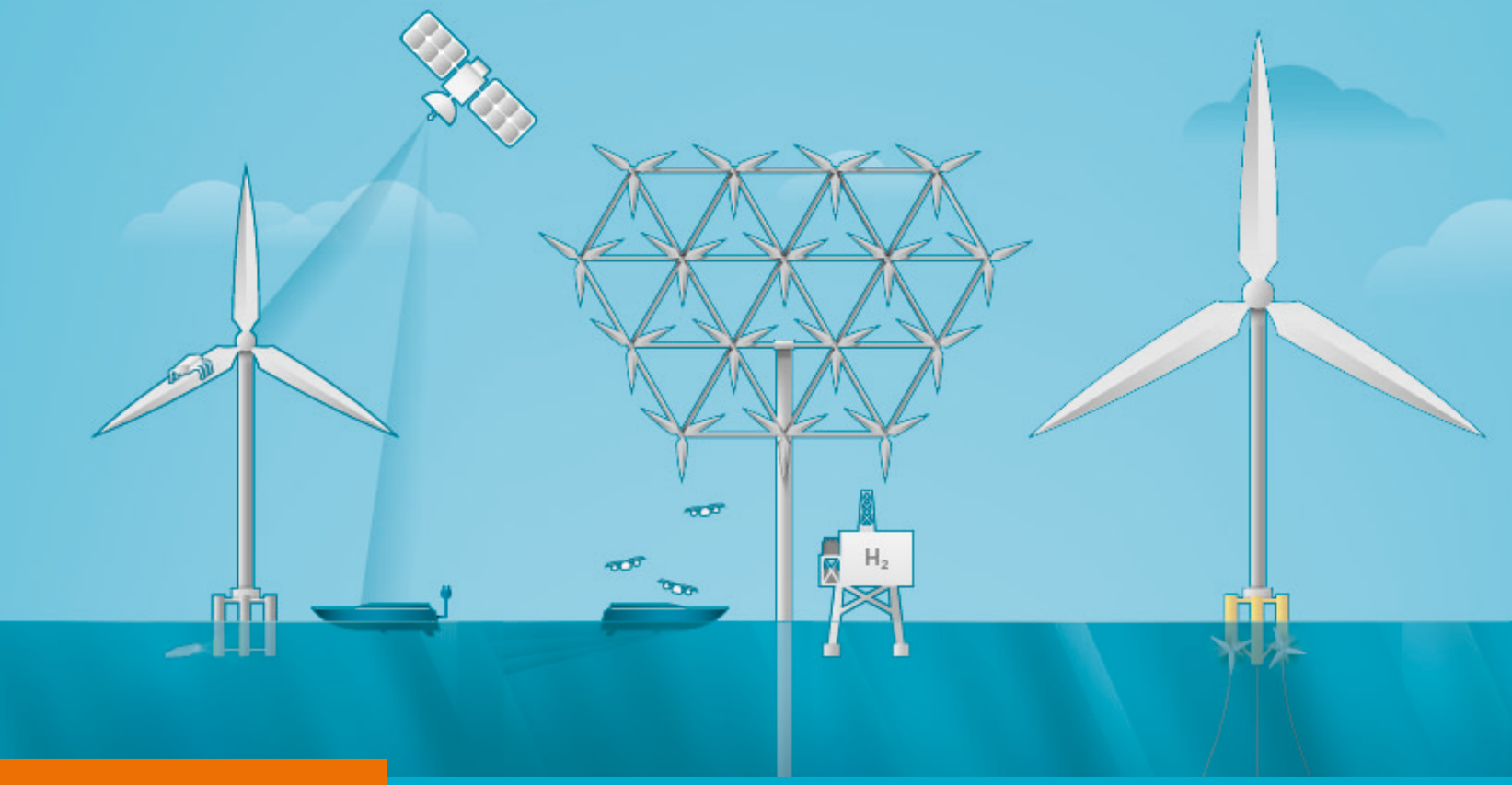
CATAPULT
Offshore Renewable Energy

RE ENERGISE

#3 WINTER 2020

THE ROAD TO NET ZERO:
PREPARING FOR A SUSTAINABLE FUTURE



DELIVERING 40GW OF OFFSHORE WIND

Accelerating the UK's transition to net zero

OFFSHORE WIND FARM OF THE FUTURE

Innovation and technology development in offshore wind

DRIVING THE ENERGY TRANSITION

Working towards an integrated net zero North Sea

ELECTRODE

The Offshore Renewable Energy (ORE) Catapult is launching a world-first for the continuous collection of data around subsea cable failures in offshore wind.

ELECTRODE platform will track root causes of outages, failure mode trends, service downtime, as well as the effectiveness of the current methods of monitoring, detection and response.

ELECTRODE will:

- enable key and recurring problems to be identified
- accelerate innovation and reliability
- fuel radical advancements in the industry
- reduce downtime, repairs and insurance costs.

Failed cables account for **75-80% of insurance claims** made by the offshore wind sector.

A single cable can take an average of two months to repair at a cost of **more than £10m.**

CATAPULT
Offshore Renewable Energy

HOW TO GET INVOLVED:
A number of organisations from the offshore wind and insurance industries have already registered an interest in ELECTRODE.

