RE ENERGISE

SUMMER 2023

10 YEARS OF CATAPULT Offshore Renewable Energy

CELEBRATING 10 YEARS OF ORE CATAPULT

THE EXPORT POTENTIAL OF THE INNOVATION NATION

AN EXTRAORDINARY DECADE IN TESTING & VALIDATION

A SNAPSHOT OF TIDAL STREAM ENERGY IN THE UK TODAY

RE ENERGISE PODCAST

The ReEnergise podcast from the Offshore Renewable Energy Catapult is where to discover more about emerging innovation in offshore renewables as we transform the future energy mix.

If you are curious 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 – this podcast is for you.

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FOREWORD

By Ronnie Bonnar
Chair, ORE Catapult

2023 marks the ten year anniversary of the Offshore Renewable Energy (ORE) Catapult, and this edition of ReEnergise focuses on the remarkable journey we've seen over that decade. It includes some of the highlights that have marked the incredible progress in the growth of offshore renewable energy, but it also looks to the future and our plans and ambitions to support the continued development of the sector through innovation.

I consider myself very fortunate to be the Chair of ORE Catapult at such an important milestone for the organisation. Back on day one in 2013, few could have predicted what would lie ahead. At that time, offshore wind was an exciting prospect, but one which needed to reduce costs and create a pathway to greater deployment. Marine energy offered an enticing future option but was not yet close enough to commercial viability.

Fast forward to today, and offshore wind is playing a leading role in our journey towards net zero, with over 14GW installed, and over four times that amount in the pipeline, largely thanks to a dramatic reduction in the cost of the technology. Although on a different pathway, tidal stream energy has also taken big strides forward, with a number of consented projects powering thousands of UK homes.

ORE Catapult has been at the very heart of this, be it through supporting over 1300 UK SMEs, having a role in over £650m being invested in projects across the sector, or helping to bring almost 150 new products and services to market. This, in turn, has helped the sector keep pace with rapid innovations in technology which have led to costs dropping and deployment growing.

This is very much just the beginning though, and in the years ahead we need to build on these foundations to unlock the innovations of the future which will help the UK economy tap into the full potential offered by the continued growth of offshore renewable energy.

So, here's to the next decade of ORE Catapult!

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10 YEARS OF ORE CATAPULT

By Professor Sir Jim McDonald
Principal and Vice Chancellor of the University of Strathclyde and President of the Royal Academy of Engineering

Over the past 10 years there has been a remarkable transformation in the offshore renewable energy sector, and ORE Catapult has been at the very heart of this.

Professor Sir Jim McDonald, Principal and Vice Chancellor of the University of Strathclyde, President of the Royal Academy of Engineering and one of Scotland's most accomplished engineers, reflects on the last 10 years and the impact that ORE Catapult has had on the sector.

OVERVIEW

There is lot to celebrate in the last 10 years of offshore renewable energy. Since 2013, we've seen a 70% reduction in the cost of offshore wind and installed capacity has grown from 3.5GW to soon to be over 14GW. UK Government targets are challenging the sector to increase offshore wind capacity to 50GW by 2030, and to reach net zero by 2050.

What's been most important is the response to the scale of the opportunity and the creation of an ecosystem where innovators, industrialists, the public sector, and academic groups focus on what is required, and work together to achieve it.

We're at a tipping point in the UK and across the world to commit to renewable energy. The maturity and sophistication of technological solutions, products and the increasing industrial infrastructure means that people see a pathway to putting renewables at the heart of the future energy strategy.

When it comes to offshore wind and, increasingly, floating offshore wind, we need to ensure we get the manufacturing base and supply chain in the UK going, invest in our skills base and attract foreign investment from the industry's biggest developers.

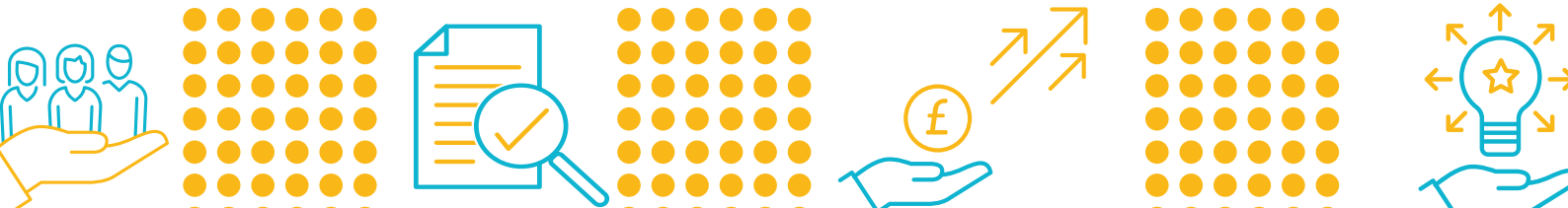
OUR SKILLS BASE

Renewables provide a platform for all educational capabilities – we need a skilled workforce, technicians, operators, designers, and those with research and innovation skills.

A report last year estimated that there would be up to 100,000 jobs in offshore wind by 2030, so the scale of the opportunity is enormously attractive. We must make sure we create and retain these all-important skills.

