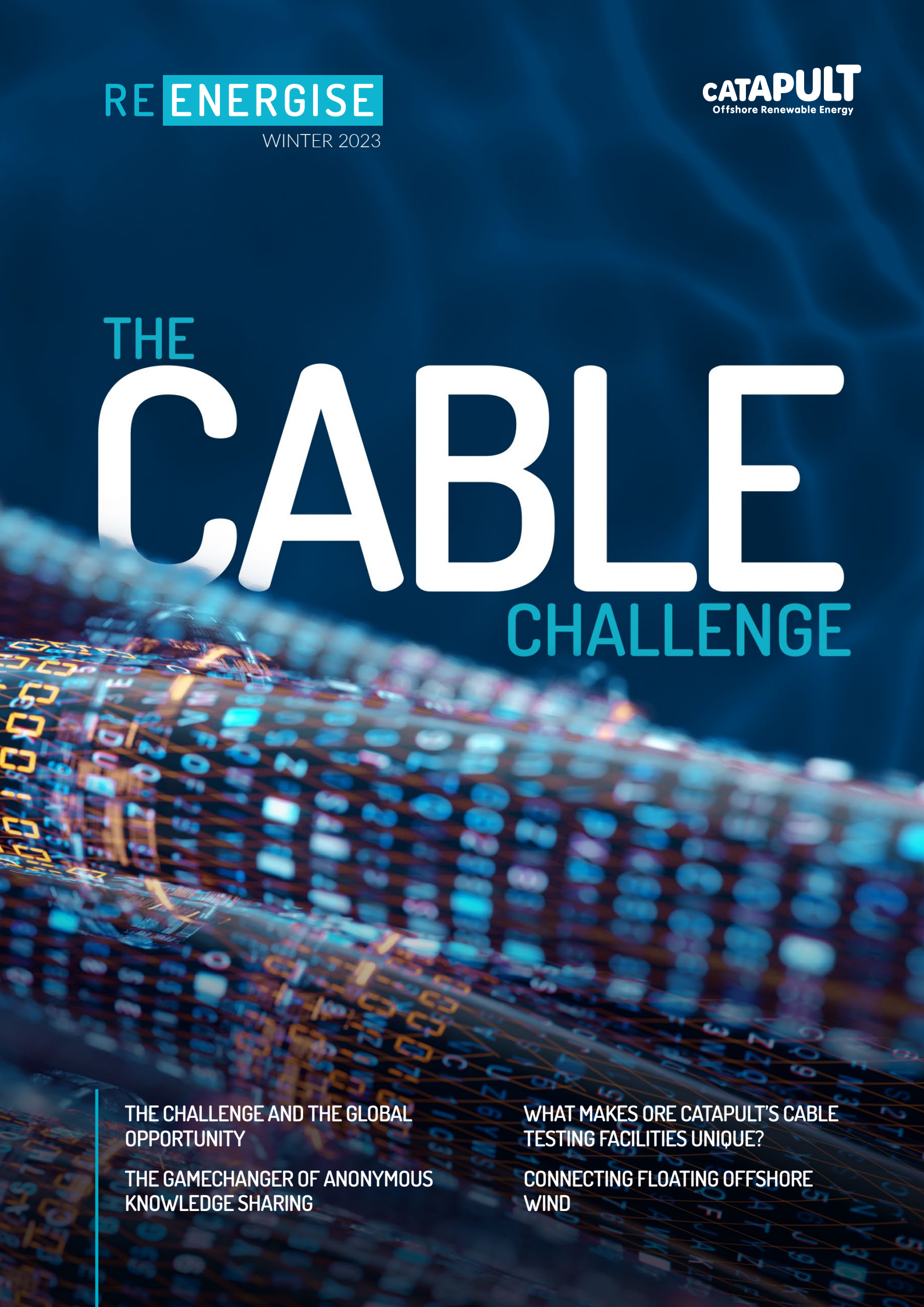
RE ENERGISE
WINTER 2023

CATAPULT
Offshore Renewable Energy

THE CABLE CHALLENGE



THE CHALLENGE AND THE GLOBAL OPPORTUNITY

THE GAMECHANGER OF ANONYMOUS KNOWLEDGE SHARING

WHAT MAKES ORE CATAPULT'S CABLE TESTING FACILITIES UNIQUE?

CONNECTING FLOATING OFFSHORE WIND

FOREWORD

By Ajai Ahluwalia, RenewableUK's Head of Supply Chain

Growing the UK's offshore wind supply chain is vital to get the industry closer to the Government's target of 50GW by 2030. With an increasing risk of shortages for offshore wind products and services across the globe, there is an opportunity not only to build up the UK's domestic market but also to export worldwide. The size of the potential prize is enormous, with the recent OWIC and OWGP Supply Chain Capability Analysis report showing that the UK's economy could be boosted by £92 billion by 2040.

RenewableUK, OWIC and others in the offshore wind industry are working with the Government to develop an Industrial Growth Plan - identifying the UK's unique value proposition for developing offshore wind supply chains which service the domestic market, as well as exporting high-value goods and services worldwide.

One of the key areas of growth is the global market for the supply, installation, protection, monitoring and repair of array and export cables. UK-based suppliers are already manufacturing array cables and protection systems successfully in existing facilities, and we have the potential to build more. The UK is forming effective clusters that bring manufacturers, operators, academia, and other services providers together. Teesside and the Humber are great examples of mature, effective clusters, and with more manufacturing bases coming to the UK, we will see development of more clusters, delivering jobs, skills, and supply chain to regions across the UK. The development of export cable manufacturing, especially HVDC cables, represents an excellent opportunity that would add significant value to our supply chain, address an urgent requirement, and build on our expertise developed through the installation of nearly 15GW of offshore wind in UK waters. Because we have developed so much offshore wind, UK contractors have gained much sought-after expertise to install array and export cables worldwide.

