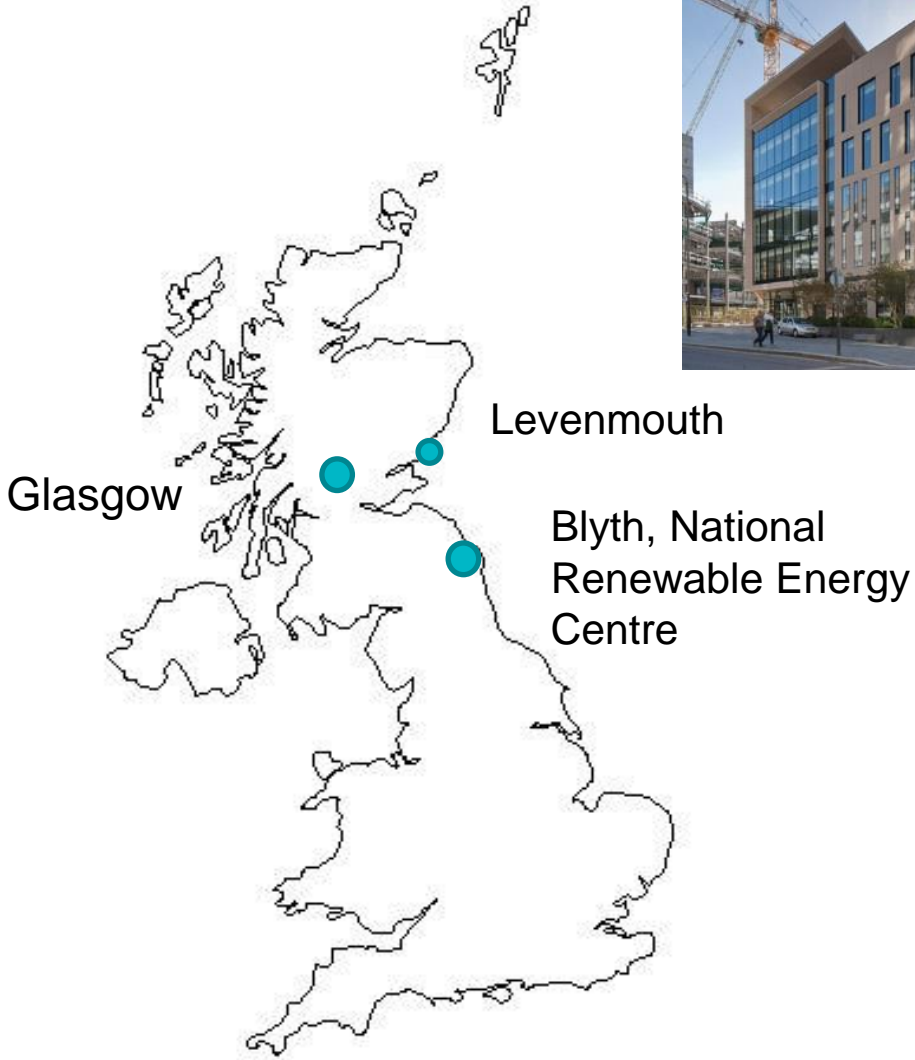
How:

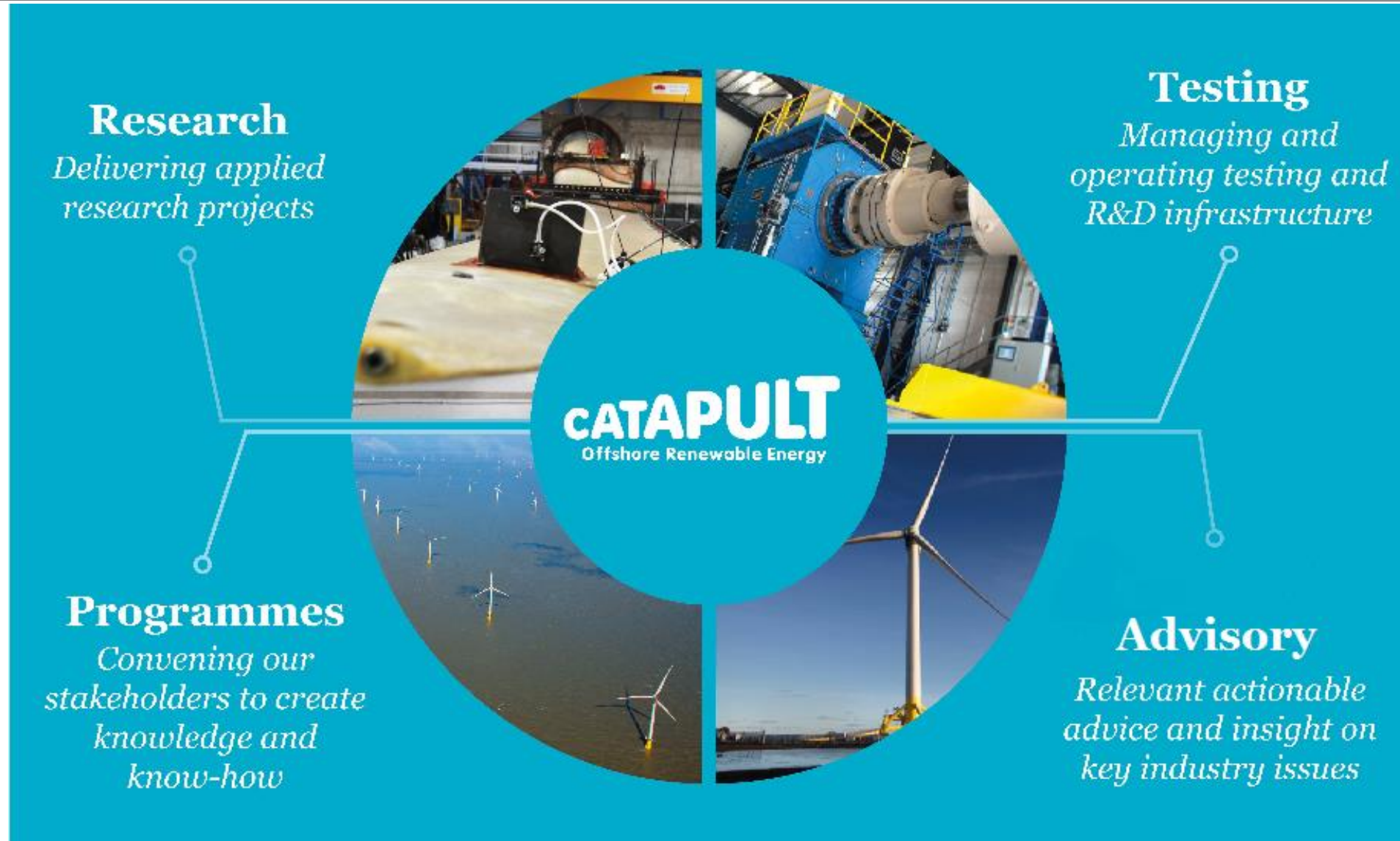
- Engineering and research experts with deep sector knowledge
- Independent and trusted partner
- Work with industry and academia to commercialise new technologies



80+
technical experts

Offshore Renewable Energy Catapult



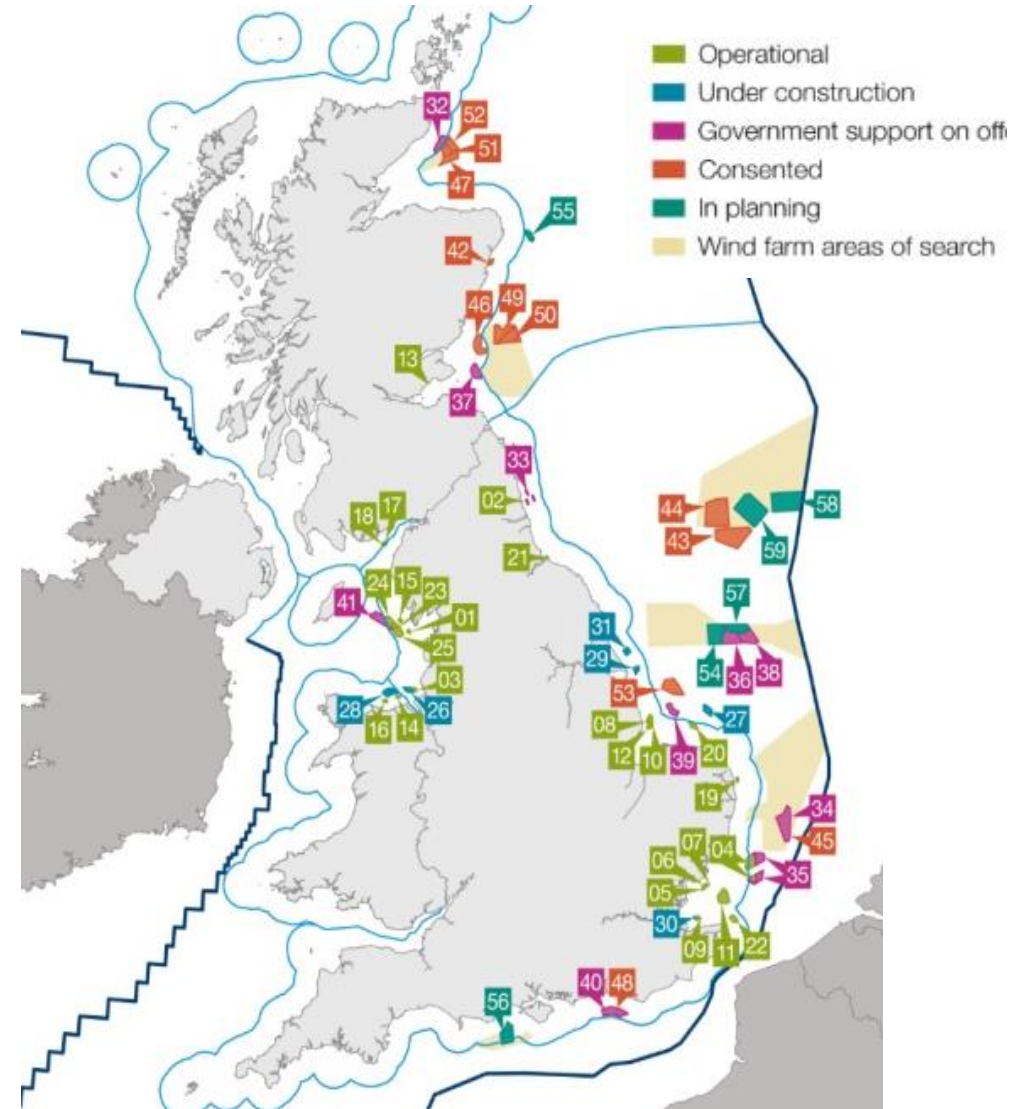
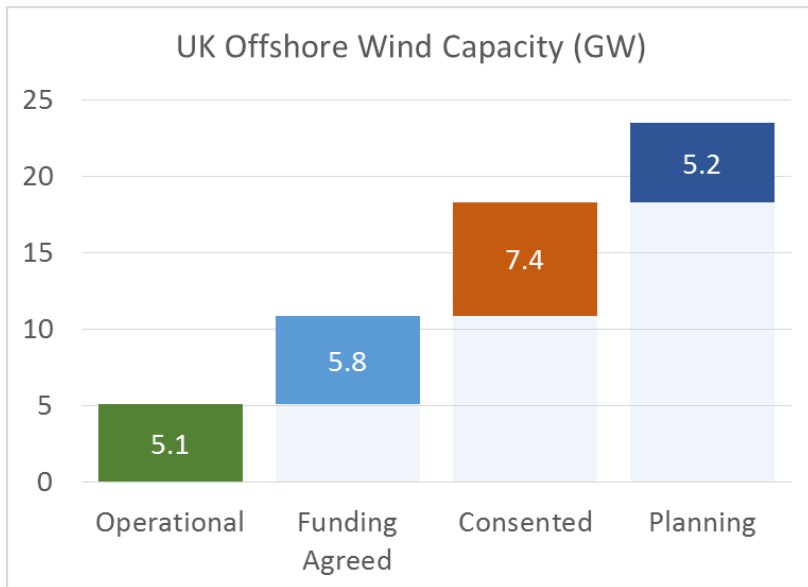