For me, the 'just transition' is about giving someone a job that's well-paid, long-lasting, and provides the opportunity to develop a career. At the University of Strathclyde, we take the highest number of young people from the two most challenged quintiles in the Scottish economy, measured by the Scottish Index of Multiple Deprivation. We must improve access across all backgrounds and ensure the sector is accessible.

I used to be chairman of Glasgow Science Centre and worked with Glasgow City Council to provide free transport and reach kids from challenging communities. Sometimes it's such simple measures that can make a disproportionate impact on the attraction of young people into science and engineering.



It's the responsibility of a leader to put plenty of ladders behind them, creating plenty of opportunity for people to access. If we don't create the skills base, we will not create economic opportunity across the UK.

We need to make sure that we develop our skilled workforce as a magnet to attract foreign investment, as well as supporting indigenous companies.

The earlier we attract youngsters and get them excited about STEM subjects, the better. But we also need to focus on what the collective academic and industrial communities can do better together.

It's not about force feeding youngsters to be engineers. It's about lighting a beacon of interest and making it clear that engineering provides the solutions to global challenges. Teachers, alongside universities and colleges, can support them to see what engineering can do.

I have the pleasure of meeting inspirational young people, driven by a social mission that's more than engineering – it's a means to making a difference. Today's generation is much more socially aware and progressive than my generation, and they are committed to making an impact on people's lives.

10 YEARS OF ORE CATAPULT

When I first became involved in the Catapult, I was sold on the commitment to innovation and the acceleration of offshore renewable energy development and deployment. Ten years ago, setting up ORE Catapult in Scotland seemed entirely appropriate, given the level of natural resource we had, the leadership we had from a policy point of view, and our academic and growing industrial base.

The merger with colleagues in The National Renewable Energy Centre in Blyth was very important as we developed a physical infrastructure to complement the knowledge base, creating a powerful combination of expertise, supporting delivery of innovative technology and systems, and de-risking the innovation journey for small companies. ORE Catapult's journey over the past ten years is remarkable and the evidence demonstrates it was a great investment for the UK.

If we didn't have ORE Catapult, it would have to be invented. It has become a champion of innovation.

THE FUTURE

The UK Government recently published its new science and technology framework, committing to make the UK a science and technology superpower. The UK Government's Chief Scientific Adviser Sir Patrick Vallance has been a fantastic advocate for engineering and science in the heart of government. But this is a global race. We need consistency of policy commitment to the sector, an evolution of regulation that supports innovation, and the building up of a skilled workforce.

The starting pistol has already gone on meeting our 2030 targets, in advance of reaching net zero by 2050. We need to understand how our offshore wind deployments sit and how they contribute to an interconnected energy ecosystem.

ORE Catapult is critical for the UK to deliver its net zero targets, but it must be seen in the context of an overarching energy system.

Offshore wind, energy storage, green hydrogen, electrification of transport systems, decarbonised built environment and smart grids need to be part of this system - no one component can deliver our net zero future. However, if we don't start delivering by 2030, the stretch to 2050 is going to be extremely challenging.

For ORE Catapult, I would say – keep doing what you're doing and keep ambition levels high – so that we can achieve net zero and realise economic opportunity.

Almost 100 years ago, the Electricity Supply Act in the UK imagined the creation of an 'electric gridiron of connections' - the national grid. We need that same vision, ambition and delivery focus on what an energy system of the future will look like.

RE ENERGISE PODCAST

Find out more

listen to 'In Conversation With... Sir Jim McDonald' on our ReEnergise podcast here

Scan here or visit
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10 YEARS OF CATAPULT Offshore Renewable Energy

WHAT'S HAPPENED IN 10 YEARS OF OFFSHORE RENEWABLE ENERGY

2013

Offshore wind installed capacity:

3,572 MW

Offshore wind share of energy generation:

3.2%

The world's largest wind farm is the London Array at 630 MW, consisting of 175 3.6 MW turbines.

2015

CfD AUCTION

The first UK Contracts for Difference (CfD) auction takes place.

2017

HYWIND

The world's first commercial floating offshore wind farm, Hywind Scotland, begins operation.

Siemens Gamesa Renewable Energy is formed through merger.

GE Renewable Energy acquires leading wind turbine blade manufacturer LM Wind Power.

2018

10 MW+

Both MHI Vestas Offshore Wind and Siemens Gamesa Renewable Energy have 10 MW+ turbines.

12 MW+

GE Renewable Energy announces its 12 MW+ turbine with a 220m diameter rotor.

2019

The third CfD auction results in record low prices for offshore wind, awarding strike prices (at 2012 prices) of £39.65/MWh and £41.61/MWh for projects commissioned in 2023/2024 and 2024/2025 respectively.

1 GW

The first 1 GW offshore wind farm - Hornsea One (1218 MW) - begins operation.

After 19 years, the 4 MW Blyth Offshore wind farm is decommissioned. This is the first time this has been done to a UK offshore wind farm.