This edition of ReEnergise is timely, as it contains a wealth of information on the growth of this global market and the technological developments which underpin its success, which will help every company in this dynamic sector make the most of the opportunities for those ready to seize them.

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THE CABLE CHALLENGE AND THE GLOBAL OPPORTUNITY

Energy may make the world go round, with electricity powering all global industry, but it is subsea cables buried in our oceans that keep all operations flowing.

But where do cables fit into the offshore renewable energy revolution, what challenges do they present, and what is the scale of the opportunity promised by this surge in clean, green energy?

With a UK target to deploy 50GW of offshore wind by 2030, the network of offshore cables submerged under our waters will need to expand to meet demand.

Renewable UK's 'Offshore Wind Project Intelligence Report - Cables Edition' revealed that over 63,200km of array cables were expected to be installed globally by the end of 2030, and nearly 40,000km of export cables forecast to be laid worldwide by the end of the decade.

The UK is currently a world leader in subsea engineering, manufacturing, and services for the offshore oil and gas industry. The rapid expansion of offshore renewable energy, however, will require unprecedented technological innovation to develop cables efficient and resilient enough to travel to deeper offshore locations.

While this challenge requires innovative solutions to overcome these barriers, the cable opportunity could unlock billions of pounds worth of export revenue for the sector, while also providing a significant boost to the UK supply chain.

63,200km

cables expected to be installed globally by the end of 2030

40,000km

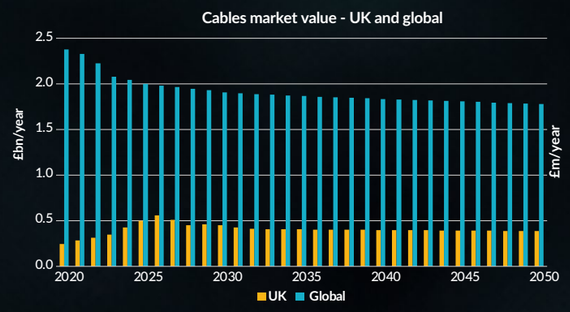
export cables forecast to be laid worldwide by the end of the decade

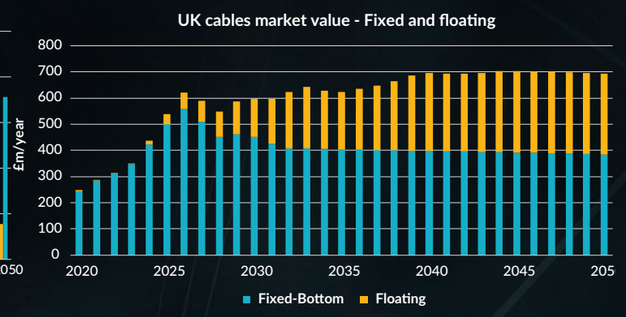
£2.08bn

Global cable market opportunity by 2023

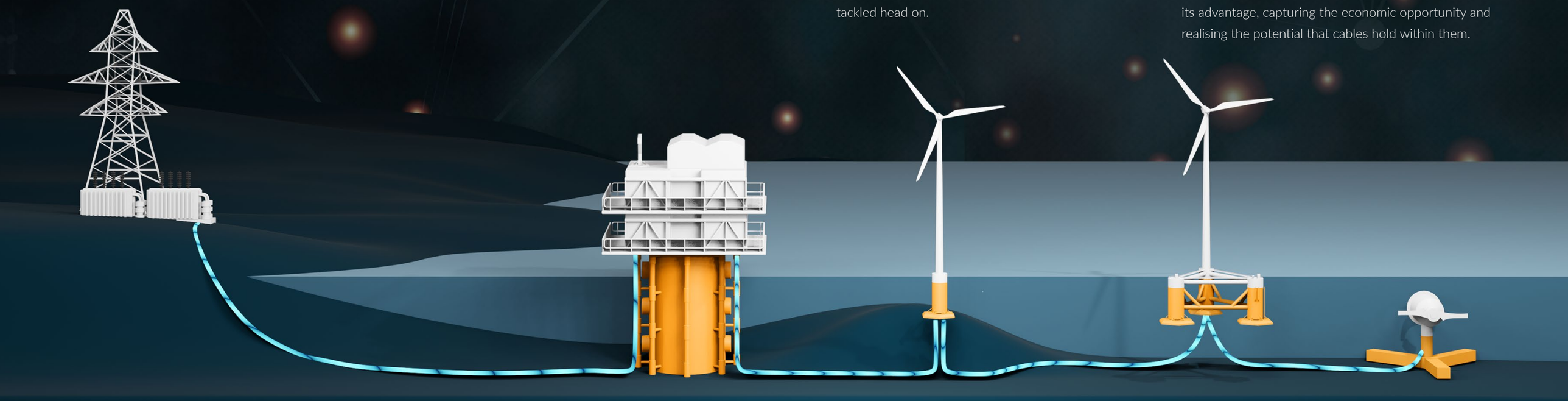
According to statistics compiled by ORE Catapult, the value of the UK cables market in 2023 is £348m against a global market opportunity of £2.08bn. By 2030, the UK's market opportunity rises to £451m against a global backdrop of £1.9bn. By 2050, the global opportunity remains high at £1.7bn while the UK drops back but remains high at £385m per year.

The UK 50GW deployment target includes 5GW of floating offshore wind and this could partly be why the value of the floating wind cables market is taking off. In fact, it's predicted that by 2050 the cable market linked to floating wind will have expanded to almost match that of fixed wind.





