CATAPULT
Offshore Renewable Energy

RE ENERGISE

#5 AUTUMN 2021

UNLEASHING THE POWER OF THE TIDES

Orbital Marine's O2 turbine arrival in Orkney
(Image courtesy of Orbital Marine)

HOW CAN THE UK UNLEASH THE FULL POTENTIAL OF TIDAL STREAM ENERGY?

WORLD-LEADING TEST AND VALIDATION FACILITIES ACCELERATING NEXT GENERATION TIDAL CONCEPTS

FACT VS FICTION: TIDAL ENERGY MYTHS DEBUNKED

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TIDAL POWER EXPRESS

Register now to join the Tidal Power Express!

In our series of half-hour lunchtime events, Catapult experts will introduce you to key innovators Nova Innovation, SIMEC Atlantis and Orbital Marine through:

- A Technology Walkaround
- Interview on Market and Export Readiness
- Explainer of the Supply Chain Ecosystem
- Audience Question Time

The series will run every Wednesday from 24th November to 15th December, with an extended panel session where our tidal innovators return once more, this time joined by guests from Marine Energy Council and the European Marine Energy Council (EMEC).

REGISTER YOUR INTEREST NOW

WELCOME

GUEST FOREWORD

PROFESSOR DEBORAH GREAVES OBE FREng FICE FRINA
DIRECTOR OF THE SUPERGEN OFFSHORE RENEWABLE ENERGY HUB, UNIVERSITY OF PLYMOUTH

Whilst the story of the last 30 years has been the rise of wind power, tidal stream power has also been a rapidly advancing form of renewable energy. Far from still being at the 'experimental' stage, tidal devices have reached a high level of sophistication and are ready for full-scale deployment. And tidal stream power has an extremely important role to play in the energy mix of the future as we strive to achieve Net Zero. Predictable power output combined with storage provides a compelling baseload for our future electricity needs.

The opportunity for the UK to continue to lead and reap the economic rewards from this global market are clear too. We are in a unique position in terms of technology development, skills and geography. UK waters hold roughly half of Europe's tidal stream resource and current tidal technologies from 30 key sites could supply 6GW of power (enough to power almost 5.6 million homes). Experts predict a £25bn export market by 2050, and 26,600 marine energy jobs by 2040.

This edition of ReEnergise magazine showcases some of the key opportunities we must capitalise on, and the key challenges we must overcome, to accelerate the mass deployment of tidal stream energy. It articulates the size of the economic prize on offer, the potential impact on levelling up our coastal communities, and analyses the current state of play of the UK sector in terms of the initiatives, projects, testing and research that is currently taking place to make commercialisation a reality.

It also highlights our ask to Government. Tidal stream energy has reached the critical development stage where the technology is proven, but we need that final investment pull into a commercial-scale market - a much more valiant effort than has already been suggested. With the same policy and funding support that the wind industry enjoyed at its pre-commercial stage, tidal stream offers a compelling prize to the UK, but one which we must grab now to secure our green economic future.

Department for Business, Energy & Industrial Strategy
EUROPEAN UNION Investing in Your Future European Regional Development Fund 2007-13
energy technologies

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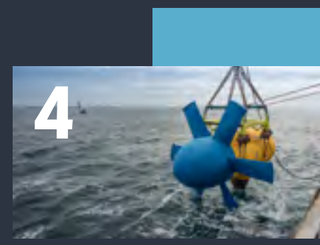
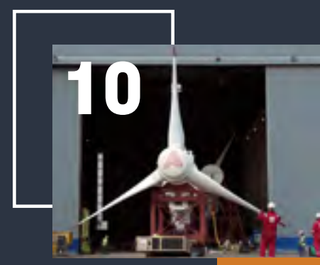




SIMEC Atlantis Turbine
(Image courtsey of Simec Atlantis Energy)

HOW THE UK CAN UNLEASH THE FULL POTENTIAL OF TIDAL STREAM ENERGY

SIMON CHEESEMAN
Wave and Tidal Sector Lead

There is no denying the potential of tidal stream energy – both in terms of helping meet our Net Zero targets and the economic benefits that its adoption can bring to the UK. The costs of tidal stream energy are forecast to drop below £90/MWh after the first 1GW of deployment, potentially creating a £25bn UK export opportunity by 2050 and 26,600 jobs from wave and tidal by 2040. Furthermore, 50-60% of the economic value will remain in coastal communities - bringing economic benefit to areas that have seen traditional shipbuilding, fishing and other industries decline.

SO WHY DOES THE INDUSTRY FIND ITSELF AT A KEY JUNCTURE IN ITS ADOPTION?

We have the world-leading technical expertise, alongside the perfect geographic setting with strong tidal flows, within the UK to make this tidal energy revolution happen, but the sector cannot get to market without the same government foresight and investment confidence afforded to offshore wind and other nascent technologies.

One of the biggest hopes for obtaining this crucial support was the UK Government's Contracts for Difference (CfDs) scheme, allowing low-carbon energy developers to compete for subsidies and offset initially high generation costs. Marine energy developers were looking for their own minima pot dedicated to tidal power (and another form of marine energy - wave power) to create some certainty in their route to market.

Those hopes were dashed by the recent announcement of the latest CfD allocation (Allocation Round 4). Of the total £55m in Pot 2 for less established technologies, floating wind was provided with a £24m minima or ring-fence, but marine energy developers were told they would have to compete against other emerging technologies for the remaining £31m. With the highest "administrative strike prices", with no allocated minima or ring-fence, marine energy projects will do well to win any capacity, in competition with the likes of floating wind (which could win capacity over and above the £24m minima) and remote island wind in a "David and Goliath" struggle.