2030/50 GW

The Offshore Wind Sector Deal is launched, setting a target of 30 GW of installed capacity by 2030 (since increased to 50 GW).

The Offshore Wind Growth Partnership (OWGP) is launched.

2020

The ScotWind leasing round is launched.

13 MW+

GE Renewable Energy's 13 MW Haliade-X turbine is chosen for Dogger Bank A and Bm - the first time turbines of this size have been contracted.

2021

£24m

The UK Government launches the fourth CfD allocation round with £24 million ringfenced specifically for floating offshore wind.

2023

Offshore wind installed capacity:

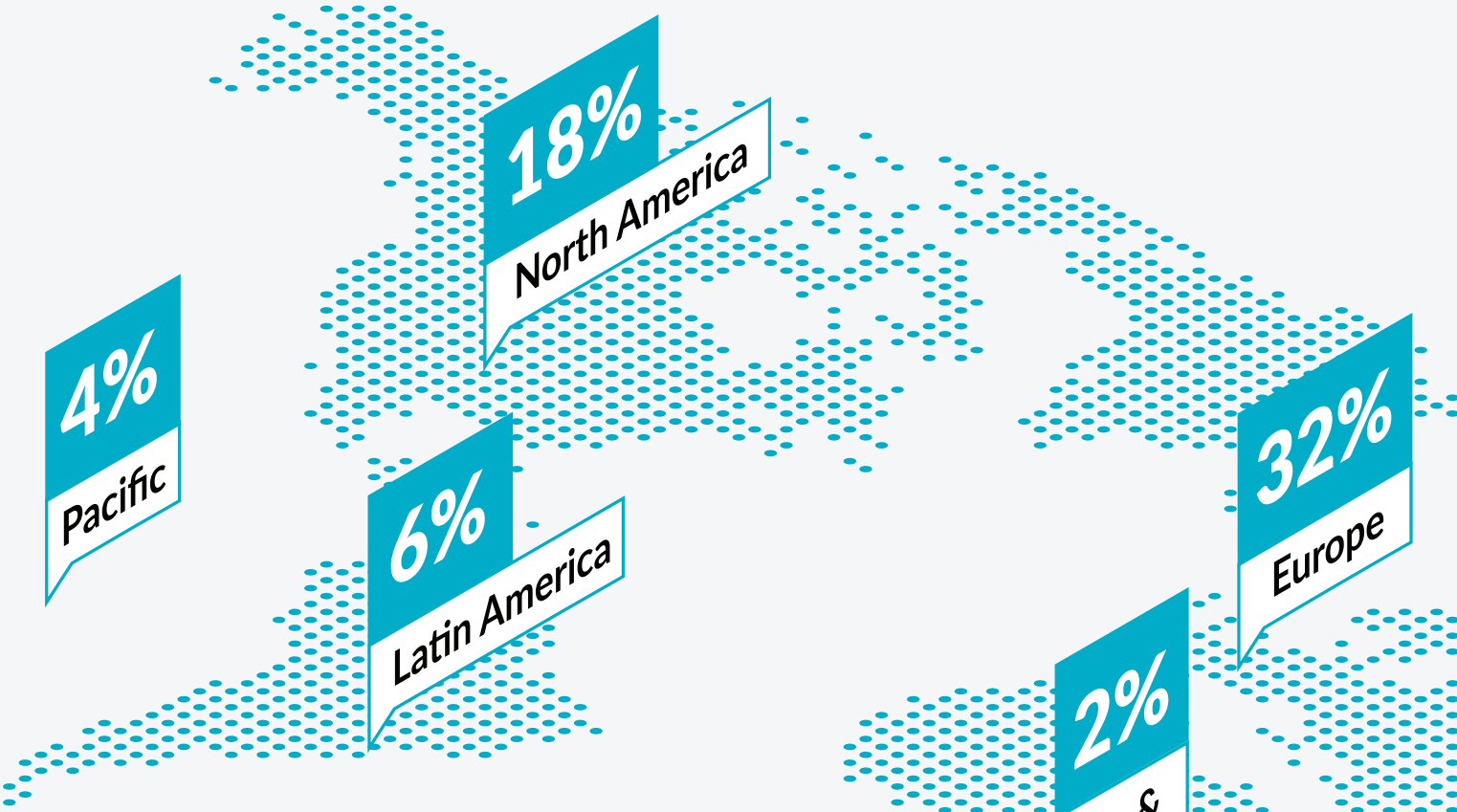
14,206 MW

Offshore wind share of energy generation:

12%

The INTOG results are published with 13 new projects for Innovation and targeted Oil and Gas.

EXPORT POTENTIAL OF THE INNOVATION NATION



Over the last decade, offshore wind has not only taken off in the UK, but has become a global phenomenon – and the UK supply chain is in an excellent position to reap the most of the opportunities this brings.

At present, Europe leads the way in installed offshore wind capacity, with its market worth estimated at £9.2 billion per year by 2030. However, there are large opportunities for growth throughout Asia, as well as North America and Africa.