To register your interest, email
ELECTRODE@ore.catapult.org.uk

For more information, go to
ore.catapult.org.uk/stories/electrode

WELCOME

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

GUEST FOREWORD

MELANIE ONN
DEPUTY CHIEF EXECUTIVE, RENEWABLEUK

This year has been like no other for all of us, but despite the pandemic, the offshore renewables sector has continued to grow in importance as a key part of the UK's current and future energy mix. We've seen ever greater commitments emerge, with the Prime Minister confirming the 40GW offshore wind target for 2030 on our path to net zero emissions and announcing his Ten Point Plan for a Green Industrial Revolution. The CCC has published its Sixth Carbon Budget stating that the UK could install up to 140GW of offshore wind capacity by 2050 to reach net zero. Meanwhile, key parallel, strategic themes have gained huge momentum, such as developing the UK-based offshore supply chain as part of the Just Transition from fossil fuels to renewables and producing renewable hydrogen from electricity generated by offshore wind farms.

In this final edition of Re-Energise in 2020, ORE Catapult looks back on what has been a transformational year for the sector, and ahead to what the future might hold. It focuses on sustainable offshore wind farms, constructed using faster manufacturing processes, composite materials and components, operated and maintained by utilising advanced robotics, autonomous systems and artificial intelligence. It shows how UK IP products and services are being exported around the world. It examines the latest developments in cutting-edge green hydrogen. Another key theme is collaboration across the energy sector, with the offshore wind and oil and gas sectors working together to decarbonise our energy system and achieve a zero-carbon future.

All of this creates huge opportunities for UK business to capitalise on these exciting new frontiers, creating jobs and economic benefits, especially for coastal communities which need levelling up, as well as ensuring that the UK continues to be a world leader in offshore renewables for decades to come.

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A crew transfer vessel approaching an offshore wind turbine

DELIVERING 40GW OF OFFSHORE WIND BY 2030

Offshore wind is fast becoming the backbone of the UK's energy supply, with the UK Government targeting 40GW of installed capacity by 2030 – four times what we have today.

To understand what one of these 2030 offshore wind farms will look like, ORE Catapult's Analysis and Insights Manager Miriam Noonan has created a hypothetical project based on the common characteristics of Crown Estate Scotland ScotWind (CES ScotWind) and The Crown Estate Round 4 (TCE Round 4) seabed leasing zones and expected technology breakthroughs, shown here.

Site Parameter	Reference Site
Turbine Rating	15MW
Turbine Numbers	100
Site Capacity	1,500MW
Array Cable	66kV
Water Depth	33m
Foundation Type	Monopile
Distance to Construction Port	100km
Distance to O&M Port	60km
Distance to Cable Landfall	85km
Transmission System	3 offshore HVAC substations
Project Life	30 years
Average Wind Speed	10 m/s

In summary, wind farms of 2030 are expected to be bigger, located in deeper waters, and more efficient. They will have larger turbines, further from shore with higher wind conditions and use state-of-the-art operations and maintenance (O&M) technologies. Sites like these may require some new thinking in terms of construction, operations and maintenance, and we have considered a few challenges and opportunities as we push the boundaries of technological innovation.

1. The average turbine rating five to 10 years ago was 4MW, compared with an average turbine rating of 7MW for turbines in 2019 and 9.5MW for projects under construction. We're expecting 15MW turbines to be standard by 2030. However, turbine growth is outpacing the supporting technology required to install it. The industry is at a turning point where new cranes and vessels need to be developed to withstand the height, reach, and lifting requirements of these structures, which may slow the pace of capacity growth. The industry may reach a point at which the cost of fabricating and installing these larger components may outweigh the benefits of larger turbines.

2. With one column versus three or four, a monopile will likely always be cheaper than an equivalent jacket in the same water depth. The depths in which monopiles are being deployed are rapidly increasing – new designs are being tested for 15MW turbines in 65m water depth.

3. Wave conditions affect the accessibility of a site, increasing vessel costs and the time it can take to install turbines and perform repairs. As we move wind farms further offshore, we are met with harsher sea conditions that will, in turn, increase the levelised cost of energy. Remote and automated O&M solutions will open up these sites to be more economically viable if fewer vessels are required.

4. The distance to an operations port has a significant impact on cost due to the frequency of vessel operations over the project life. This impact is more noticeable at a site that uses daily transfers of crew transfer vessels (CTVs) than at a site that uses service operating vessels (SOVs), which are stationed on-site for a longer period. As the transfer duration trends towards a full working day (i.e. a full 10-12 hours are spent travelling to and from the port to site), the use of CTVs becomes unfeasible.

5. As well as the distance to an O&M port, the decision to use CTVs or SOVs is also driven by project capacity. There is more value in using an SOV on a large site with many turbines to maintain, than a small project that will have fewer site visits. The combined impact of the two parameters indicates what may be the preferred strategy at different sites.

6. Most projects currently installed in the UK are connected to the grid via a High Voltage Alternating Current (HVAC) transmission system. However, for large projects, far from shore, the cost and electrical losses become prohibitive. A High Voltage Direct Current (HVDC) transmission system requires additional offshore converter stations, which are very expensive for small projects, and unlikely to be economical for the level of electrical losses incurred in nearshore projects. However, they may be the preferred solution for larger projects, far from shore.