Graphs: ORE Catapult



£451m

UK's cable market opportunity by 2030

In a report published this summer by the Offshore Wind Industry Council, 'Innovation Focus', six sector objectives were identified to resolve technology challenges. One of these was to enable floating wind solutions and continued cost reductions where the report states:

"Floating offshore wind has rapidly become a major technology opportunity for developers. This comes with additional technology challenges inherent in deeper waters further from shore with dynamic movements, and there is a pressing need to reduce costs further and to ensure high reliability of critical components such as mooring lines and dynamic cables."

But what about the challenges for this radical transformation in the offshore renewables industry? What about cable failures, the demand for bigger turbines, and the reliability of floating platforms? Floating platforms need innovative and robust dynamic cables that can take the strain of existing far offshore into the harshest of sea conditions. These challenges need to be identified and tackled head on.

Driving down the rates of cable failure – a major issue which accounts for most of the insurance claims made by the offshore industry - is an urgent priority.

"Subsea cable failures present an unnecessary cost burden on energy supply. In such a young industry, we are still learning how these failures occur, and we lack data that would allow us to track trends and clear up the unknowns."

Charlotte Strang-Moran, ORE Catapult's leading expert in electrical infrastructure.

Work such as ORE Catapult's ELECTRODE project is already providing solutions – collecting a pool of data on cable failures for the first time on this scale – creating a resource of huge benefit to the future of the industry.

There is a wealth of opportunity in the cable market, but the UK needs to take steps now to fully leverage this to its advantage, capturing the economic opportunity and realising the potential that cables hold within them.

WHAT MAKES ORE CATAPULT'S CABLE TESTING FACILITIES UNIQUE?

Rougher seas, deeper waters and harsher environments - the further the offshore renewable industry develops, the greater the need is for electrical infrastructure to keep up with the rapid expansion.

Though the electrical capabilities of subsea cables are well understood, the structural capabilities are not. Cables are challenging to repair and costly to operate and maintain. Winter weather, seasonal winds, salty air, and stormy seas all make it extremely challenging to operate reliably all of the time.

That is why testing the robustness and reliability of high voltage (HV) subsea cables is vital to maintaining cost-effective levels of power efficiency to the grid.

Cable failures account for 80% of insurance claims in the UK. The cost implications of even a single cable failure can potentially be enormous, taking an average of two months to repair.

ORE Catapult's HV Electrical Laboratory is the UK's only accredited facility for the testing of power cable systems.

Located in Blyth in the north east of England, the laboratory has established world-class test, validation and research capabilities. Thanks to the highly experienced teams of technical researchers, test engineers, and technology specialists, it aims to accelerate the deployment of new and innovative offshore renewable energy technology.

One of the key benefits of this facility is being able to provide an end-to-end service under one roof. We work with clients to test static and dynamic cables with accelerated ageing, endurance testing, failure investigations, lifetime assessment and development of asset management strategies being just a few of the services on offer.

Our 15-tonne bespoke cable bend fatigue test rig, designed and built by Northumberland based Osbit, is state-of-the-art and capable of testing floating wind and tidal cables, acting as a representative test bed for all aspects of subsea cable development. It simulates offshore installation forces and applies bend curvatures and tensions to the test sample as would be experienced by the cable systems in offshore installation conditions.

Look out for more exciting news about bespoke cable test assets, which we will be showcasing at our Floating Wind Innovation Centre in Aberdeen early next year.

FIND OUT MORE:
ORE Catapult cable testing facilities

CASE STUDY

ANONYMOUS KNOWLEDGE SHARING – A GAME CHANGER FOR CABLE FAILURE

One of the biggest challenges facing the development of offshore wind cable solutions is the lack of effective knowledge-sharing across the industry. Capabilities and experience position the industry well to understand failures in the field. However, without shared knowledge and data, there will always be limitations to the impact this can have. That is why ORE Catapult launched ELECTRODE, the first programme of its kind for the continuous collection of anonymous data around subsea cable failures in offshore wind.

While testing individual cable designs is one thing, programmes like ELECTRODE create greater transparency on why cables fail, helping us to progress as an industry together.

There are 6,000km of subsea cables that connect offshore wind turbines to the grid, and to repair a single failed export cable can cost as much as £12.5million, with an average downtime of 38 days resulting in even more lost revenue.

It is, therefore, a no-brainer that understanding the causes of cable failure is a key priority for the sector going forward. Better knowledge and prediction will ensure faults are not left to become failures in the future. The one caveat though is that this requires all players – designers, manufacturers, installers, developers, operators and insurers - to share vital data.