Future for International Growth

Asia

China is already a major player in offshore wind and is set to increase this role in the years to come. In fact, it is predicted that the country may take prime position in having the largest offshore wind capacity in the world this year. Other markets in the region are also moving forward with their plans for offshore wind, and present potential export markets to UK suppliers.

Europe

Europe has led the way in offshore wind development over the last 10 years, with a total installed capacity of 28.4 GW. In many ways Europe has been the guinea pig for the development of offshore wind, learning that to deliver projects efficiently, risks need to be taken and disruptive innovation must be at the heart of a growing industry. This journey has led to Europe being the world-leader in offshore wind deployment and an excellent market for the UK's supply chain.

USA

One of the major emerging markets taking off in the last couple of years is the USA, which now has a target of 30 GW offshore wind capacity to be installed by 2030.

The US is in a fantastic position to learn from the more mature European markets, with knowledge sharing covering a range of topics, from consenting and planning through to technology development and grid connection.

Floating wind will likely be a major source of US offshore wind capacity in the coming decades as much of their estimated 2,000 GW capacity lies in deeper water sites that are unsuitable for conventional, fixed-bottom turbines. One of the core challenges is the development of an infrastructure that will be suitable for connecting floating wind turbines to US electrical power grids.

UK Supply Chain Export Potential

Overall, a recent GWEC Market Intelligence report foresees Asia emerging as the world's most prominent offshore wind region, home to nearly 40% of installations by 2050, followed by Europe (32%), North America (18%), Latin America (6%), the Pacific region (4%) and Africa and the Middle East (2%).

By building on existing UK capabilities in areas such as blade manufacture, cable supply, operations, and maintenance (O&M), and transitioning knowledge from other sectors such as subsea technology and marine operations, the UK can create crucial and fantastic export opportunities in other markets.

10 YEARS OF CATAPULT Offshore Renewable Energy

AN EXTRAORDINARY DECADE IN TESTING AND VALIDATION

Charting 10 years of testing and validation at the Offshore Renewable Energy (ORE) Catapult highlights just how integral the organisation has become to technological progress across the offshore renewables sector.

While innovation has been at the very core of ORE Catapult's mission from the start, no one at its launch in 2013 could possibly have predicted the impact that its testing and validation services would go on to have on the whole industry.

The 15MW drive train test facility at ORE Catapult's National Renewable Energy Centre in Blyth.

ORE Catapult cemented its world leading position with the certification of LM's giant 107m blade for HaliadeX that helped to unlock a £9 billion investment in the world's largest wind farm at Dogger Bank.

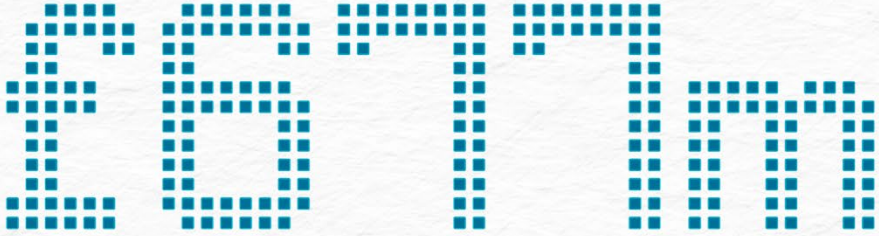
Still in its relative infancy, offshore wind was characterised by an average levelised cost of energy of £140/MWh back in 2013, and an industry unconvinced that scaling up would successfully reduce this cost. Yet from day one, support from ORE Catapult for those at the cutting edge of offshore wind development has driven innovation, developed knowledge, and generated belief.

One early example of successful collaborative work was the Catapult's development of facilities to support Clipper Windpower, who were disrupting the market with a hugely ambitious 10MW turbine as a sign of things to come. Ever increasingly lengthy blades and productive power trains were put through their paces at its Blyth facility over the following years.

Partnership also led to the development and installation of EDF's ground-breaking Blyth Offshore Demonstrator Wind Farm just 5km offshore from the Catapult's National Renewable Energy Centre, utilising brand new technologies and installation methods.

A five year research and development agreement signed in 2017 with energy giant GE supported both their entry into offshore wind and the accelerated technology development of the HaliadeX turbine. ORE Catapult cemented its world leading position with the certification of LM's giant 107m blade for HaliadeX that helped to unlock a £9 billion investment in the world's largest wind farm at Dogger Bank. Any lingering uncertainty regarding scaling up had been well and truly overcome. The R&D programme also focused on developing digital tools that will lead to a reduction in human intervention on the offshore wind farms of the future.

It wasn't just size that mattered though, with the overall complexity of testing increasing year on year, which has led to ORE Catapult rapidly and dramatically expanding its skillset and technical expertise. As a result, the head count of the organisation has grown from a few dozen a decade ago to over 320 today. Public sector confidence in ORE Catapult grew too, with ORE Catapult at the heart of £677m investment in offshore renewable energy innovation projects.



Investment in offshore renewable energy innovation projects

OVER 1350 SMEs

have been supported - proving new technologies and boosting investor confidence.