There is no doubt that the CfD mechanism has been very successful in driving down costs of technologies such as offshore wind, but it should also be acting as an investment in next-generation energy technologies such as tidal power.

In tandem with these tidal energy CfDs, new and innovative approaches such as the Marine Energy Council's proposed Innovation Power Purchase Agreement (IPPA), would also support future technology development while taking the costs away from consumer bills. The introduction of IPPAs would be welcomed by the industry as support for technology developers not yet ready to participate in the CfD process. The IPPA is designed to deploy small-scale devices in UK waters and secure a market for the power they produce.

Ultimately, the industry is calling out for a clear, strategic governmental commitment to project and technology developers to enable the UK to access the economic and low carbon benefits of the sector. CfDs are a key final link in the financial support chain to pull through pre-commercial technologies, they should pick up where grant funding begins to taper off ensuring promising technologies are not left in the doldrums.

As we approach COP26 later this year, the UK Government has the opportunity to lead by example on a world stage, promoting the need for sustained investment to accelerate commercialisation of tidal stream technology and cost reductions.

ORE Catapult is working closely with tidal sector developers, the supply chain and regulators, to support accelerated cost reduction through innovation and testing, identifying best practice through collaborative projects and helping grow our understanding of the oceans. More on this throughout the rest of this ReEnergise issue.

1. https://committees.parliament.uk/writtenevidence/19220/pdf

THE TIDAL POWER BOOST FOR COASTAL COMMUNITIES IN THE UK AND FRANCE

ORE Catapult's analysis of the potential markets for wave and tidal technologies has outlined a compelling opportunity for the UK economy. As mentioned in the previous article, an estimated 50-60% of the future value of this new energy sector will remain with our coastal communities. In short, if you have a wave or tidal power installation off your coastline, your community will not just play host, but will also reap the benefits of revenue and job creation.

It is already evident that locations like Ynys Enlii in Wales, Bluemull Sound in Shetland, Stromness in Orkney and the Cornish coast are the world's hotspots for this green tech revolution. The world's most advanced wave and tidal stream technologies are not being developed in London, Los Angeles or Tokyo, but in our seaside towns and villages.

A case in point: the first people in the world to power their homes and cars with tidal energy are in Shetland, where Nova Innovation created the world's first offshore grid-connected tidal array and recently installed the first tidal-powered car charging point. The array is already delivering local economic value too. More than 80% of the content used to construct the site was supplied by UK companies (including 25% of supply chain spend in Shetland and Orkney). During its operation and ongoing expansion (under the EU-funded EnFAIT and ELEMENT projects), over half of its expenditure continues to go to local companies (and 98% in the wider UK).

Regional development specialists IDETA have recently scoped out the local community benefit of tidal stream developments in Brittany in a report for the ELEMENT project.

The benefits identified for these communities are:

JOB CREATION

If France can replicate the UK experience, local supply chain companies will see direct job creation. These would be primarily in manufacturing and fabrication, electrical equipment, repair and installation, civil engineering and water transport. Indirectly, increased economic activity in the region would also benefit hospitality, financial, real estate and other service sectors.

LOCAL ENERGY COMMUNITIES

By selling tidal-powered electricity through green energy providers such as 'Enercoop' (a citizen's association that provides 100% green energy to consumers in France) or by creating a local energy community, energy could be provided to vulnerable groups at a lower cost. These communities would also be able to store and sell excess energy to other parts of the country too, providing additional revenue.

REDUCED ENERGY BILLS

A third of households use electricity for their home heating: the current cost reduction trajectory of tidal stream energy means that these households could benefit from cheaper power in the future.