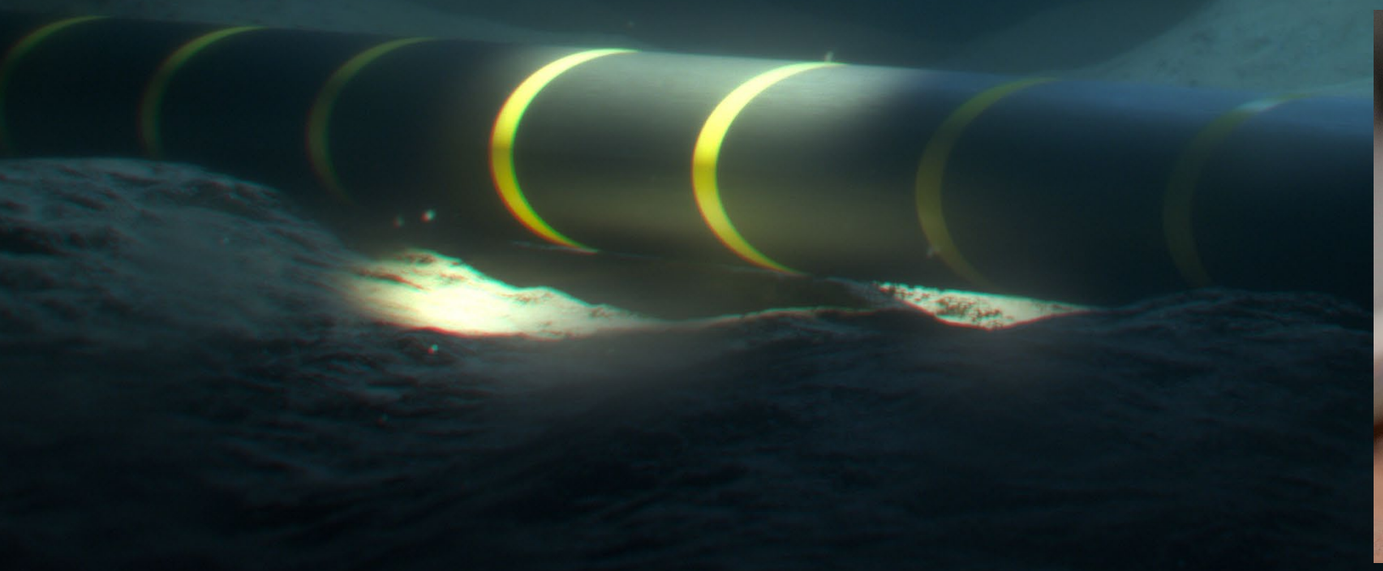
Launching at the end of 2023, ORE Catapult's ELECTRODE (Electrical Cable Failure and Reliability Trending for Operational Developments) will proactively approach the industry to collect anonymised data on cable failure, paving the way for radical advancements and significant reductions in operation and maintenance costs.

ELECTRODE will track subsea cable failure and identify trends, give insight to aid maintenance and condition monitoring, provide trusted insight and trended data, and improve insight to cable reliability. All of this will, in turn, inform innovation and best use of technology, improve efficiency and drive down costs, and also provide hard evidence for insurers and investors.

Anonymity is a key principle of the platform, which greatly reduces the risk to owners and operators who take part. Once the data is collected, participants will have access to identified trends, recurring issues, information on accelerating innovation in reliability and a benchmark against other OEMs.

The ambition of ELECTRODE is to quickly become recognised industry-wide as reliable, up-to-date, and having sufficient data to accurately predict the causality of cable failures - creating more confidence for the sector.

FIND OUT MORE:
Key progress is expected at the beginning of 2024 – watch this space



CASE STUDY

MUTUAL INSURANCE PROJECT

At the start of 2023, Renewable Risk Advisers were awarded a 12-month contract by Innovate UK, to create an entity that will improve the "insurability" and "bankability" of UK offshore renewable energy through improving asset management opportunities for the Offshore Transmission Owners (OFTOs). OFTOs own and operate the high voltage transmission infrastructure that includes export cables to shore.

The project, supported by ORE Catapult and Prospect Law, is named "The Insurance-Debt Nexus: How risk policy keeps renewable energy bankable."

Project finance is crucial to the six OFTO owning companies that are responsible for the 23 live assets around the UK (pictured right), and approximately 80% of the value of offshore wind farm insurance claims have come from cabling losses. This escalating cost of damages in the offshore wind subsea cable sector has led to a more difficult insurance market, resulting in increased premiums, and more stringent terms.

The current reliance on the need to prove physical damage for the insurance policy to respond, means that repair campaigns are often delivered at great expense, such as during winter months.

However, a mutual insurance solution could reduce the costs of vessel hire, which can amount to 65% of the value of insurance claims, enable electrical fault-finding technologies to strengthen preventative maintenance of export cables, propose collective equipment procurement so that asset managers can stock cost saving equipment currently beyond their budget, and promote information sharing between competing organisations to develop best practice.

Charlotte Strang-Moran, Project Engineer at ORE Catapult, said:

"This project is about de-risking technology and encouraging innovation – lowering costs and creating a way of working that can only benefit the offshore renewable industry."

CABLES AND THE ENVIRONMENT

While our future energy mix changes, the urgent need for extensive subsea cabling comes with its own environmental implications.

A recent report from the Offshore Wind Industry Council (OWIC), 'Innovation Focus' identified the need to maximise efficient use of sea space and accelerate deployment in consideration with other sea users and the environment. Reducing the timescales involved with data gathering and environmental impact assessments would streamline the consenting process. However, these changes can only come about through improved communication of expectations, data sharing and technological developments.

This challenge was also picked up in ORE Catapult's recent report, 'Accelerating Offshore Wind – The Role of Innovative Technology in Decision Making and Faster Consenting'.

The report identifies that offshore wind farms affect activities such as fishing, due to the installation, operation and maintenance of the supporting electrical infrastructure of inter-array and export cables. Crucially though, the report goes on to state that this can be avoided, minimised and mitigated through technology choice, design and siting, innovation and management of offshore wind farms.

Current requirements for pre-development planning, consenting applications and construction of offshore projects takes many years.

However, the rapid expansion planned for the deployment of offshore wind – UK offshore wind capacity needs to increase by 240% to meet 2030 targets - could result in a change to the ecosystem, so consideration of the environmental impact is essential. The report found that streamlining the consenting process will be essential to achieving 50GW by 2030, but also that by getting innovative, time can be saved.