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UK's offshore wind opportunity

- 1,465 offshore turbines (3,320 in Europe)
- 5.1GW operational (11 GW in Europe)
- 10GW installed by 2020
- 2nd CfD Auction announced for April 2017



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Battle on for Neart na Gaoithe CfD

Backers of the 450MW Neart na Gaoithe offshore wind farm in Scotland's Firth of Forth will take a shot at reversing the cancellation of its Contract for Difference early next year.

An arbitration hearing has been set for the first quarter when developer Mainstream Renewable Power will bid to overturn termination of the £114.39 per megawatt-hour CfD by the Low Carbon Contracts Company.

The Irish developer is

disputing the counterparty's decision and is expected to argue that it could not formally meet milestone investment requirements due to circumstances outside its control.

An RSPB court action against Neart's consent was undecided when the LCCC took its decision.

The Scottish Court of Session ultimately ruled against planning permission for the 64-turbine project as well as the 784MW Inch Cape

and 1050MW Seagreen wind farms.

The Scottish government, as well as Mainstream and Inch Cape developer SDIC Power, have appealed the decision. A hearing is due in February. Mainstream said

the "investment consortium, the major contractors and the required £2bn of construction financing remain in place" for Neart despite the setbacks.

The company has meanwhile installed a duct block beneath cables to be

installed by ScottishPower at the Torness nuclear plant.

"This work de-risks (Neart na Gaoithe's) onshore cable crossing while also discharging part of our onshore consent," said a spokesman.

SPR finds answer to East Anglia 3 bird concerns

ScottishPower Renewables has agreed to rejig turbine configurations at its 1.2GW East Anglia 3 wind farm off Norfolk to ease RSPB fears over bird mortality.

The developer said it will increase the distance between blade tips and the surface of the water from 22 to 24 metres across 70%

of the project. RSPB said it believes the change will reduce the death rates for gannets, kittiwakes and gulls, and the decision means the charity will have no further input during the planning process for the project.

SPR is seeking consent for up to 172 turbines with maximum tip heights of 247

metres and rotor diameters of up to 220 metres.

A spokesman said the company is a "responsible developer with a lifetime view" of its assets.

"Our positive engagement with RSPB... has again demonstrated how an effective planning balance can be achieved."

Eon takes out two Robin Rigg turbines

Eon is decommissioning a pair of six-year-old Vestas V90 turbines at its 180MW Robin Rigg wind farm in the Solway Firth between England and Scotland.