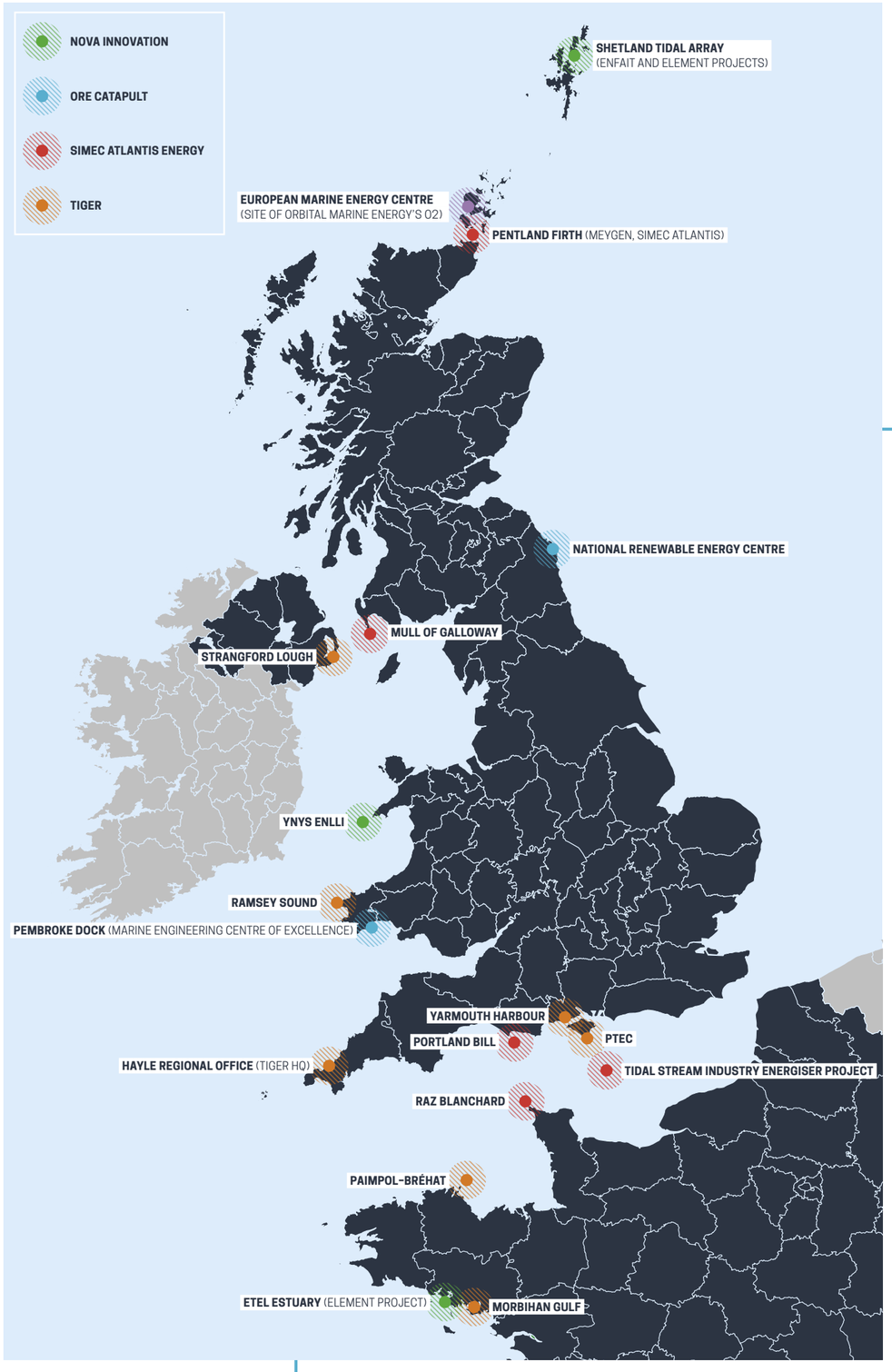
The biggest single investment in this future supply chain in either the UK or France is TIGER, a €46.8m cross-channel project led by ORE Catapult's Cornwall team and part-funded by the Interreg France (Channel) England Programme. Installing a targeted 8MW of new tidal capacity in sites across the region, the project is working with manufacturers and industrial suppliers to ensure they can benefit from this future capacity, bringing jobs and revenue to their communities too.

For news on supply chain and local community opportunity in tidal stream, visit:

TIGER interregtiger.com

EnFAIT www.enfait.eu

Element element-project.eu



Key project sites in the UK and France

SR2000 testing at EMEC's Fall of Warness test site
(Image courtsey of Orbital Marine Power)

THE WORLD-LEADING TEST AND VALIDATION FACILITIES ACCELERATING NEXT GENERATION TIDAL CONCEPTS

To support the UK's tidal technology development, simulated and real-world test environments are absolutely key to tidal developers. We explore some of the UK's leading facilities and some of the projects they are supporting to accelerate tidal technology, and help it reach its potential.

ORE Catapult operates dedicated tidal turbine test and validation facilities suitable for systems rated from less than 1MW up to 3MW, and an 18MVA grid integration platform for tidal system electrical testing, from its National Renewable Energy Centre in Blyth, Northumberland. Additionally in Wales, the Catapult has a new buoy deployment planned from the Marine Energy Engineering Centre of Excellence (MEECE) in Pembroke Dock.

Elsewhere in the UK, established test facilities are also supporting tidal developers to demonstrate and scale-up their technology. This includes the Orkney-based European Marine Energy Centre (EMEC), which provides the world's only multi-berth, purpose-built, open sea test facilities for wave and tidal energy converters, and all-important grid connection capability.

Another is FaBTest, a nursery ocean facility for demonstrating marine technologies located in Falmouth Bay. It enables developers to test technologies, components, moorings and deployment procedures in a moderate wave climate.

VALIDATING THE INDUSTRY'S LARGEST TIDAL MACHINES

The UK facilities are ideal for new tidal innovations and prototype technology, through to the sector's largest machines. To date, ORE Catapult has put Simec Atlantis' AR1000 (1MW) and AR1500 (1.5MW) tidal turbines through their paces, with the former deployed at EMEC, and the latter deployed to the MeyGen project in the Pentland Firth as part of a 6MW demonstration array. The UK's ability to test, validate and deploy the AR1000 and AR1500 has enabled Atlantis to develop its AR2000 machine, which will be part of the next MeyGen development phase, Project Stroma.

ACCELERATING NEXT GENERATION TIDAL CONCEPTS

Another tidal turbine developer, Nova Innovation, is pushing the very latest developments in tidal technology. Working with ORE Catapult and an 11-strong international consortium, Edinburgh-based Nova is leading on the Effective Lifetime Extension in the Marine Environment for Tidal Energy (ELEMENT) project to improve performance using artificial intelligence. In a world-first, the ELEMENT team is using behavioural modelling and machine learning to control tidal energy turbines to improve efficiency and reduce costs.

Using its rotor and drivetrain as a sensor, the ELEMENT project seeks to eliminate the need for separate sensors to be attached to the turbine. This has historically presented a significant cost to tidal energy producers as they require replacing and repairing when affected by biofouling, corrosion and other common effects of the marine environment.