Autonomous technologies, for example, could be used for environmental monitoring and further address the knowledge gaps associated with these impacts. The report states: *"The use of innovative technologies has the potential to reduce overall consenting timelines from an average of five years to three years, resulting in a potential time saving of 40%."*

To further address the environmental implications of subsea cabling associated with offshore installations, ORE Catapult is leading a group of leading offshore wind developers, Orsted, SSE, ESB, Scottish Power Renewables, and RWE, alongside seabed mobility experts, Cooper Marine Advisors and Partrac, on the Seabed Mobility project. They are working to produce seabed mobility guidance for use in planning offshore wind and marine energy developments worldwide.

A mobile seabed can present risks to installations such as buried cables or offshore wind turbine foundations. These risks need to be identified and managed to reduce potential damage or disruption to an offshore project and reduce the potential cost of repair or replacement.

Caroline Whalley, ORE Catapult's Environmental Specialist and author of the report, said:
"We are already seeing how the use of new technology is helping to increase our knowledge of environmental interactions across the offshore wind sector. Through enhanced and more efficient data gathering, these technologies have the capacity to create greater certainty around the potential environmental effects of offshore wind, thereby reducing risk and streamlining decision-making during the consenting process."

There is acknowledgment among the world's leading offshore wind developers that there is a significant need to better understand the influence of seabed mobility over the life cycle of a project, to ensure performance and support the acceleration of offshore wind energy.

Photo: Aberdeen Renewable Energy Group via Ian Hastie

FLOATING OFFSHORE WIND AND DYNAMIC CABLES

The Floating Offshore Wind Centre of Excellence (FOW CoE) emerged on the scene in 2019 to accelerate the commercialisation of floating offshore wind. The collaborative programme, managed by ORE Catapult and supported by industry and academic partners, has laid the groundwork for increased deployment of floating offshore wind (FOW) and is now looking at build-out requirements, the supply chain, and the technical and environmental challenges of deploying large-scale FOW. One of these key challenges centres on dynamic cables.

DYNAMIC CABLE SYSTEMS

Dynamic cable systems are a critical component in any floating offshore wind project, ensuring efficient power transmission from floating turbines. The development of floating turbine technology is hugely exciting, but it also means that cable engineers must find ways of designing cable systems that can stand up to the strain of movement in challenging conditions.

Technical challenges and opportunities

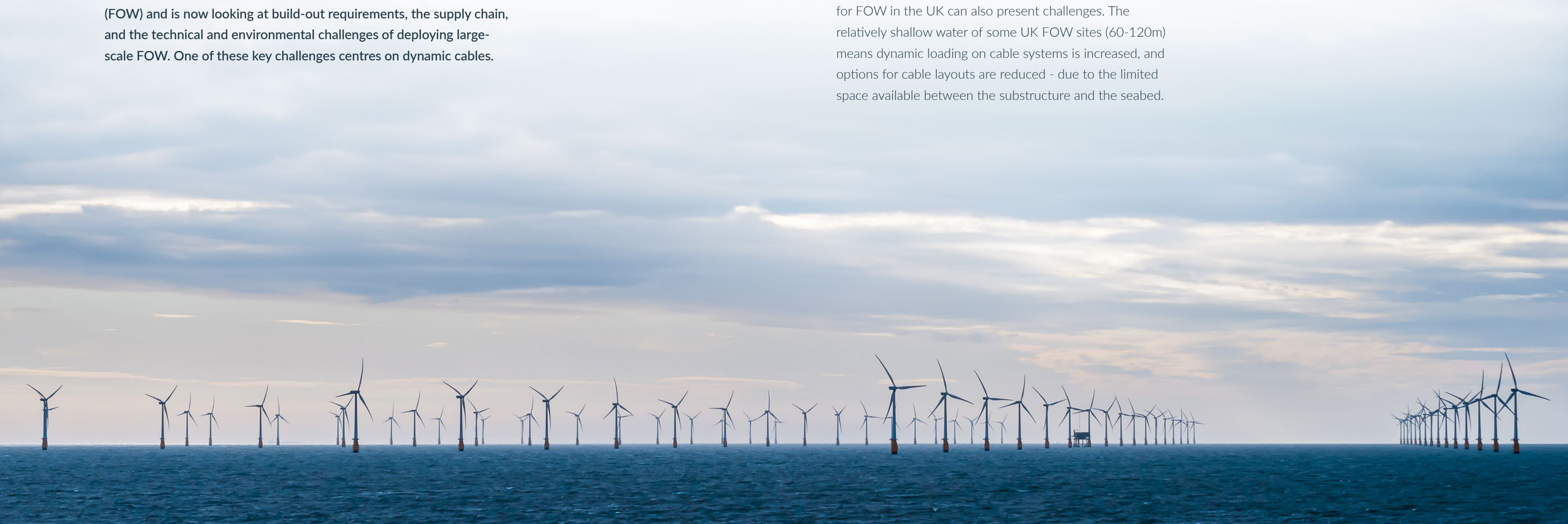
Dynamic cable systems are usually found in remote locations with high wind speeds, as well as varying seabed topography, and water depths – making for a harsh marine environment. They are subject to complex dynamic mechanical, thermal and electrical loading, as well as abrasion and other environmental impacts. Site conditions for FOW in the UK can also present challenges. The relatively shallow water of some UK FOW sites (60-120m) means dynamic loading on cable systems is increased, and options for cable layouts are reduced - due to the limited space available between the substructure and the seabed.

Existing supply chain capacity is also limited by the scale of supply required for the FOW industry from 2030. Because of this, industry needs to work together to develop improved design, testing and qualification approaches, address knowledge gaps and support the development of innovative technologies.

How are these being addressed?

The FOW CoE launched a new strategic programme in 2022 focusing on dynamic inter-array cable systems.