Testing and validation hasn't been monopolised by the sector's big operators either, with ORE Catapult stats pointing to over 1350 SMEs benefitting from crucial and timely input in proving new technologies and driving up investor confidence during 10 years of operation. A perfect example of this is the support provided to Magnomatics during the development of their game changing magnetic drive train.

Meanwhile, huge progress has been made in supporting continued development of subsea cable. ORE Catapult's testing capability jumped from 32kv to 275kv in a short space of time, with export cable now regularly under testing at the Charles Parsons Technology Centre in Blyth and dynamic cable testing just around the corner. A highly skilled team of technicians also offer laboratory testing on cable performance and durability.

A long running and highly productive partnership with JDR Cables has generated a number of innovations, with the partnership also being a key reason for JDR's decision to develop a £130m, state of the art subsea cable manufacturing facility just across from ORE Catapult's site on the Blyth estuary.

It's also safe to say that this testing and validation capability has driven huge amounts of research in the sector, as ORE Catapult has forged ties with OEMs and the supply chain to influence the design and modification of next generation turbine blades, structures, power trains and cables.

Looking ahead, the influence of testing and validation at ORE Catapult is only set to grow. A desire remains to provide the "biggest and the best" in terms of assets and work is ongoing to extend both the 100m blade and 15MW power train test facilities in Blyth, but significant thought and investment is also being placed on other opportunities for growth such as digital simulation and sub system testing.

We recently opened our flagship Digital, Autonomous and Robotics Engineering (DARE) Centre, to drive forward innovation, product development and market confidence in high tech solutions relating to operations and maintenance, surveying, repairs and more. Utilising the centre's unique position on a controlled dock at the heart of ORE Catapult's National Renewable Energy Centre in Blyth, the DARE Centre will provide companies large and

ORE Catapult's testing capability has jumped from 32kv to 275kv

32kv > 275kv

small with state of the art wet and dry facilities to prove and develop new robotic and autonomous technology with the power to change the future of wind.

It is safe to say that in the ten years since ORE Catapult launched, the energy, vision and commitment to supporting innovation from all corners of the renewables industry remains as strong as ever. ORE Catapult is already looking forward to the next 10 years of supporting the industry's disrupters and innovators, working to solve tomorrow's challenges today.

Minister for Energy Security and Net Zero Rt. Hon Graham Stuart MP opening ORE Catapult's DARE Centre in Blyth.

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10 YEARS OF ACADEMIC ENGAGEMENT

In 2023 we are celebrating 10 years of combining world-leading test and demonstration facilities with engineering and research expertise to accelerate technology development, reduce costs, and enhance economic growth across the UK.

Our research expertise has been made possible through dynamic academic partnerships across the UK and beyond, focusing on areas of key value to the offshore renewable energy sector.

Over the last decade, we have created Research Hubs to build relationships with leading research academics that offer UK companies access to ORE Catapult's in-house expertise, and knowledge from partner universities.

These Research Hubs include:

- Wind Blade Research Hub, established in 2017 with the University of Bristol
- Electrical Infrastructure Research Hub, created in 2018 with the Universities of Strathclyde and Manchester
- Powertrains Research Hub with the Universities of Sheffield and Warwick, formed in 2019

Through these Hubs, we have tailored research programmes and tapped into the knowledge of our partner institutions to further learning for the offshore renewables industry.

650

Partnered in over 650 research and development projects

250

Over 250 research and analysis papers published

In the past decade we have worked with 14 leading universities across the UK, and sponsored over 40 PhDs focused on areas of key importance to the development of offshore renewable energy.

Another key element of our academic engagement is skills development. Our involvement with Centres for Doctoral Training (CDTs), such as the Industrial CDT in Offshore Renewable Energy (IDCORE) has led to 14 programme alumni being employed within the ORE Catapult team, including our first sponsored doctoral student, Dr Ampea Boateng, who is now employed as a Principal R&D Engineer in Wind Turbine Architecture. This clearly demonstrates the value of the programme's collaboration with the doctoral networks, developing the leaders of the future.

And it doesn't stop there - in the past decade we have worked with 14 leading universities across the UK, and sponsored over 40 PhDs focused on areas of key importance to the development of offshore renewable energy. Two of our senior ORE Catapult employees also have visiting professorships.

Our research is focused on developing new technologies needed for the UK to capitalise on the potential of offshore renewable energy.

Along with other Catapults, we have been an active participant in the UK Research Institute's (UKRI) Researcher in Residence programme, which funds UK academics to undertake research at a Catapult centre, which has led to further research collaborations.

ORE Catapult Step4Wind PhD students

Omar Ibrahim

1. What is the title of your PhD?
"Dedicated floating offshore wind to hydrogen: Coupling possibilities, system design, techno-economic assessment, and policy implications."

2. What challenge are you seeking to solve as part of your research and at what stage are you at?
I am investigating a novel route for green hydrogen production through dedicated floating offshore wind farms, and examining the cost reduction potential it can bring. I am currently conducting techno-economic modelling for possible coupling routes, and studying its policy implications.