One of the next major phases of the ELEMENT project is using ORE Catapult's 1MW drivetrain rig to implement Hardware in the Loop (HIL) tests to assess the performance and demonstrate improvements from the ELEMENT onboard control. Testing is taking place this Autumn and is a big step in the project's move towards offshore deployment at the Shetland Tidal Array, and final refinement of the ELEMENT control system in 2022.

By extending tidal turbine lifetime, improving efficiency and increasing availability, the project is expected to deliver a 17 per cent cost saving on the levelised cost of tidal energy.

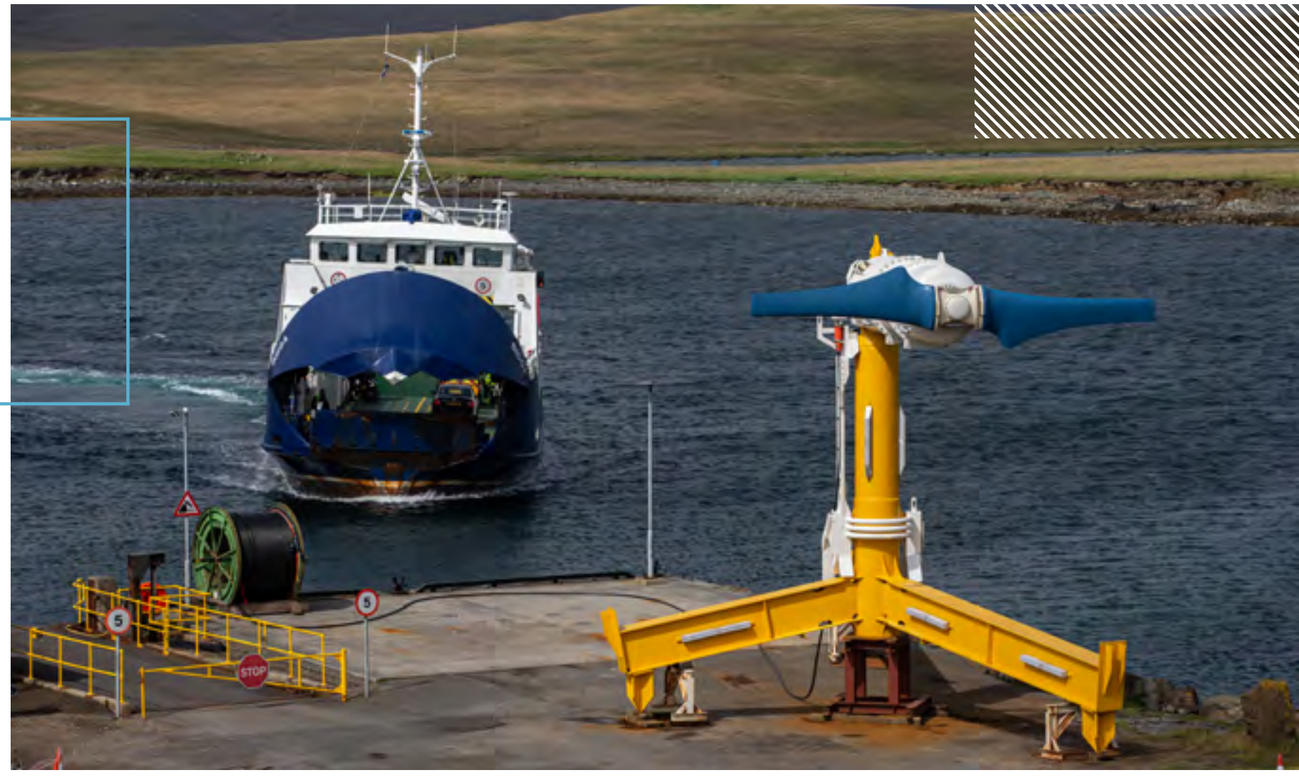
PROVIDING OPEN-ACCESS TEST AND MEASUREMENT IN SUPPORT OF TIDAL DEPLOYMENT

To further support the development of tidal technology, ORE Catapult's MEECE team is deploying a research buoy into the Marine Energy Test Area's (META) Dales Road marine energy test site, in the Milford Haven Waterway.

The buoy provides a unique opportunity for companies to access an offshore platform to test their novel technologies in a real marine environment, removing barriers related to funding and consenting. It provides a multi-purpose asset that can be used to test a variety of marine technologies, including mooring and anchoring components, dynamic cables, instrumentation for the marine environment, communication systems and inspection technologies. Measurements from the buoy are transmitted back to shore for real-time monitoring.

MEECE - which delivers research, development and demonstration activities to support innovation in the Welsh supply chain from its headquarters in Pembroke Dock - can also fund access to the buoy for companies developing novel marine technologies.

TIDAL STREAM PROJECT SUMMARIES



Nova Innovation's Eunice Turbine
(Image courtesy of Nova Innovation)

ELEMENT

ELEMENT (Effective Lifetime Extension in the Marine Environment for Tidal Energy) is a €5 million project funded by the European Union's Horizon 2020 research and innovation programme. It will demonstrate how artificial intelligence can slash the cost of tidal energy by an estimated 17%, bolstering the case for tidal energy as an important part of the world's future energy mix.

The ELEMENT team use behavioural modelling to create the world's first intelligent tidal energy turbine, using its rotor and drivetrain as a sensor. This transformation eliminates the need for separate sensors to be attached to the turbine, which has historically presented a significant cost to tidal energy producers as they require replacing and repairing when affected by biofouling, corrosion and other common effects of the marine environment.