What is clear is that the wind farms of the future will look very different to those first installed almost 20 years ago, and the pace of technological innovation required to install, operate and maintain them creates huge opportunities for UK job creation and economic benefit.

Learn more about Miriam's wind farm of the future here >

MIRIAM NOONAN
Analysis and Insights Manager, ORE Catapult

WHAT WILL THE OFFSHORE WIND FARMS OF THE FUTURE LOOK LIKE?

The Offshore Renewable Energy Catapult plays an important role in supporting the development of the offshore renewable energy sector and some of the industry's most innovative and exciting new products and services. As attention turns to a green economic recovery post COVID-19 and the UK's commitment to becoming a net zero carbon economy by 2050, we must focus now on expanding our national clean energy infrastructure and supporting the development of a world-class supply chain capable of commercialising these innovative solutions and competing for contracts on a global stage.

As we look to offshore renewables to power the UK's green economic recovery, we've outlined some predictions of what kind of technology innovations offshore wind farms will house in the future.

2020-2030

During the 2020s, we expect to see the rapid commercialisation and deployment of innovative robotic and autonomous system solutions such as inspect-and-repair blade crawlers like BladeBUG and subsea asset inspection robots like Rovco.

We also expect new design and engineering techniques for blade manufacturing inspired by other industries, including racing yacht sailing from ACT Blade. Made up of an internal composite structure and high-tech textiles, as opposed to the prevailing fibreglass, it has the potential to lay the groundwork for blade recycling in offshore wind.

We may also see the deployment of satellite applications in offshore wind farms as they are used for activities such as navigation and positioning, and communications of service operation vessels (SOVs).

By 2030, we could also see the decarbonisation of marine vessels servicing the offshore wind sector. Electric vessels and the capability of charging them offshore will enable greater flexibility to operate in the field for longer periods, supporting a reduction in operations and maintenance (O&M) costs.

2030-2040

The rise of the robots will continue with the introduction of the 'mothership' as developed in the MIMRee project. These are fully autonomous vessels that initiate and plan missions, before mapping and scanning wind turbine blades upon approach to understand where the robots should be deployed. Drones will be launched from the autonomous mothership to conduct visual inspection of the blades and transport crawling robots onto the turbine to conduct hyper-spectral imaging inspection and repairs.

Turbines could also look different, with designs moving from the single-rotor designs we see today to arrays of multiple rotors on a single structure, drastically reducing installation and maintenance costs.

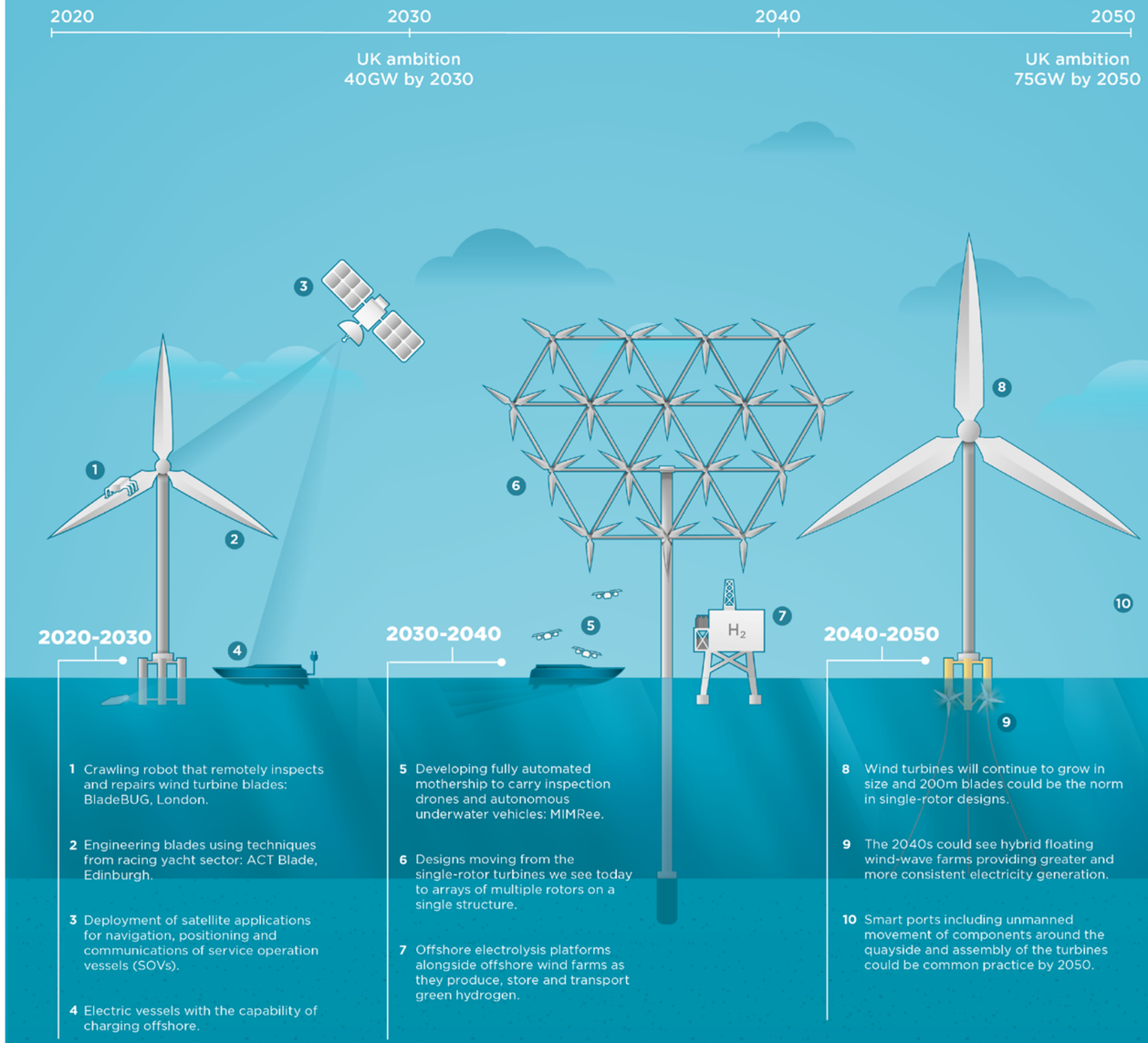
The UK has outstanding offshore wind resources, with the potential for over 600GW in UK waters, and potentially up to 1000GW, well above the figure of 75GW needed for UK electricity generation by 2050. This opens up the possibility of growing the offshore wind industry beyond electricity demand, with the production of green hydrogen for export. By 2040, we could see offshore electrolysis platforms alongside offshore wind farms as they produce, store and transport green hydrogen.