MPI jack-up Adventure took down the 3MW machines in

an operation that kicked off earlier this month.

Crews are currently working to remove the transition pieces and monopile foundations, marking what is thought to be the first time commercial UK

offshore turbines have been decommissioned.

Eon said removal, which is expected to be completed by the end of the month, was prompted by "natural movements of the sandbank and the loss of seabed level"

at the site on the north side of Robin Rigg.

Turbines A1 and B1 were first shut down in April due to the problem.

"This has no impact on the remaining turbines and this issue is unconnected to the engineering works currently ongoing at the wind farm," said Eon, which has been addressing historic grout issues at Robin Rigg.

The company added that no decision had been taken on whether to replace the two machines or to remain with a 174MW layout.

■ Donald Trump's third legal attempt to halt construction of an 11-turbine wind farm off the Aberdeenshire coast was heard by the UK Supreme Court earlier this month.



ROBIN RIGG: and then there was 174MW... Photo: Eon

Vattenfall's 100MW project could be visible from the US tycoon and presidential candidate's Menie golf complex in north-east Scotland.

Cable faults pull the plug offshore

ReNEWS
7 January 2016

Export cable failures have stopped the juice flowing at large-scale wind farms in the North Sea off Germany and in the UK Irish Sea.

Dong Energy's 183.6MW Walney 2 went offline late last year due to an unspecified problem with the project's 132kV link to shore near Blackpool in north-west England.

Winter storms have hampered initial attempts to get a repair crew in place with lead contractor Briggs and MPI jack-up vessel Enterprise on the job.

The vessel is currently




DEAD IN THE WATER: winter weather is holding up export cable repairs at Dong's Walney 2 wind farm in the Irish Sea

Knowledge Area	Innovation Challenge
Blades	Leading edge erosion prevention systems
Blades	Longer blades (materials and manufacture)
Powertrains	Generator health monitoring
Powertrains	Converter health monitoring
Electrical infrastructure	Preventing the development of free spanning cables
Electrical infrastructure	Cost effective subsea survey of cables and foundations
O&M	Cost effective blade inspection technology and methodology
O&M	Automation of wind farm servicing tasks
Foundations & substructures	Deterring marine mammals from the site of piling operations
Foundations & substructures	Corrosion protection on foundations in the inter-tidal zone
Foundations & substructures	Prevention and repair of scour

- Challenge areas launched and on website with Expressions Of Interest (EOI) process.
www.ore.catapult.org.uk/innovationchallenges

Clone of Levenmouth Wind Turbine (CLOWT)



Date
Thursday 12th January 2017

Location
Fife Renewables Innovation Centre (FRIC),
Ajax Way, Leven, KY8 3RS [Click here for map](#)

Timing
10.00 to 14:00 (Refreshments on arrival, buffet lunch provided)

Offshore Wind Sensors Technology Demonstration Opportunity


Workshop and competition for innovative sensor technology SMEs to gain demonstration access to ORE Catapult's 7MW Offshore Wind Demonstration Turbine

About the competition
With an established market for sensors in sectors such as aerospace, oil and gas, and automation, the opportunity to develop new approaches and technologies is considerable. Demonstrating these technologies in the offshore wind sector can be challenging both in terms of access to an operational turbine and also in relation to prohibitive costs. ORE Catapult is looking to support companies in making this transition.

ORE Catapult is launching a competition aimed at SMEs who can provide sensor instrumentation to the blades, tower and substructure of the 7MW Levenmouth Demonstration Turbine to monitor its behaviour in real-world conditions. This is part of the Catapult's recently announced 'Clone of the Levenmouth Turbine' (CLOWT) programme. The workshop will offer a unique opportunity for SMEs in the UK to learn more about our exceptional asset and how its capabilities can assist their journey towards commercialisation.

Who is this workshop for?
The opportunity is for SMEs seeking to demonstrate, validate and calibrate novel sensor technologies for the offshore wind sector. This programme will utilise ORE Catapult's 7MW Levenmouth turbine. Technologies should be at TRL 5 or higher and should be non-invasive to the operations of the turbine, or require any significant alteration of their device.

We are seeking sensor technologies that can instrument:
Blades | Drivetrains | Foundations



This CLOWT project is supported by Scottish Government

[Click this button to view the agenda or register](#)