ELEMENT will help to accelerate the commercialisation of tidal stream technology through introducing intelligent control systems to tidal turbines so they can automatically adjust their operating parameters to tidal flows, thus maximising energy capture and find better ways of capturing data on tidal stream dynamics, feeding this enhanced knowledge into the design of tidal turbines.

OPIN

The Ocean Power Innovation Network (OPIN) is a cross-sectoral collaborative network that aims to accelerate the growth of the ocean energy sector and its supply chains across the partner regions of Ireland, the UK, Belgium, France, the Netherlands and Germany.

Ultimately, OPIN aims to encourage both cross-sectoral and cross-regional collaboration for SMEs working in marine energy, bringing proven expertise, capabilities and products from other industries into the ocean energy sector. This will help to reduce costs and accelerate technology development.

OPIN also offers a Technology Assessment Process (TAP) to give those operating in the marine energy sector a roadmap for risk reduction, development and commercialisation, as well as independent evidence for investors. The evidence-based dossier – a TAP Report - will help to map the company's journey through the development process, identifying commercialisation milestones and future sources of support to accelerate the technology to market. For more information about the TAP service, contact **opin@seai.ie**

TIGER

Proving that tidal energy generation can be cost-effective on a large scale could open the door for it to become the renewable energy source of choice in coastal locations, helping the growth of clean energy generation.

An important piece of the jigsaw is the €45 million EU-funded Tidal Stream Industry Energiser (TIGER) project in the Channel region that is led by ORE Catapult. TIGER is actively supporting the design, consenting or installation of up to 30MW of tidal stream capacity and bringing developers, technologies and experience to the fore across the south coast of England and the north coast of France.

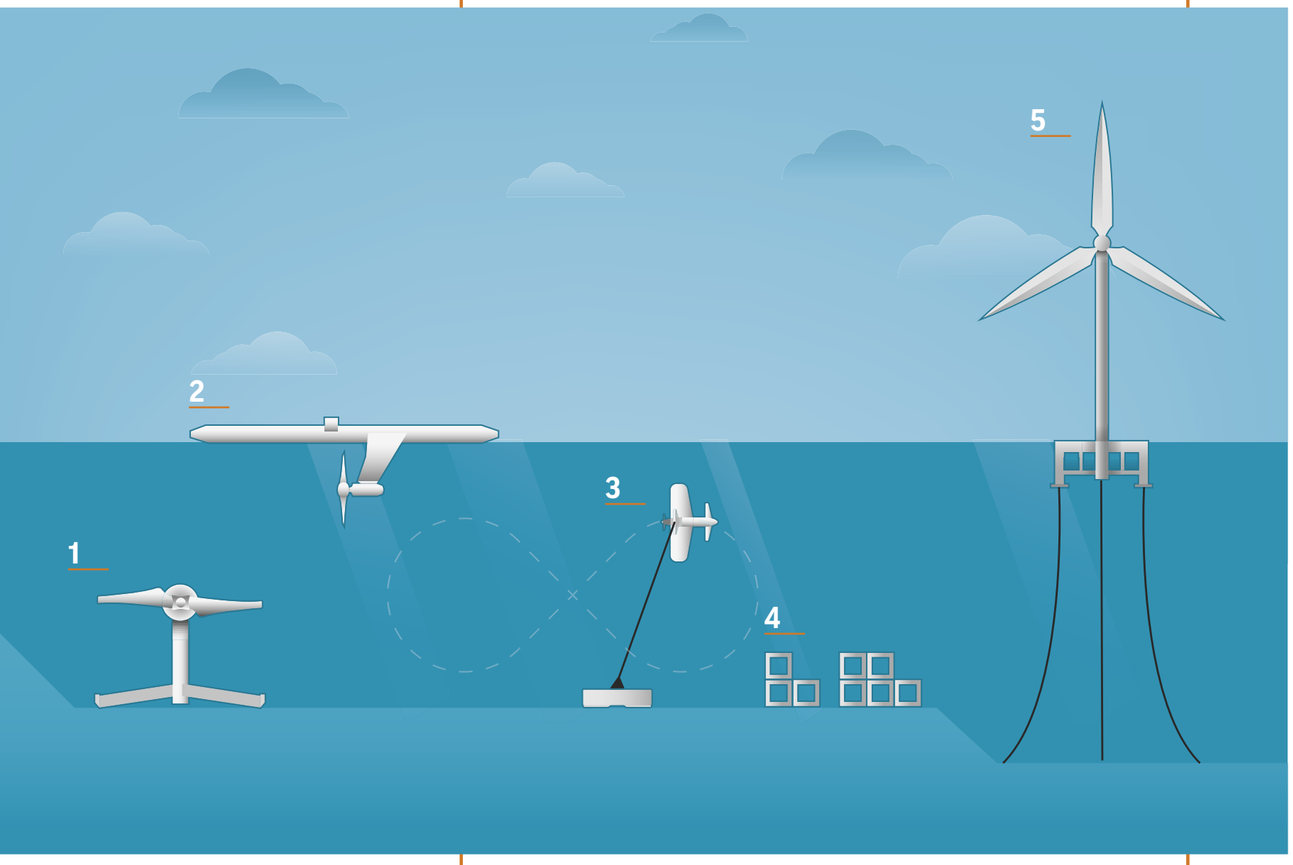
TIGER brings together multiple partners across the UK and French offshore renewable energy supply chain to work towards validating the commercialisation of marine energy technology. This validation will help to ensure that sustainable and affordable energy plays a key role in our future energy mix as we work towards achieving Net Zero by 2050 and beyond.