Charlotte Strang-Moran, Project Engineer at ORE Catapult, leads the Dynamic Cable programme at the FOW CoE and highlights some of the projects the Centre is currently focusing on.



SEPT 23 – DEC 24

Project: Subsea vs Floating Substations – Technoeconomic Comparison

There are three options for substation design, including above-surface bottom-fixed, floating, and subsea. FOW sites further from shore may not be able to directly transmit power to an above-surface bottom-fixed substation and may require one of the two more novel designs, floating or subsea. These designs do come with some uncertainties and challenges such as the lack of available HV dynamic export cables, and the complexity of subsea HV equipment respectively.

This project will create:

- A Technical Roadmap for the development of floating and subsea substations through to commercialisation
- High level designs of floating infrastructure and subsea infrastructure
- A cost comparison for a range of potential UK projects.

JUN 23 – JUL 24

Project: Deep Water Dynamic Cable Solutions

Deep water floating wind energy is a potential for sites in the Atlantic, Mediterranean Sea, Baltic Sea, US West and East coasts, and parts of Asia. Deep water in this context is between 300m and 2,000m in depth, whereas a typical shallow floating wind infrastructure in UK waters would be 60m to 150m in depth. Deeper water requires different cable design solutions to shallow water.

This project will:

- Identify the global deep water floating wind market size
- Define a range of feasible deep water cable systems
- Understand the development opportunities for the UK supply chain
- Define the cost implications and optimal systems in various water depth scenarios.

NEW PROJECTS IN THE PIPELINE

Project: Installation Risks and Failure Mitigation

The project will establish dynamic cable installation technologies/techniques for a 1GW wind farm and use these to identify installation risks. Potential opportunities to reduce risk will be identified and the key technical challenges associated with existing and future installation will be recorded.

Current supply chain capability, industry gaps and readiness for installation of dynamic cable systems will be clarified, and recommendations will be made on when different approaches may be viable options for different cable configurations and installations – clearly identifying where future development efforts would be best focussed.

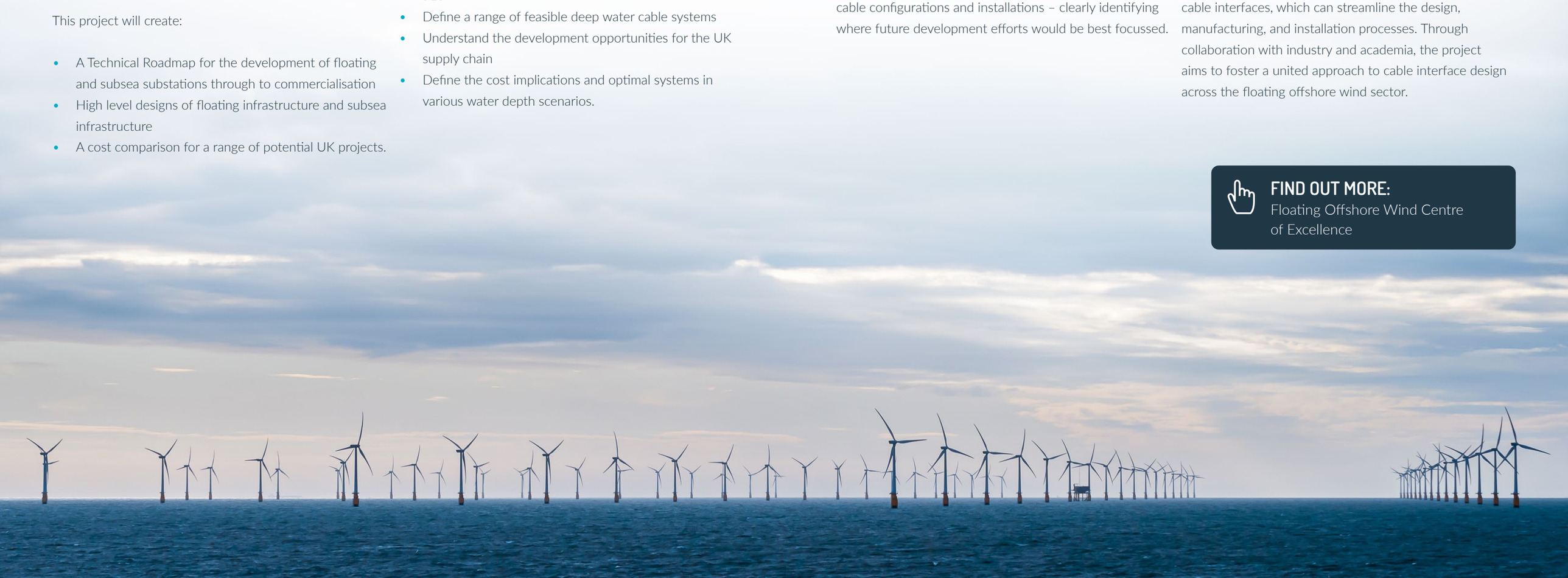
Project: Dynamic Cable Interfaces for Floating Offshore

This project recognises the need for innovative solutions to meet the rigorous demands of the challenging marine environment.

It will investigate novel design approaches, materials, and mechanical termination techniques for dynamic cable interfaces and identify means of improving robustness, longevity, and adaptability to various floating wind systems.

It will also explore the feasibility of standardising dynamic cable interfaces, which can streamline the design, manufacturing, and installation processes. Through collaboration with industry and academia, the project aims to foster a united approach to cable interface design across the floating offshore wind sector.

FIND OUT MORE:
Floating Offshore Wind Centre of Excellence



CASE STUDY

Over the past year, two suppliers of Bend Stiffener Connectors, Balltec and S3N Ventus, have taken part in the Floating Offshore Wind Centre of Excellence's Technology Development Programme.