2040-2050

Wind turbines will continue to grow in size and 200m blades could be the norm in single-rotor designs. Due to their size, these blades will need to use an entirely new construction and installation methods, with flexible blade structures used to reduce the likelihood of breakage. Secondary rotors could start to be used on the tip of blades where, because of their high speed, they will generate even more power from every gust.

The 2040s could see hybrid floating wind-wave farms across UK waters as floating wind technology is commercialised at an industrial scale. Floating wind has made significant advances in recent years and is set to become a major contributor to global offshore wind capacity over the coming decades. Innovative hybrid floating platforms could take this technology further, providing greater and more consistent electricity generation, and opportunities to use different O&M strategies for the combined wind-wave system.

Finally, by 2050 we could also see a number of Smart Ports established across the country. Fully autonomous port operations, including unmanned movement of components around the quayside and assembly of the turbines, could be common practice by 2050. The smart management of these ports could revolutionise the UK's manufacturing capabilities in the offshore wind industry as we increase capacity to 75GW and beyond.



SUSWIND: ACCELERATING SUSTAINABLE COMPOSITE MATERIALS AND TECHNOLOGIES FOR BLADES

The race is on the bring the biggest offshore wind turbines in production today to market. Both GE Renewable Energy, with their 13 MW Haliade-X, and Siemens Gamesa Renewable Energy's Direct Drive SG 14-222, with a power boost capacity up to 15 MW, are in the running. The production of these next-generation large wind turbines is seen as vital if the UK is to accelerate the build-out of floating wind - unlocking deeper, higher wind speed sites - and achieve next-zero by 2050. But how can we ensure that these turbines of the future, and their components, such as blades, are as sustainable as they can be? Globally, around 14,000 wind turbine blades are reaching the end of their usable life within the next two to three years – that's almost 50,000 tonnes of blades that are destined for landfill or incineration.

In partnership with the High Value Manufacturing (HVM) Catapult's National Composites Centre (NCC), and supported by The Crown Estate, Oil & Gas Technology Centre (OGTC) and RenewableUK, we've launched the SusWIND project to drive the future sustainability of wind turbine technology. SusWIND will discover and demonstrate viable ways to recycle composite wind turbine blades, explore the use of sustainable materials and processes in developing composites for blades, and innovate in design to future-proof the turbine blades of tomorrow.

Investing now in the future of composites sustainability will unlock the use of recycled and recyclable composites for the next generation of sustainable products. This will create a future where composites are a viable, sustainable and low carbon material for use across multiple industries including renewable energy, transportation and infrastructure.

ACT Blade successfully trialling its game-changing technology at ORE Catapult's National Renewable Energy Centre in Blyth.

Research & Innovation Director Dr Stephen Wyatt, who leads on the project for ORE Catapult, said: "As we strive to achieve net zero, offshore wind capacity globally is set to grow rapidly to meet our low carbon energy needs. It's therefore vital that we work to minimise the direct impact on our environment and look for new and innovative ways to recycle the existing fleet of wind turbines and their blades. We must also work at the same time to future-proof technology for the next generation through the use of composites or more environmentally friendly and sustainable materials. Projects like SusWIND play an integral part in solving this major industry technology challenge."

As well as the obvious benefits of sustainability and recyclability, there are significant opportunities to reduce the costs associated with next-generation turbines by using new composite-based components, as well as increase the level of UK content in the turbine's manufacture, which is at its lowest in the area of major turbine components.

This represents a huge opportunity for UK companies to supply and manufacture these major components, such as blades, and for the UK to gain a competitive advantage in future turbine production. UK companies are already leading the way, such as Edinburgh-based ACT Blade, which is manufacturing an innovative lightweight turbine blade, made up of an internal composite structure and high-tech textiles, as opposed to the prevailing fibreglass. ACT's blades are 24 per cent lighter, meaning they can be made 10 per cent longer than the standard 55-metre blade around today, produce nine per cent more energy and reduce the cost of energy by 6.7 per cent.