ENFAIT

When it comes to testing tidal turbine technology, there is no better facility than the 'real world'. The EnFAIT (Enabling Future Arrays in Tidal) project aims to demonstrate the development, operation and decommissioning of the world's first offshore tidal array (six turbines) over a five-year period to prove a cost reduction pathway for tidal energy and that it can be cost competitive with other forms of renewable energy.

The €20m Horizon 2020 project is demonstrating a grid-connected tidal energy array that delivers a step change in the lifetime cost of energy for tidal power and proves that high array reliability and availability can be achieved with best practice maintenance regimes. The project takes a significant step towards creating a commercial, bankable tidal energy sector.

The project is also bringing local economic benefits, with the array powering homes and businesses across Shetland for the past four years. The project has also created a 100% European supply chain, with more than half of its content delivered by Scottish companies, clearly demonstrating the economic case for local tidal energy production.



SEASCAPE OF THE FUTURE

1

NOVA INNOVATION

Seabed-mounted tidal turbines, such as Nova Innovation's 100 kW M100-D tidal device, sit on the seabed, held in place by their own weight, with no drilling required. Typically, a base-frame known as a substructure is placed on the seabed, and a ballast weight is added to ensure the structure does not move. The tidal turbine nacelle is then lowered onto the substructure. This approach means that only the nacelle needs to be removed for maintenance rather than the entire substructure, making it more cost effective. The turbines have no visual impact on the landscape, and they do not pose any risk to boats or ships. Nova Innovation is leading the charge for tidal energy, developing tidal turbines that allow for rapid deployment, high reliability and performance. Nova is working with ORE Catapult to further develop its tidal devices under the EnFAIT and ELEMENT projects, building on its proven track record to innovate and lower the costs of tidal energy.

www.novainnovation.com

2

ORBITAL MARINE POWER

Tidal turbines can also be suspended beneath a platform floating on the surface of the water such as Orbital Marine Power's O2 device. Orbital's unique floating platform is moored via anchors in powerful tidal stream locations, 10m blades give the O2 more than 600m2 of swept area to capture flowing tidal energy. The O2 has been designed so that installation of the turbine, and all its associated moorings, can be carried out by low-cost work vessels and servicing can be carried out by RIB vessels – minimising downtime and lowering construction and operational costs. Orbital Marine Power is working with ORE Catapult as part of OPIN and the TIGER project, the largest ever Interreg project, that looks to drive the growth of tidal stream energy by installing up to 8 MW of new tidal capacity at sites in and around the Channel region thus driving innovation and the development of new products and services.

www.orbitalmarine.com

3

MINESTO

Another alternative concept is Minesto's Deep Green tidal kite, a device that 'flies' through the mid-water column, swooping in a figure-of-eight shape to increase the speed of the water flowing through the turbine. By sweeping a large area at a relative speed that is several times the actual speed of the underwater current, this means that when Deep Green multiplies the relative speed which the turbine is pushed through the water, the electricity produced by the power plant's generator is several hundred times greater compared to if the turbine was stationary. As a result, it is applicable in areas where no other known technology can operate cost effectively. Minesto is also a key partner in the TIGER project and will manufacture, install and operate its Deep Green Micro Grid marine energy converter to demonstrate its innovative technology off the European Atlantic coastline and contribute to the overall development of tidal stream energy.

www.minesto.com

4

ARC MARINE

As both offshore wind and tidal turbines come to the end of their operational lifetime, ARC Marine is developing a solution to minimise the disruption to the environment during their decommissioning, turning monopile, foundation remnants and cable protection into opportunities for accelerating reef creation. Currently operating in the offshore wind industry, ARC Marine has created Reef Cubes, Marine Crete and Marine Matts, manufactured solely from marine-friendly waste material, as the perfect man-made habitat for marine flora and fauna. By finding ways to extend the lifetime of steel and concrete in the marine environment, ARC Marine hopes to minimise environmental disruption and create a new habitat for marine life, becoming part of the ecosystem and negating costly and environmentally damaging decommissioning work.

www.arcmarine.co.uk

5

FLOATING WIND / WAVE HYBRID SOLUTIONS

Not only will different sources of renewable energy work in tandem with each other to create a diverse energy mix, we could also see a combination of different sources on the one device. The Floating Power Plant (FPP) Platform is a floating platform that hosts a single wind turbine ranging from 5 MW to 15 MW and integrates 1 MW to 4 MW wave power dependent on the wave resource. Designed for deeper water and extreme offshore conditions, combining wind and wave on the floating platform can secure greater power capacity, lower the cost of energy and ensure more consistent power production. The platform is also large enough to house various energy solutions like electrolysers and hydrogen storage.

www.floatingpowerplant.com

TIDAL STREAM ENERGY AND ITS ROLE IN THE UK'S ENERGY TRANSITION

GUEST AUTHOR
DR DANNY COLES
Research Fellow, University of Plymouth

It is estimated that the UK's electricity demand will increase from its current level, of 308 TWh/year, to between 550 and 680 TWh/year, by 2050 (Climate Change Committee, 2020). To achieve Net Zero targets, a diverse fleet of renewable power generation technologies is required. Whilst wind and solar PV will take a leading role in the energy transition, complementary technologies will be needed to overcome challenges related to meeting rising electricity demand, and the integration of variable power generation onto the grid.

Tidal stream power has shown promise to contribute to this diversification of generation technologies. It is estimated that approximately 34 TWh/year could be produced by tidal stream turbines, equivalent to 11% of current annual electricity demand (Carbon Trust, 2011, Coles D et al., 2020). With its potential clearly visible to the offshore renewables sector, how can academics support the journey to mass deployment up and down UK shores?