3. How is ORE Catapult helping with your research?
ORE Catapult is currently expanding our hydrogen research capabilities, and a few ongoing projects align already with the working scheme of my PhD. Getting exposed to on-ground projects helps steer the direction of the work closer to realisation.

4. When will you complete your PhD and what do you plan to do with your research?
I am expected to complete my PhD this autumn, and I plan to continue contributing to pushing further coupling floating offshore wind with hydrogen production in an industrial context.

5. How does your research fit into the development of offshore wind around the UK?
The UK offshore wind development plans clearly include floating offshore wind in a very sharp ramp-up (especially in Scotland). Additionally, the UK clean hydrogen development goals are even more boosted with strong investment, making my research focus a very live topic for the UK and globally.

Moving forward we'll continue to pioneer research in areas across our expansive knowledge base such as floating wind platforms, next generation wind turbine systems, future energy systems and marine energy.

Step4Wind is a European industrial doctorate programme which involves a cohort of 10 students funded at TU Delft, Politechnico Milano and University College Cork. ORE Catapult is the industry supporter for five of these projects and a couple of our students, Omar and Likhitha, are featured here.

We are just getting started. Over the next decade we expect our academic engagement to reach new heights and our world leading research base will be a key part of the green industrial revolution.

Likhitha Ramesh Reddy

1. What is the title of your PhD?
My PhD is on "Hydrodynamic numerical modelling of floating offshore wind turbines."

2. What challenge are you seeking to solve as part of your research and at what stage are you at?
I work on using high-fidelity numerical techniques and low-fidelity solvers - understanding it all is crucial. The current challenge I am working on is bridging the knowledge between the two types of solvers.

3. How is ORE Catapult helping with your research?
ORE Catapult brings an industrial perspective to my research. I work on a niche topic, but being associated with ORE Catapult throws light on the larger picture.

4. When will you complete your PhD and what do you plan to do with your research?
I am scheduled to finish my PhD in Oct 2024. After that, I intend to continue working in the offshore wind industry, contributing to green energy solutions.

5. How does your research fit into the development of offshore wind around the UK?
The UK is the forerunner in developing floating offshore wind as it offers a vast market. One of the common issues we are encountering is the need to lower the levelised cost of energy (LCOE) of these systems. The floating foundation contributes to 30% of the total costs of a floating wind turbine. By enhancing the accuracy of the numerical models used in the industry, my research presents an opportunity for better optimisation.

10 YEARS OF CATAPULT Offshore Renewable Energy

A SNAPSHOT OF TIDAL STREAM ENERGY IN THE UK TODAY

The UK journey

A decade ago, only early tidal turbine prototypes were being deployed and tidal sites were still being consented. Since then, the industry has consented sites at MeyGen, Morlais, Ramsey Sound and Perpetuus Tidal Energy Centre on the Isle of Wight, and ORE Catapult has tested tidal turbines by Atlantis, Nova Innovation, Siemens and Tocardo.

ORE Catapult has produced industry-leading reports over this time on cost reduction, tidal's contribution to the energy system, site consenting, transition to volume manufacture, and has provided the UK Government with data that has paved the way for ring fenced funding for tidal energy in the Contracts for Difference scheme.

Why tidal?

Tidal stream energy (TSE) is clean, green, secure and unique among renewables as it's entirely predictable. The tide can be predicted years in advance – unlike wind energy that depends on wind blowing, or solar that depends on the sun shining. This lends itself well to energy systems where it can complement other types of power, reduce the mismatch between supply and demand, and offset storage costs.

Tidal delivery

TSE has a successful track record in the UK over the past decade. Nova Innovation increased the size of its Shetland Tidal Array, operating since 2016, to six tidal turbines this year – making it the array with the largest number of tidal turbines in the world. In February 2023, SAE Renewables achieved a 'world first' by generating 50GWH of electricity from tidal power at its MeyGen site, and in 2021, Orbital Marine Power launched its 2MW tidal turbine in Scotland – the most powerful tidal turbine in the world.

Across the UK, TSE currently delivers 10MW of power, supplying the equivalent of 7000 homes. However, this is a drop in the ocean compared to the estimated 11.5GW national potential identified by recent studies that could provide 11% of the UK's electricity demand – the equivalent of around 10 million homes.

Tidal benefits

It is estimated that TSE projects in the UK could create 22,000 jobs by 2040 – exceeding the wind and solar industries and contribute up to £17 billion to the UK economy by 2050.

Up to £600 million per year by 2050 could be saved by reducing reliance on energy storage and balancing technologies, and an increasing emphasis on domestic energy security presents an opportunity for TSE to grow as a reliable and forecastable renewable energy source.

It is estimated that TSE projects in the UK could create 22,000 jobs by 2040 – exceeding the wind and solar industries and contribute up to £17 billion to the UK economy by 2050.

Tidal cost

Following offshore wind as the blueprint for success, a clear cost reduction pathway has been identified for TSE, with prices dropping below £80 per MWh by 2035 if the opportunity is realised – making it more competitive than nuclear.

The 'Cost Reduction Pathway of Tidal Stream Energy in the UK and France' report produced by ORE Catapult in October 2022 documents the global state of the tidal market and a cost reduction trajectory tracking TSE from its current price of £260/MWh down to £78/MWh by 2035, and £50/MWh by 2047.