Dr Gareth Williams, project lead for NCC, said: "Composites are a key enabler for the success of wind energy and the role that it plays in delivering a low carbon global economy. But it is apparent to engineers, economists and environmentalists alike that we need to find a more sustainable way forward. We must commit to transforming the current linear blade product lifecycle into an increasing circular process that forms part of a larger future market for low carbon, recycled composites materials. Investing now in the future of blade sustainability will help unlock the use of recycled composites for the next generation of sustainable transportation and infrastructure."

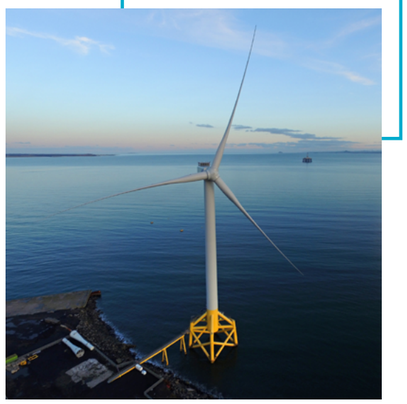
SusWIND complements ORE Catapult's other activities in the areas of sustainability and the circular economy, including our Circular Economy for the Wind Sector (CEWS) initiative and the Sustainable Circular Economy for Offshore Wind project, led by the University of Leeds and co-funded by EPSRC and the Department for International Trade. These initiatives will investigate the reuse, recycling or sustainable disposal of decommissioned offshore wind turbines, as well as lay the foundations of a new circular economy supply chain for the sector, allowing wind turbine components to be disposed of in the best possible way.

There will, undoubtedly, be a trade-off between the increased cost of manufacturing new, sustainable blades and reduced mass. Ultimately, however, costs can be reduced by using high value, digitally-enabled design, manufacturing technologies and composite materials. To achieve the turbines of the future requires a significant shift in terms of technology and manufacturing, requiring new designs and adapting and automating manufacturing processes. That's why it's critical that government, industry and academia continue to work together now to make these turbines of the future today's reality.

CHAMPIONING GREEN HYDROGEN

Hydrogen is an abundant element throughout our universe, but recently it's started to hit national agendas as a clean energy solution. This conversation, long discussed in scientific and tech circles, is now moving into the mainstream thanks to rapid leaps in the technologies that will make it a viable, competitively priced energy source within the next decade.

In September, we released a report in collaboration with the Offshore Wind Industry Council looking at the opportunities and challenges from integrating high levels of renewables on the electricity grid, and making a strong case for the synergies between offshore wind and green hydrogen production. Offshore wind and hydrogen together form a compelling combination as part of a net zero economy for the UK, with the potential to make major contributions to jobs, economic growth and regional regeneration as well as attracting inward investment, alongside delivering the emission reductions needed to meet our commitment to net zero. In the report, we identified a clear cost reduction pathway and set out a ten-year programme for the UK to convert this opportunity into an economic success story.



ORE Catapult's Levenmouth Demonstration Turbine, Fife

The three big messages were:

1. Hydrogen is essential for meeting our net zero targets: the UK energy system requires 130TWhr to over 200TWhr hydrogen in 2050 in order to integrate 75GW or more of offshore wind.

2. By 2050, green hydrogen from offshore wind will cost less than blue hydrogen (from natural gas) with most of the cost reduction occurring before 2030, by which point it will meet a significant part of energy demand. This conservative estimate could be exceeded if electrolysers are adopted more rapidly and natural gas prices rise.

3. Development of an indigenous green hydrogen industry could generate £320bn for the UK economy and sustain up to 120,000 jobs by 2050.

Action is needed now to secure the economic benefits for the UK, including a national strategy that offers increased support for demonstrations and accelerated funding for research and development. And we at ORE Catapult are already partnering on just these types of technology innovation, research and demonstration projects in the hydrogen arena.

In February, UK Research and Innovation (UKRI) awarded funding for a two-year project that will trial green hydrogen as a way of meeting the heating and transportation needs of the local community. The project, Milford Haven Energy Kingdom (MH:EK), brings us into a cross-sector consortium that will trial hydrogen fuel cell cars, create transport solutions for Pembrokeshire's 4.2 million annual tourists and improve off-take markets for offshore renewables.

A feasibility study that we conducted under the Methilltoune project in 2019 has also yielded results, paving the way for SGN to win Ofgem approval and funding for their H100 Fife green hydrogen heating network. In the project's first phase, the plan is for a network that will heat around 300 local homes using clean gas produced by an electrolysis plant, potentially powered by ORE Catapult's Levenmouth Demonstration Turbine.

With more hydrogen research and technology innovation projects in the pipeline– in the English regions and in areas such as vessel decarbonisation– we anticipate that hydrogen is truly going to be innovation rocket fuel for our sector during the 2020s.

Helicopter landing at an offshore wind farm and oil platform. *Credit: Equinor*

DRIVING THE ENERGY TRANSITION TOWARDS AN INTEGRATED NET ZERO NORTH SEA

Collaboration across the entire energy sector will be essential if the UK is to achieve its net zero carbon goals. In the oil and gas and offshore wind sectors, in particular, there are many synergies in their respective supply chains that can be built upon to aid the transition to a future green offshore energy sector.