CLOWT



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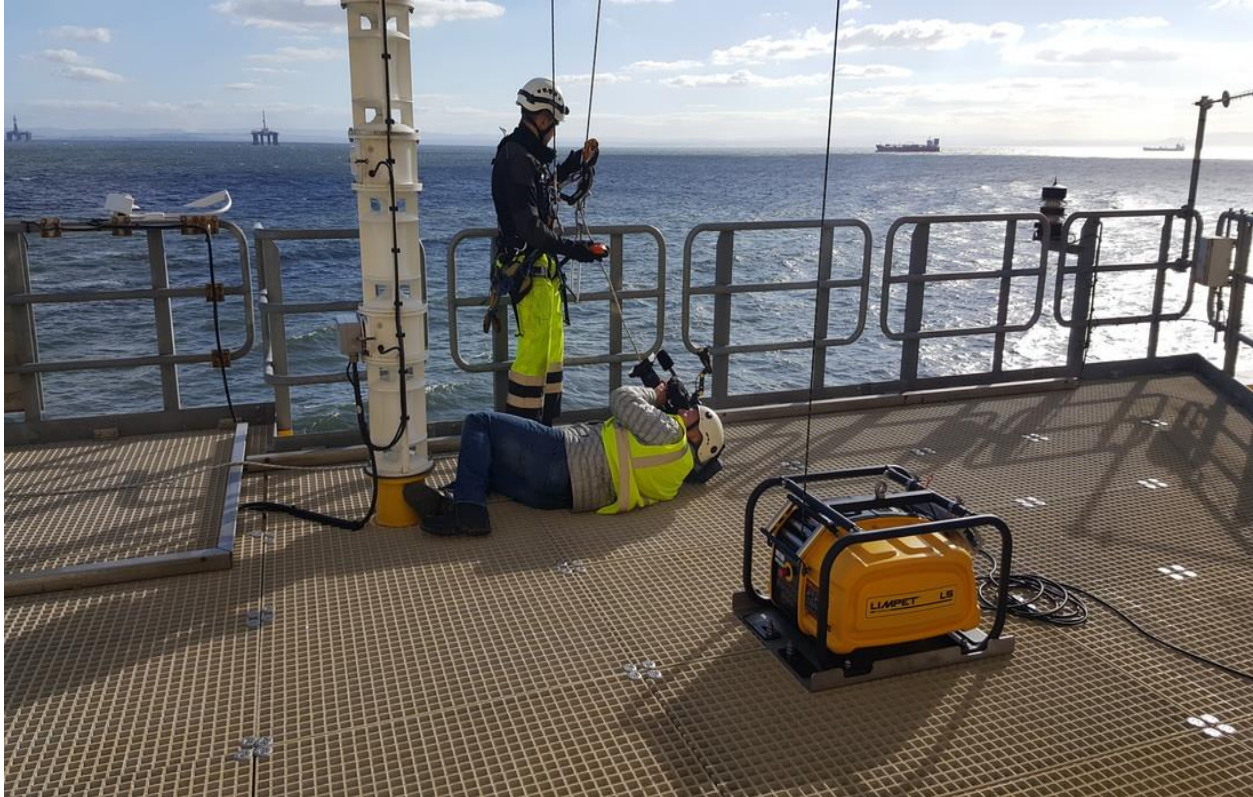
Case Study: ACT Blade



ORE Catapult Support

- Responded to Blade Innovation Challenge
- Identified funding avenues for feasibility study of novel blade technology
- Funding bid co-development
- Secured 3 rounds of Energy Catalyst funding (Innovate UK)
- Supported investment/OEM pitch development
- ACT Blade, set up to exploit technology