Challenges

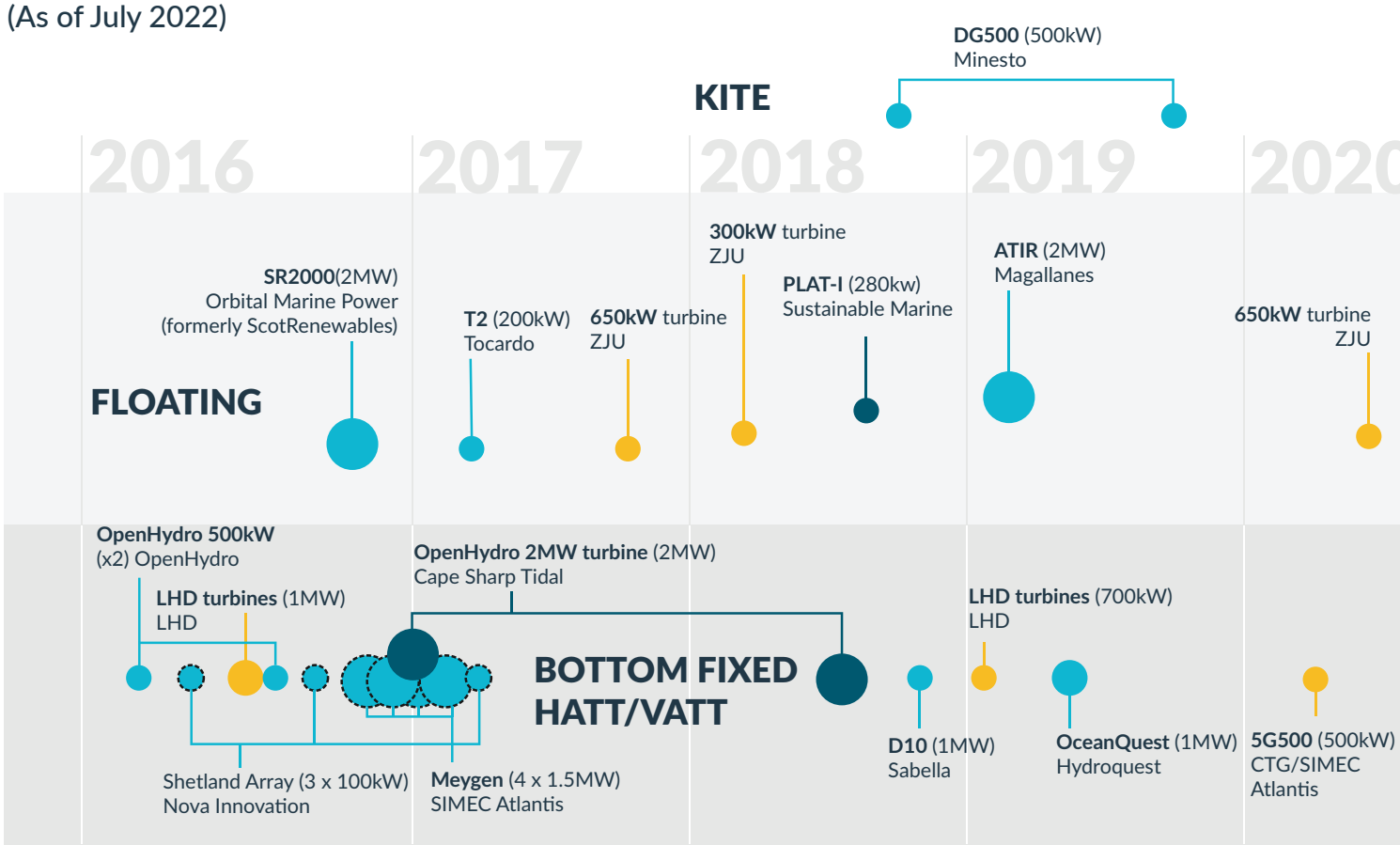
Cost

To drive down costs, a big increase in installed capacity is needed over the next decade. This requires long-term policy support and continued commitment to ring-fenced funding from the UK Government.

ORE Catapult's recent report in tidal energy cost reduction, called on policymakers to commit to industry deployment targets, ring-fence funding in the UK Government's Contracts for Difference rounds and streamline the consenting process to strengthen the project pipeline. These three actions will improve private sector confidence, open new funding streams, and accelerate the cost reduction process.

In 2021, £20 million a year was ring-fenced for TSE through the UK Government's Contracts for Difference (CfD) scheme. In 2022, 40.8MW was awarded in the CfD's Allocation Round 4 and this improved the sector's ability to secure private investment – key to unlocking cost reduction. In March 2023, the UK Government confirmed £205m for the CfD's Allocation Round 5, including a ringfence of £10m for tidal stream projects. It remains to be seen what the results will be.