According to the Reimagining a Net Zero North Sea: An Integrated Energy Vision for 2050 report, produced by ORE Catapult in collaboration with the Oil and Gas Technology Centre (OGTC), up to £416bn of investment is needed over the next 30 years for the transition, but this could deliver £125bn per year to the UK economy, while creating 230,000 jobs.

Here at the Catapult, we work closely with the OGTC to support this cross-sector collaboration and foster strong growth opportunities for both industries. This partnership has led to the creation of the Energy Transition Alliance – a ground-breaking collaboration that aims to transform the energy sector and accelerate the UK's transition to net zero. The Alliance will develop a roadmap on how the North Sea Basin will transition from an oil and gas driven world today, to a position that aligns with the Government's net zero ambitions by 2050.

The Energy Transition Alliance has kicked off five ambitious projects to support the North Sea's transition to renewables:

SUSTAINABLE WIND TURBINE DECOMMISSIONING PROJECT

This project will research, develop and demonstrate technologies that could ultimately lead to a commercially viable solution for cost-effective recycling and re-purposing of wind turbine blades.

POWERLINK PROJECT

A project to deliver a prototype AC/DC conversion technology that will reduce CO2 from ongoing activities, with a 10 times smaller carbon footprint and 5 times cheaper than existing conversion technologies.

UKCS SPECIFIC FLOATING WIND FOUNDATION COMPETITION

A competition to stimulate innovation in the floating wind foundation sector. Followed up with a design and demonstration of the successful technology that proves it can offer the lowest cost and highest manufacturing value to the UK.

POWER FROM SHORE CALL

A call to industry for innovative technologies to reduce the cost of power from shore, alongside a push to stimulate cross-operator projects.

UK OFFSHORE RENEWABLE SUPPLY CHAIN STUDY

A study that will build on previous work from ORE Catapult to identify a means to maximise the full potential of the UK supply chain in the production, installation and decommissioning of offshore renewables.

THE GLOBAL MARKET FOR OFFSHORE WIND

The 'Saudi Arabia of wind power' was how the UK Prime Minister, Boris Johnson, recently described the growth ambitions for the UK's wind industry during a United Nations roundtable discussion. This has been placed into sharp focus as Prime Minister Johnson and governments around the world consider how they collectively implement over £9 trillion in economic rescue packages in response to the coronavirus pandemic.

By 2030, the UK is planning to have increased its offshore wind exports five-fold to £2.6bn, as outlined in the Offshore Wind Sector Deal. By leading the shift to a clean energy economy, the UK is creating significant investment opportunities and harnessing its position to export valuable offshore wind best practice and technology innovation to emerging markets.

How collaboration is opening global market opportunities for UK businesses

ORE Catapult is growing its international reach to support UK businesses in accessing emerging offshore wind markets, with a collaboration with TUS Wind in China one of the most advanced initiatives. The £2m TUS-ORE Catapult Research Centre (TORC) is developing collaborative research programmes, supporting market entry and incubation for UK businesses in China, providing commercial support for Chinese offshore wind developers and supporting the demonstration of new technologies on a 300MW wind farm in the Shandong Province.

The goal is to increase UK content of high-value products, services and innovation across a wide variety of technical areas of offshore wind. This is particularly targeted at UK SMEs, which have the opportunity to hone their offering for export markets and a route for entry into China that is de-risked, creating opportunities in a rapidly growing market.

One example is Oxford-based company, Anakata, whose Formula One-inspired 'winglet' innovation can significantly improve the aerodynamic performance of wind turbine blades. The award-winning retrofit product has now entered the Chinese market, with direct support from TORC, installing the winglets on a turbine at the Gansu Changma wind farm. A joint MOU has since been signed between Anakata and TUS Wind, as the company prepares for further growth in the biggest potential offshore wind market in the world.

Another region with huge growth potential is the United States, with green recovery potentially boosted by a recent, dramatic shift in politics that could advance $1.7 trillion in green recovery investment over the next 10 years. Already, offshore wind forecasts in the US are estimating growth by at least 10GW, potentially reaching 16GW of deployed capacity by 2030.

In particular, the Eastern Seaboard of the US around New York, New Jersey and Massachusetts have significant expansion plans for offshore wind development sites with major European players such as Equinor and Orsted currently engaged. The industry here is still at a very embryonic stage with only one small offshore wind farm currently operational at Block Island, deploying five GE Haliade-150 6MW turbines. Therefore, supply chain innovation and exchange of best practice with Europe will be critical in accelerating the development of this market sector. ORE Catapult has engaged with several major US programmes of work including the National Offshore Wind Research and Development Consortium (NOWRDC), delivering a $40 million programme of offshore wind research and innovation to support the goals of the US market. In addition, ORE Catapult has acted as advisors to TUFTs University in Boston on a major piece of work for the US Bureau of Ocean Energy Management (BOEM), reviewing design life issues for wind farms for planned developments in US waters.