Projects such as the Tidal Stream Industry Energiser (TIGER) project are building cross-border partnerships to identify opportunities for collaboration between industry, regulators and academic partners. For example, work undertaken by the University of Plymouth, the Offshore Renewable Energy Catapult and Alderney Commission for Renewable Energy is investigating the role tidal stream can play in displacing diesel on the island of Alderney.

Results show that the cyclic, predictable nature of tidal stream power generation provides grid integration benefits over other renewable energy sources, such as wind power, by reducing reliance on reserve power, for example. Importantly, when displacing fossil fuels, this can also lead to a reduction in carbon emissions (Coles D et al., 2021b). This work is being expanded to investigate the benefits large-scale tidal stream deployment may provide to the UK grid, through modelling being undertaken by the University of Plymouth and Imperial College London. Outputs from the TIGER projects can be found at www.interregtiger.com.

Ongoing research within projects such as TIGER is investigating a wide range of topics, including resource assessment, turbine loading, component/system reliability, and cost of energy. Here we provide a brief summary of some research findings to date, starting with cost of energy.

Orbital Marine Power, partner in TIGER, launches O2 turbine
(Image courtesy of Orbital Marine Power)

COST OF ENERGY

In the UK, the installation of the first 10 MW of tidal stream capacity resulted in its levelised cost of energy (LCoE) dropping from approximately £520/MWh, to £300/MWh (OREC, 2018). This is still expensive relative to some other technologies, such as wind and solar PV power. However, we need more than just wind and solar PV to achieve Net Zero, and tidal stream is on a far steeper cost reduction trajectory.

Increasing cumulative installed capacity serves to drive down LCoE, through technology and industry development. The technology learning rate defines the percentage decrease in LCoE with every doubling of cumulative installed capacity. Based on operational projects to date, tidal stream has achieved a technology learning rate of approximately 25% through the first 18 MW of installed capacity (OREC, 2018).

Looking forward, tidal stream would become cost competitive with nuclear (£90/MWh) after 1 GW of installed capacity with a technology learning rate of approximately 17%. For tidal stream to produce its estimated energy yield potential of 34 TWh/year, approximately 11.5 GW of installed capacity is required, suggesting there is scope for further cost reduction, below £90/MWh, with additional development after 1 GW has been installed.

RELIABILITY

We talk a lot about the reliability of tidal energy with respect to its predictable nature, but we must also explore its dependability in terms of availability. A review of tidal stream energy deployments to date shows that blade failure has been the most common cause of downtime, followed by generator and monitoring failures (Walker S et al., 2021). The majority of blade failures are attributed to underestimation of loads during design. However, floating devices did not experience any failures, despite making up 30% of total deployments. Floating devices did however exhibit high levels of curtailment, indicating that intervention was often possible to prevent failure from taking place.

Importantly, results show that the likelihood of failure has reduced over time, and that this is particularly noticeable for horizontal axis devices, which are the most common design in operation. At the time of writing, the likelihood of a tidal stream turbine failing is similar to that of a wind turbine in 1996, when the wind industry had achieved 2.6 million operating hours. Data suggests that the reliability growth curve of tidal stream is following a similar trajectory to that of wind turbines, with significant potential for further improvement as cumulative installed capacity increases.

CLOSING THOUGHTS

Progress in the tidal stream industry, such as reductions in cost of energy, and improved reliability, highlight its potential to play a part in the UK's energy transition. As demonstrated, collaboration between academics, industry and other stakeholders is key to understanding the true contribution tidal stream energy can provide. Future build out will depend in part on its ability to provide reliable, cost effective energy. Significant improvements in these areas have been achieved to date. Further improvements will be driven mainly by learning from doing, necessitating a steady increase in installed capacity. In the wind industry, this was achieved through prolonged subsidy support from Government that helped fund over 10 GW of installed capacity. For tidal stream to contribute significantly to Net Zero targets, similar access to subsidy support is needed.

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Nova Innovation's Eunice Turbine
(Image courtesy of Nova Innovation)

FACT VS FICTION

MIRIAM NOONAN
Analysis Insights Manager

Like all developing sources of energy, tidal stream is under intense scrutiny from the energy industry and government to ensure its viability within the electricity supply. With this examination comes conflicting statements and blurred lines.

To help us sort the tidal energy facts from fiction, Analysis and Insights Manager Miriam Noonan debunks some of the common misconceptions surrounding tidal stream energy.

FICTION #1

TIDAL AND WAVE POWER ARE EXPERIMENTAL TECHNOLOGIES

Tidal turbine technologies have been tried, test and validated across the country, including at ORE Catapult's test and validation facilities as part of projects with SIMEC Atlantis and Nova Innovation. Due to this testing, tidal stream technologies have achieved rapid development in recent years. Furthermore, tidal turbines are already powering parts of our everyday life, with some projects already grid-connected and producing energy for communities around the UK that have previously relied upon imported diesel - in Shetland, there are even electric car charging points powered by the local array. What's more, is that UK companies are already exporting their turbine models overseas for projects in Canada and Japan.