Case study: Limpet Technology Demonstration



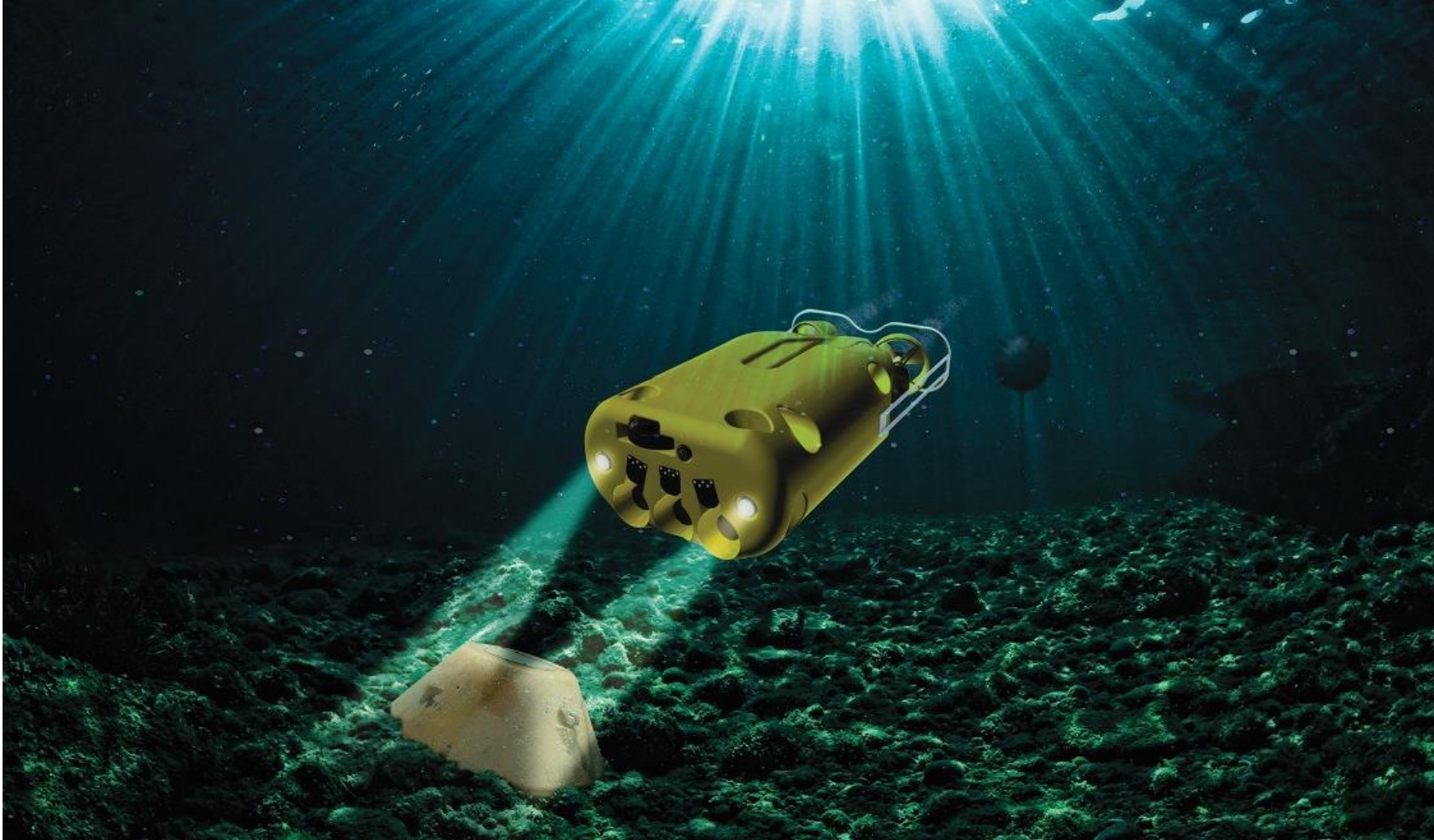
ORE Catapult Support

- Access to full scale operational turbine
- Supported demonstration of a range of technologies
- Building investor and customer confidence



Technicians inspect a blade controlling their work position using Limpet

Case study: Autonomous subsea survey



ORE Catapult Support

- Access to expertise
- Introductions to utility & OEM
- Test and demonstration
- Access to funding (H2020 bid)

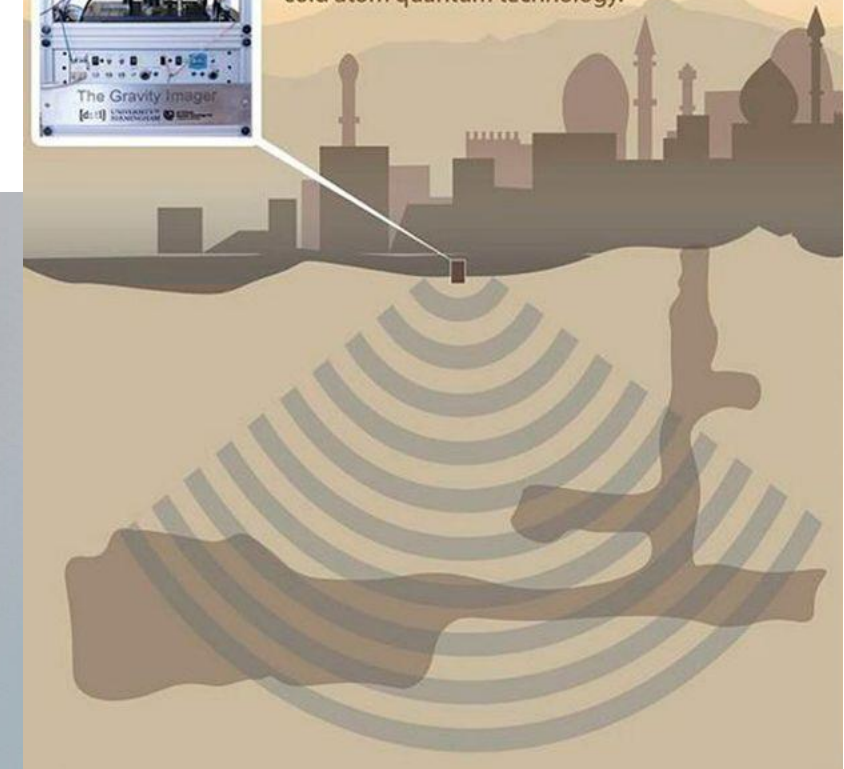
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The Gravity Imager

Underground surveys that once took weeks could take minutes with this portable gravity sensing system - tracking enemy tunnels, spotting underground bomb stores or aiding disaster relief using cold atom quantum technology.



UK duo signs cross-sector collaboration deal

OffshoreWind.biz



A UK-based duo, Tekmar Energy and Subsea Innovation, has signed an agreement to collaborate on development and strategy towards cost and risk reduction for offshore wind farm cabling and oil & gas SURF and ancillaries.