Looking further afield at other geographical areas, South Korea, Taiwan and India are also planning their first large scale offshore wind farm developments supporting the transition to a global low carbon economy. India has a 1GW project planned off the coast of Gujarat and ORE Catapult is currently engaging with the Indian National Institute of Wind Energy (NIWE) to support their national infrastructure developments, in what will clearly become another globally significant offshore wind market.

BY 2030, THE UK IS PLANNING TO HAVE INCREASED ITS OFFSHORE WIND EXPORTS FIVE-FOLD TO £2.6BN, OUTLINED IN THE SECTOR DEAL.

Anakata F1-inspired 'winglets'

PROJECT SNAPSHOTS

Technology Innovation & Green Growth for Offshore Renewables

Earlier this year we launched a new £3.5m offshore innovation programme, primarily targeting supply chain companies located in the North of Tyne area with opportunities to fund and support technology innovation in the offshore wind and subsea sectors. The Technology Innovation & Green Growth for Offshore Renewables (TIGGOR) is designed to boost supply chain growth and productivity in the region's burgeoning offshore wind and subsea sectors, as well as encourage market entry from companies that currently do not operate in these industries.

The programme is made up of two key strands through which businesses can receive support: Technology Demonstration (delivered by ORE Catapult, EDF Renewables and Equinor) and Business Growth (delivered by Offshore Wind Growth Partnership and North East LEP).

Circular Economy for the Wind Sector

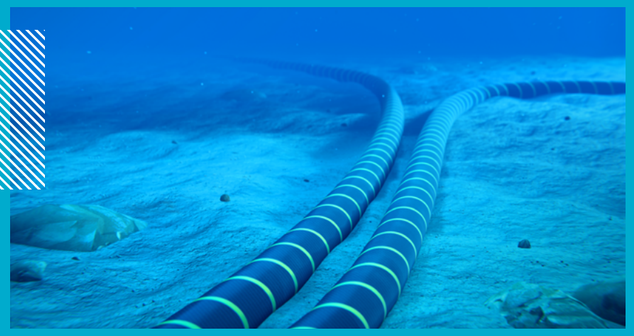
ORE Catapult has established the Circular Economy for the Wind Sector (CEWS) project to investigate new solutions for the bulk recycling of wind turbines, and the use of techno-economic analysis to assess their suitability for large-scale redeployment.

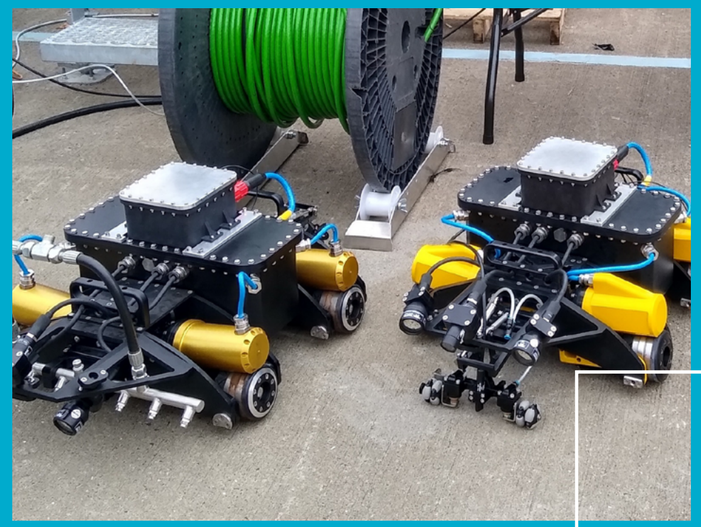
As part of this project, ORE Catapult aims to lead and facilitate the development of industry best practice and the supporting tools for the detailed understanding of "true" end-of-life potential for pilings, to reduce the environmental and ecological impacts. As well as the reuse, recycling or sustainable disposal of decommissioned offshore wind turbines, CEWS aims to lay the foundations of a new circular economy supply chain for the sector, allowing wind turbine components to be disposed of in the best possible way.

Total Control

ORE Catapult is a partner in one of the biggest European research and innovation projects tackling the control of offshore wind turbine yaw and pitch. The project, TotalControl, is a €5 million four-year project funded by the European Union through its Horizon 2020 programme.

The project seeks to develop a better understanding of how controlling wind turbine wakes can impact on power output and will combine individual optimal control of the turbines with an entire wind farm collaborative approach, while also considering grid operator demands. TotalControl is one of the first projects looking to enable the entire fleet of turbines to orchestrate their yaw and pitch in harmony with each other, taking into account the effect one turbine's operation has on the wind flow coming through to another.





iFROG robots at ORE Catapult's National Renewable Energy Centre, Blyth

OSIRIS

OSIRIS is a highly innovative robotic solution for the detailed inspection of offshore wind turbine blades. By combining features of drones and climbing robots, OSIRIS will offer a flexible, safe and cost-effective solution to blade inspection offshore. It will alleviate the risks imposed on offshore technicians who typically carry out operations and maintenance tasks manually under hazardous conditions.

As part of the 21-month demonstrator project, ORE Catapult will provide access to our 7MW Levenmouth Demonstration Turbine for the testing and validation of the robotic solution. In addition to access to the Levenmouth turbine, ORE Catapult will provide project management support to plan, monitor and control the delivery of the OSIRIS project.