The programme is designed to accelerate technically robust products from the Floating Offshore Wind (FOW) supply chain to market, that have been through a structured, approved technical risk reduction process, increasing safety, and reducing cost.

ORE Catapult's role in the project involves developing a Technology Qualification Plan - a list of approved tests and analysis required to prove the performance of technologies before deployment.

Challenges in this sector include a lack of standardisation across the industry including cable size as it is not clear what kind of cables will be used for several types of FOW platforms and manufacturers can be very guarded over what is being developed for the market. This directly inputs the size of the connector required for FOW platforms.

What are Bend Stiffeners?

Bend stiffeners are used to support flexible cables when connected to rigid structures or a floating production system, where there is a requirement to control the minimum bend radius of the cable. They are usually attached at either the top or seabed connection.

BALLTEC AND S3N VENTUS

Balltec Engineered Solutions

Balltec, based in Lancashire, started in 2004, providing the oil and gas market with pipeline recovery tools and mooring connectors that it designs, evaluates, assembles, and tests. As well as supplying products, Balltec also proof loads and tests other client's products and can design and manufacture bespoke test rigs.

The company was selected for the programme as for almost 20 years they have been renowned for their pioneering solutions in the offshore engineering industry. More recently, they have become an established leader in the fixed bottom wind market in the most challenging aspects of Cable Protection Systems (CPS) and heavy-lifting. They have provided solutions on Revolution Wind, Formosa II, and South Fork, to name a few.

It is Balltec's previous expertise in complex, heavy-lifting and mooring projects in the offshore oil and gas industry that has enabled them to offer their well-matched technology and experience to the Floating Offshore Wind (FOW) sector.

The diverless Bend Stiffener Connector (BSC), is an example of the opportunities that have arisen for the further development of products to suit FOW. The BSC offers secure cable protection in a simple, compact product that is easy to install and with an added benefit of being easily recoverable with a quick service and turnaround time.

S3NVentus

S3NVentus' team of design and project engineers have over 60 years of combined experience in delivering offshore and subsea products, including over 100 projects and 500 Bend Stiffener Connector units. Based in Ashington, Northumberland, S3NVentus was formed to support FOW by adapting their extensive oil and gas experience to support the emerging needs of the renewables industry.

S3NVentus wanted the opportunity to robustly challenge and improve their new products, and to gain industry acceptance into the FOW sector, to develop industry leading, competitive products.

Participation in the programme has helped them to design, manufacture, test and qualify a new and innovative 66kVA cable installation and release system. This cost-effective system enables seamless installation of cable and bend stiffeners using a Bend Stiffener Connector system designed and optimised for the challenges of FOW. S3NVentus is the only provider of a tested and certified cable release system, designed specifically for rigorous fatigue loads expected from FOW facilities.

The programme also enabled S3NVentus to establish a test and manufacturing facility for static and dynamic testing of client products over a large range of cable sizes, loads and installation angles.

Thanks to their participation in the programme, S3NVentus have increased their ability to support and increase the supply chain for Bend Stiffener Connectors and their ancillaries, gain client supported qualification data, perform fatigue tests, and innovate to overcome product gaps and challenges.

THE FUTURE FOR CABLES

How do the upcoming milestones for offshore wind affect the need for better connectivity in offshore renewable energy?

The offshore wind sector in the UK has a pipeline ahead of it that could see a quadrupling of its current capacity over the coming years. Over the next decade we are likely to witness several major milestones along the way.

Next year, we are expecting the opening of the Celtic Sea leasing process for up to 4.5GW of floating wind to be built in that region. The major ScotWind, INTOG, and Round 4 projects will also be moving closer to getting turbines in the water. All this builds on those projects already consented, such as the recent completion of the Seagreen site and the world's largest offshore wind farm at Dogger Bank. So, even considering the recent disappointing news surrounding CfD Allocation Round 5, a great deal of activity in developing new offshore wind sites is in the pipeline, all of which means a lot of cables.

While each of these milestones moves us a step closer to hitting our targets for offshore wind deployment, each of them also leads to challenges around how we manage an increasingly crowded seabed, especially in relation to cable infrastructure. For example, it has recently been estimated that the number of Cable Laying Vessels (CLV) that would be required to reach 50GW of offshore wind by 2030 is 47, compared to the current 15 CLVs currently operating in the UK. Whichever way you look at it, space is going to be at a premium and we need solutions that are going to ensure creative and collaborative ways of ensuring there is a joined-up approach.

Collaboration is not only key within the offshore wind sector, of course, but is also vitally important when interacting with other sectors that are developing new data cables to serve our increasingly interconnected and data driven economy. There is much that can be gained from shared learning and best practice, as well as being aware of each other's priorities and timelines. By doing this, we can also help seabed managers, such as The Crown Estate and Crown Estate Scotland, as well as marine regulatory bodies, make timely and well-informed decisions around cable routes which can, in turn, positively impact the timelines needed to develop and build new offshore wind farms.

Across these pages the various challenges and opportunities in the development of cable technology, as well as some of the innovative solutions currently being developed have been laid out.

There has already been remarkable progress made, but the coming years will see this evolve to a whole new level with the use of smart technology, dynamic materials, and innovative designs. This brings with it exciting supply chain potential for UK companies, as well as solving a big part of the puzzle of how to make the most of our offshore energy resources and move faster towards Net Zero.

Photo: JDR Cables

NEWS ROUND UP

JUNE 2023

An interactive online guide to aid the acceleration of commercial floating offshore wind development has been published by ORE Catapult.