Tekmar said on Thursday that it will see the companies work together to develop new solutions for offshore cable installation equipment, advanced systems and subsea sealing solutions such as EPRC and J-tube seals, SURF and cable solutions (bend restrictors and hang-off systems), and bespoke tooling for offshore

Dave Thompson and James Ritchie; Image source: Tekmar

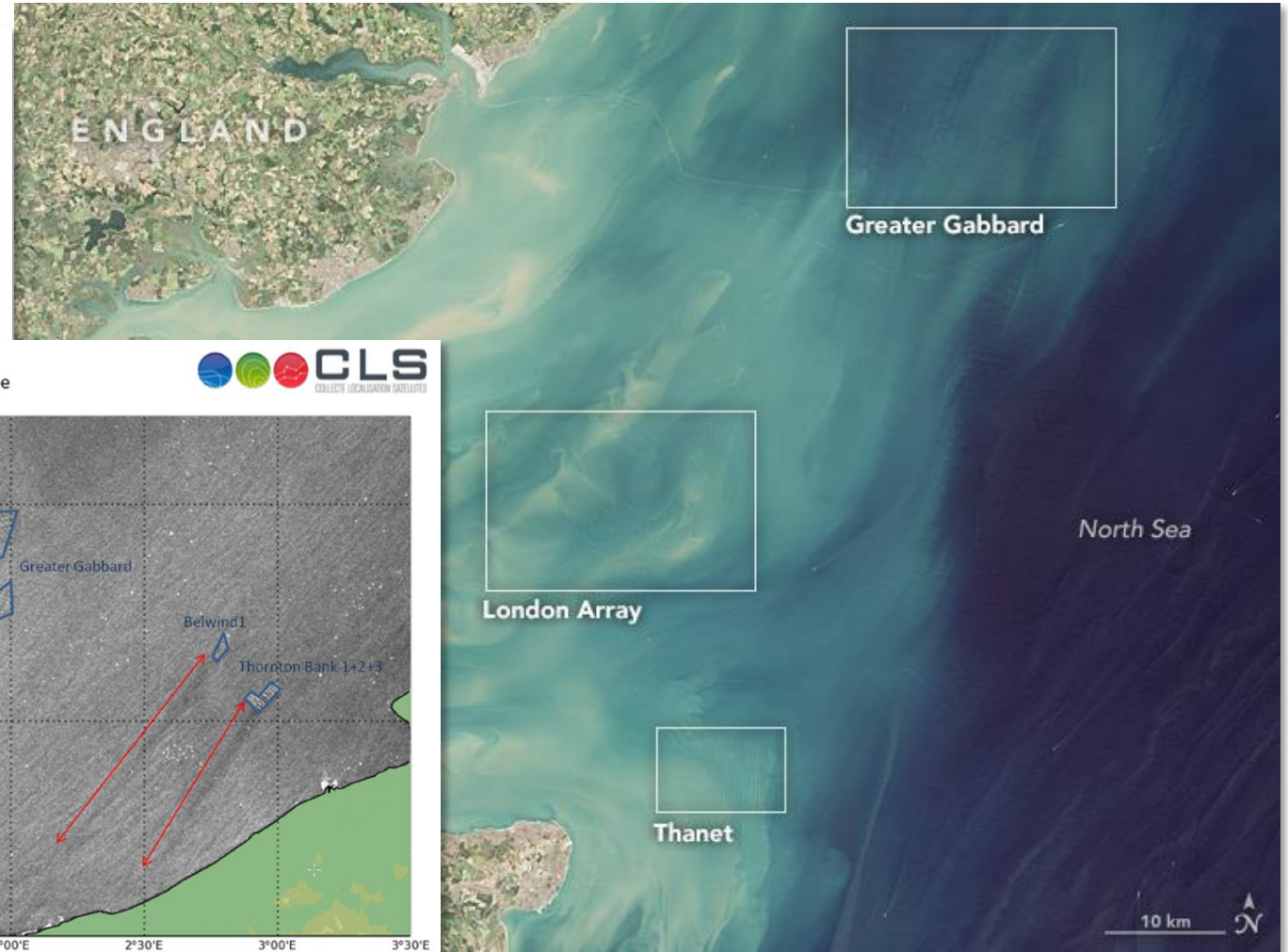
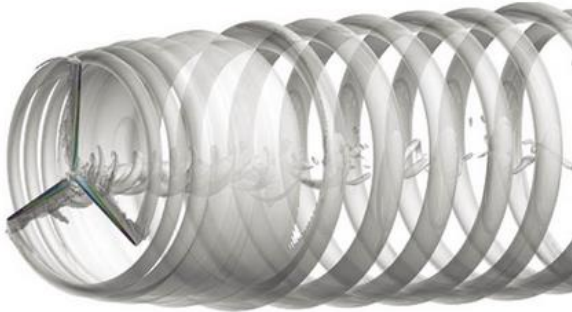
systems and subsea sealing solutions such as EPRC and J-tube seals, SURF and cable solutions (bend restrictors and hang-off systems), and bespoke tooling for offshore

Oil & Gas, Offshore Wind Joint Industry Project Leads to WIN WIN Situation



Image: DNV GL

The DNV GL-led WIN WIN (WIND-powered Water INjection) project, which gathered industry players from oil & gas and offshore wind sectors, including ExxonMobil, ENI Norge, Nexen Petroleum UK Ltd., Statoil, VNG Norge, PG Flow Solutions and ORE Catapult, is on the right track to make the best use of both offshore energy industries in a single project.