Historic and announced tidal turbine deployments (2016-2027)
(As of July 2022)



Long lead times

These are caused by the sector only procuring small volumes of components to support a low number of devices. As components tend to be bespoke, suppliers only manufacture when an order comes in. Pushing for standardisation and transition to volume manufacture will necessitate buying in larger volumes and would alleviate this problem, which should happen as larger projects gain consent and revenue support.

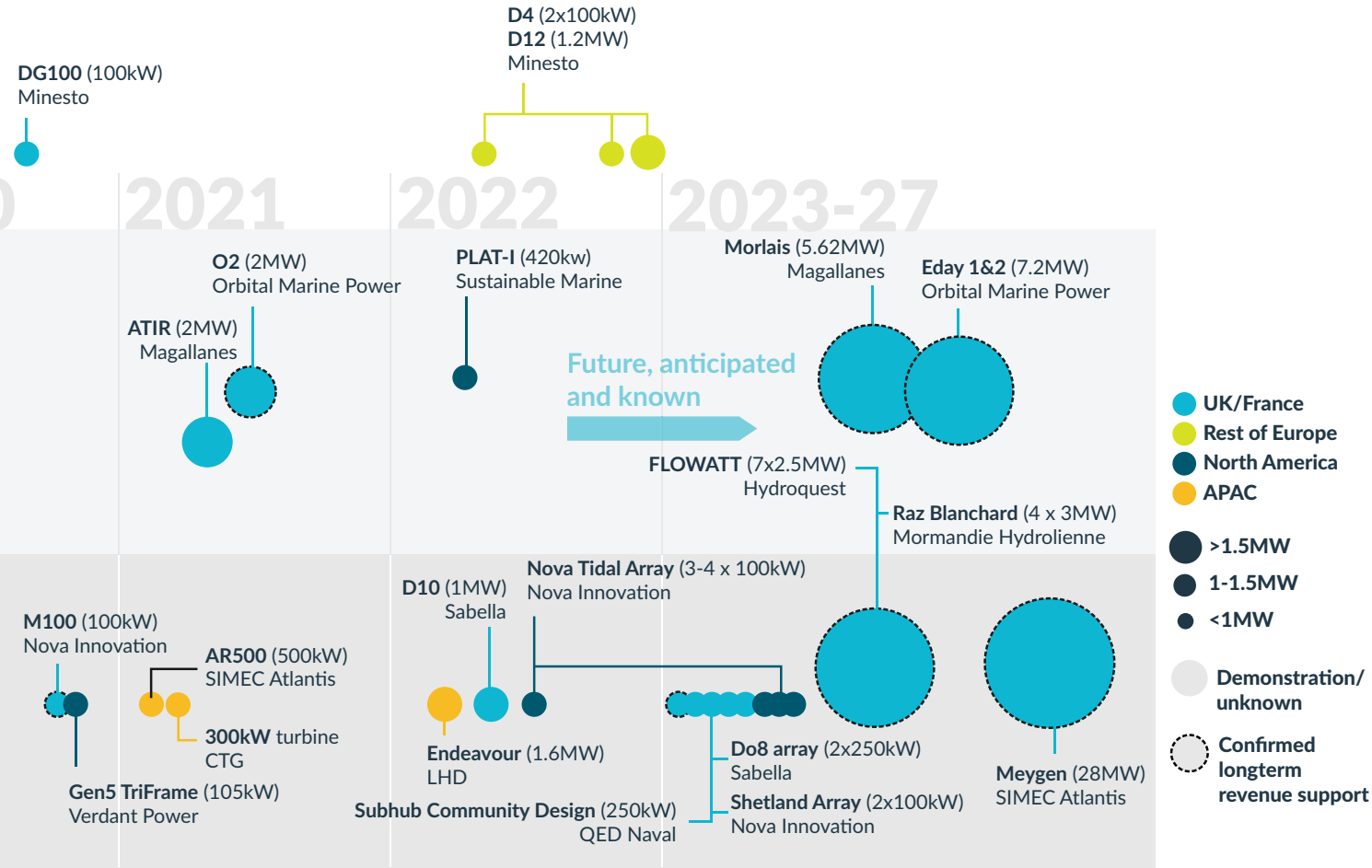
The most problematic areas of the supply chain for lead time are tidal turbine blades, electrical powertrain components (gearbox, generator etc.) and wet mate connectors.

Need for collaboration

There are key areas where the industry can collaborate, such as blade design, standardisation of wet mate connectors and subsea cables, and design and manufacturing of foundations and subsea hubs. Blade manufacture and foundation design needs to be improved as the industry scales up.

Developers should also take advantage of de-risking their designs and avoid costly failures by using testing facilities at research and academic institutions such as ORE Catapult's National Renewable Energy Centre in Blyth, and the University of Edinburgh's FASTBlade and FloWave facilities, before moving on to real world test facilities such as the Falmouth Bay Test Facility, Cornwall and the European Marine Energy Centre, Orkney.

There is also potential synergy with other marine technologies such as tidal lagoon and wave power. Coordinated development of marine power will use similar supply chain organisations and may reduce the integration challenges of those technologies, allowing more cost-effective use of the infrastructure built to support those developments.



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