- ORE Catapult outlines plans to develop a virtual environment for better planning and maintenance of offshore wind farms, led by its Operations and Maintenance Centre of Excellence in Grimsby.
- Offshore Renewable Energy Catapult announces first Launch Academy in East Anglia

JULY 2023

- A new ORE Catapult report details how technology advancement can enable faster and more accurate data collection – with the potential to reduce consenting times for offshore wind farms by as much as 40%.

AUGUST 2023

- GE Vernova's Offshore Wind business and ORE Catapult sign major new research collaboration

SEPTEMBER 2023

- ORE Catapult's Fit for Offshore Renewables (F4OR) supply chain support programme launches new programmes in North East Scotland, Caithness, Sutherland & Orkney, and Wales.

OCTOBER 2023

- New programme focused on reducing risk and cost of floating wind is launched by the Floating Offshore Wind Centre of Excellence
- The 5G PORTAL (Ports and Offshore Renewable Technology Accelerator Lincolnshire) – an advanced 5G equipped 'living lab' – covering the port of Grimsby and the Lynn and Inner Dowsing wind farm is officially switched on at ORE Catapult's Operations and Maintenance Centre of Excellence.
- The Joule Challenge technology collaboration secures new £4.7m investment in high value design for next-generation composite offshore wind turbines
- An innovative project involving one of Scotland's tidal energy pioneers has created an intelligent control system within a tidal energy turbine that could slash costs by over 17.7 per cent.

RE ENERGISE PODCAST

If you want to know about how we can generate energy from the tide, launch sea vessels with robotic crews in UK waters, and adapt national grids on the journey to net zero – the ReEnergise podcast is for you. Subscribe to the series from wherever you download your podcasts, and you'll hear a new edition of ReEnergise every month.

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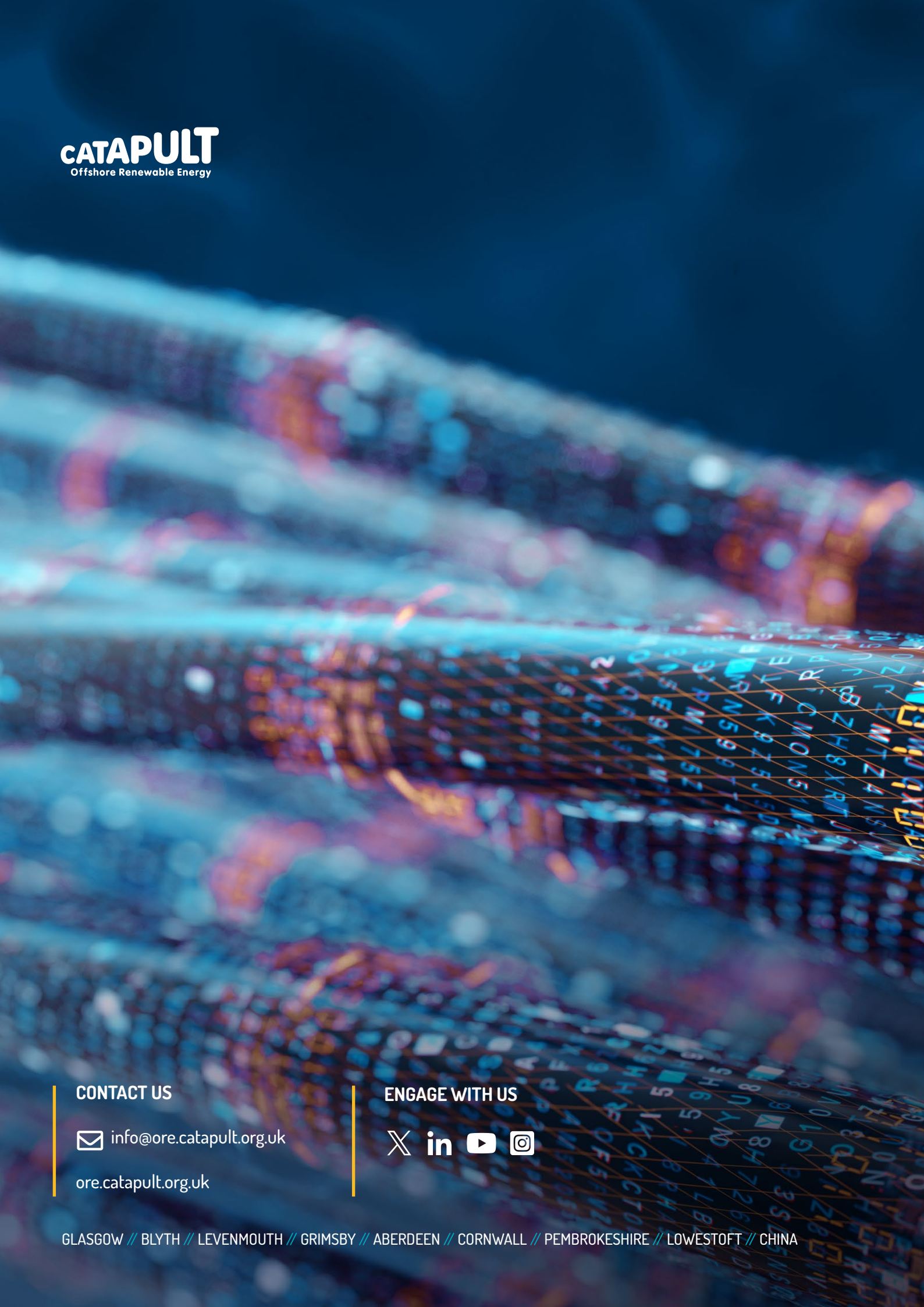

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CONTACT US

info@ore.catapult.org.uk

ore.catapult.org.uk

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