The large and detailed model that produced the images calls for trillion processor computer. "But this can greatly increase depending on the flows potentially increasing this by a factor of four or five," says Cho

For the CFD software, Chow and van Dam use OVERFLOW-2, a NASA refined over the past two decades. The code, developed and maintained throughout NASA and the aerospace industry for simulating various hypersonic space vehicles, and aircraft. Chow says his research group taking these tools from the aerospace industry over to the field of

RS-2 20130430 17:41:53 UTC SAR intensity image

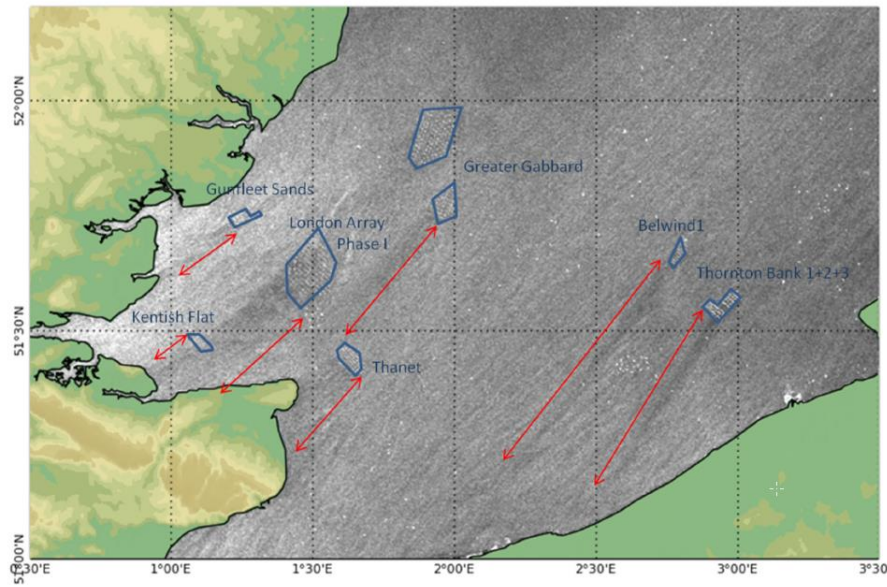


Figure 1. RADARSAT-2 intensity map of the southern North Sea observed 30 April 2013 at 17:41 UTC. The blue lines outline wind farms and the red arrows the wind farm wake.

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Innovation Challenges related to satellite applications

Innovation Challenge	
Met ocean measurements	Wind speed and direction, wave height, current. Used for site characterisation or for weather measurements and forecasting. If satellites could provide more rapid updates, this could be helpful as input to higher temporal and spatial resolution forecasts.
Vessel tracking	Currently AIS (a radio wave technology) is being used for all vessels over 200t. Would satellite technology have any advantages? Could we track all vessel sizes cost effectively?
Internet access for remote offshore wind farm sites	Communication link during the construction period before fibre is installed. This would be used for real-time logging of offshore activity, faults, incidents, near-misses etc.
Integrated performance and operation management tools	Incorporating site conditions, personnel availability and communication, system component health monitoring and logging of activity into an effective application.
Cloud height and coverage	Providing a live feed would be useful for logistics planning and not easily measured on-site.
Lightening prediction	Critical for ensuring a safe working environment. Using remote sensing to track lightning from space, then potentially using this to improve predictions, could help with the operation and maintenance of a wind farm.

Innovation Challenges related to satellite applications

Innovation Challenge	
Movement/subsidence/ turbine orientation	With the correct accuracy/time resolution, monitoring structural movement could have various applications.
Avian activity	Tracking flocks of birds, even crudely could be used pre-construction and calibrated with “in the field” measurements. It could be used post construction to monitor ongoing interactions.
Sea mammal/fish shoal tracking	Tracking activity subsea, even crudely, could provide savings on costly conventional environmental surveys.
Mapping / bathymetry	If it could offer rapid accurate site surveying, could be combined with multiple remote functions and provide higher frequency maps of cables.
Wake monitoring	If satellites were able to monitor the wind turbine wakes from large wind farms, this could be a valuable input for improving wind farm modelling and therefore the long-term energy assessments.
Lessons learned from operating equipment remotely	Satellites are very difficult to access to conduct maintenance, so lessons learnt from maintaining satellites, such as remote updates of software, could be passed on to the wind industry.
Satellite communications	Currently used within the wind industry, often for data transfer from offshore meteorological masts and remote wind farms. Increasing the bandwidth and improving the reliability of communications could aid the management of wind farms.