FICTION #2

TIDAL STREAM AND WAVE POWER ARE TOO EXPENSIVE

Already, tidal stream's Levelised Cost of Energy (LCoE) has been cut by more than 40% in the last three years alone, according to the European Commission's Joint Research Centre. The energy costs of today's tidal stream projects are well below expectations. According the one of our key reports, tidal stream has the potential to reach a LCoE of £150 per MWh by 100MW installed, reducing to £90 per MWh by 1GW and £80 per MWh by 2GW. To put that into context, offshore wind delivered £125/MWh after the first 2.5GW of deployment! But tidal energy cost reduction doesn't stop there. Further reductions are possible with additional focus on innovation and continued drops in cost of capital towards levels coming through in offshore wind.

To hear more from Miriam, you can watch the full interview here >

FICTION #3

MARINE ENERGY TECHNOLOGIES COULD IMPACT SEA LIFE

The devices that have been deployed to date have been subject to a significant amount of environmental monitoring to understand how they affect their surrounding environment. To date, we haven't seen any negative effects and, in fact, we see marine species such as birds and mammals actually changing their behaviour around the devices as they become part of their natural habitat, and in some cases even creating new habitats for marine life. One such tidal project that supports these results is the environmental monitoring that has been carried out at the Shetland Tidal Array, developed by Nova Innovation since 2010. This includes 20,000+ recorded hours of subsea video footage and over nine years of data from land-based marine mammal and bird observations where no collision or near misses have been observed.

FICTION #4

WE CAN GET EVERYTHING WE NEED FROM WIND POWER

Wind power is a fantastic source of renewable energy, there's no denying that. However, the Earth's tidal forces are a free, clean and, importantly, predictable source of power. Due to tidal energy's predictable nature, it can provide electricity when sources such as wind power are unavailable – bridging the gap in supply and ensuring the UK can operate entirely on renewables.
Tidal stream energy is a complementary source to wind, with some geographical locations more suited to exploiting the tide than the wind. Tidal energy potential within the UK is 30-50GW of additional energy we cannot harness from wind alone. Tidal stream energy has an extremely valuable role in diversifying power sources and reaching every corner of the UK.

NEWS ROUNDUP

Chancellor Rishi Sunak and ORE Catapult's Tony Quinn

Chancellor Visits our World-Leading Levenmouth Demonstration Turbine

The Chancellor of the Exchequer, Rishi Sunak, visited our Levenmouth Demonstration Turbine where he witnessed first-hand the impact of the world's largest and most advanced open access offshore wind turbine dedicated to research and demonstration in the growth of the UK supply chain and meeting the UK's decarbonisation and Net Zero targets.

The Chancellor said: "Harnessing innovative new technologies will be crucial to help the UK meet its climate goals and shape our economy for the future. It is brilliant to see ORE Catapult's Demonstration Turbine helping companies to commercialise their ideas and boosting green industries in Scotland, particularly as we prepare to host COP26 in Glasgow later this year."

During his visit, Mr Sunak also met with three UK innovators, Rovco, Cyberhawk and Pict Offshore, that have already benefitted significantly from working with ORE Catapult through access to the Levenmouth Demonstration Turbine.

Drone launched from Thales' Halcyon vessel as part of MIMRee trials

The robot A-Team that will be vital for the future of offshore wind and Net Zero

One of the UK's most ambitious robotics projects, Multi-Platform Inspection, Maintenance and Repair in Extreme Environments (MIMRee), has proven the concept for a fully robotic team, combining artificial intelligence and autonomous systems, to repair offshore wind turbines. The project results open the door to human-robot teams at wind farms within the not-so-distant future.

As lead partner in the project, our analysis has shown that within 10 years this scenario will be feasible at offshore wind farms with robots working semi-autonomously (that is, under the remote supervision of humans and only requiring technicians for intervention offshore when essential).

By 2050, such a system could be capable of planning its own missions and conducting them autonomously at 'wind farms of the future' that are built for repair by resident robots. We estimate that this move will shift workers from hazardous environments at sea to onshore control room roles and reduce the cost of energy by 10% (including a 27% reduction in operating expenses).

£3.3m funding success for offshore wind projects to drive forward maritime decarbonisation

ORE Catapult has successfully won £3.3m funding for five projects as part of the Clean Maritime Demonstration Competition, funded by the Department for Transport and delivered in partnership with Innovate UK. The projects will convene industry, the supply chain and Government to address the policy, commercial, regulatory and technical barriers to achieving maritime decarbonisation.

One of the Competition's flagship projects is a feasibility study into establishing a National Clean Maritime Demonstration Hub in ABP's Grimsby docks – the world's largest offshore wind O&M Port.

The decarbonisation of the UK's maritime fleet is essential if we are to achieve Net Zero by 2050 and transitioning to a future of zero-emissions shipping with clean vessels and alternative fuels is vital. As both a potential producer and user of clean fuels, the UK's offshore wind industry is in a unique position to act as a springboard for that broader maritime decarbonisation.

Windcat Workboat Vessel

TetraSpar Demonstrator ApS.
(Credit: Stiesdal)

UK Government Joins ORE Catapult's Floating Wind Centre of Excellence

The Centre welcomed the UK Government's Department for Business, Energy and Industrial Strategy (BEIS) as a new strategic partner, further strengthening the Centre's mission to accelerate the growth and commercialisation of the floating offshore wind sector. BEIS will join the 15 existing partners helping set the groundwork to realising the huge economic and environmental benefits the floating offshore wind sector will bring to the UK and facilitating the delivery of a cost-effective Net Zero.

The Centre's outputs provide an evidence base for key strategic and policy decisions relating to the development of floating offshore wind, with a portfolio of 26 projects in delivery or already delivered and approximately £3.5m of funding committed by partners to date. BEIS's £2m contribution forms part of the £1bn Net Zero Innovation Portfolio.

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