ELECTRODE

ELECTRODE (Electrical Cable Failure and Reliability Trending for Operational Developments) is the first programme of its kind for the continuous collection of anonymous data around subsea cable failures in offshore wind. In a global industry first, ELECTRODE will track cable failure trends and service downtime, as well as the effectiveness of current methods of monitoring, detection and response.

It will be operated in a similar way to our SPARTA model, with anonymity the core principle of the platform and so there will be no risk to owner/operators who take part. By getting involved in the programme, owner/operators will be able to identify trends and recurring issues, accelerate innovation in reliability, and benchmark themselves against others.

iFROG

iFROG is an amphibious robot capable of working in teams to clean and inspect monopiles above water level and up to 60 metres below. The multi-robot solution was developed under a three-year project that was funded by Innovate UK and brought together iFROG developer InnoTecUK, ORE Catapult, TWI and Brunel University London. Teams of iFROG robots will be able to clean corrosion and biofouling from monopiles, before inspecting the surfaces and conducting pre-emptive checks of weld integrity.

Earlier this Autumn, the game-changing potential of iFROG was demonstrated at ORE Catapult's dry and wet docks in Blyth as the robot navigated a monopile interior using magnetic adhesion and conduct non-destructive testing.

NEWS ROUNDUP

Prime Minister Boris Johnson visits our Test and Validations facilities in Blyth

Earlier this month, UK Prime Minister Boris Johnson visited our National Renewable Energy Centre alongside senior industry figures from SSE Renewables, Equinor, GE Renewable Energy and LM Wind Power, to see first-hand the scale and scope of the next-generation advanced testing and validation undertaken by ORE Catapult. Our Test & Validation Director Tony Quinn led an extensive tour through our Blade Test 2 and 15MW drive train test facilities, showing the LM 107m blade and GE's Haliade-X nacelle that will be installed at the world's largest offshore wind farm, Dogger Bank.

The Prime Minister said Dogger Bank Wind Farm would bring high quality jobs and investment and drive economic recovery. With a focus on skills and opportunities for young people he said the site was central to the UK's power future, generating jobs and growth for years to come.

ORE Catapult to Advance Next Generation Blade Manufacture

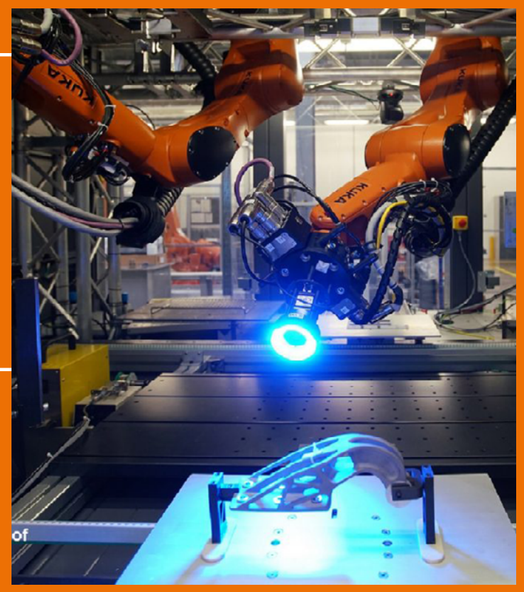
Last month, we outlined plans to boost the wind turbine blade designs of the future with investment in a state-of-the-art prototype blade manufacturing facility. The Additive Manufacturing for Wind Blades project will install an advanced manufacturing cell our National Renewable Energy Centre in Blyth, capable of proving technologies which can reduce blade manufacturing costs, increase production speeds and explore the potential for new materials with a reduced environmental impact.

The facility will be used to directly support UK SME and supply chain development to accelerate new and innovative prototype blade designs for application in the wind industry, as well as forging further ties with key players in industry, such as original equipment manufacturers and academia.

World's first robotic 'blade walk' on a wind turbine

The UK has achieved the world's first blade walk by a robot on an offshore wind turbine, thanks to BladeBUG and ORE Catapult. Over two days in mid-October, the six-legged inspect-and-repair robot repeatedly scaled blades at our 7MW Levenmouth Demonstration turbine off the coast of Fife.

The robot represents a 30% cost reduction in current blade inspection methods and is being developed under a £1 million collaboration project between BladeBUG and ORE Catapult, part funded by Innovate UK. By the project's end next year, BladeBUG will be capable of inspecting blade surfaces for emergent cracks and imperfections, transmitting data on their condition back to shore and resurfacing the blades.



Credit: High Value Manufacturing Catapult

Major boost for UK robotics sector

Last month, we were delighted to announce Tethys Energy Services (Tethys) and Aerones had won our blade robotics innovation competition to demonstrate a novel remote blade maintenance technique for offshore wind farms to one of the industry's leading turbine manufacturers, GE Renewable Energy. Tethys and Aerones will deliver a new offshore transportation and delivery platform to enable the Aerones onshore wind robotics technology to work offshore.

Launched by ORE Catapult, GE Renewable Energy and KTN, the next phase of the innovation competition will see Tethys and Aerones demonstrate their prototype technology on ORE Catapult's 7MW Levenmouth Demonstration Turbine in Fife. In addition, GE Renewable Energy will provide technical support and guidance on how the technology could be used on the company's offshore projects.

BladeBUG testing on top of Levemouth Demonstration Turbine

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