



SUE BARTLETT-REED CHAIR

UK MARINE ENERGY COUNCIL





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**UK MARINE
ENERGY COUNCIL**

THE TROUBLE WITH TIDAL – A PREDICTABLE OPPORTUNITY

Blue Invest -- Greenwich Maritime

9th September 2024



Marine Energy Council

- Set up April 2018 to meet challenge of political position on marine renewables.
- Progression from the ORE Cost Reduction Strategy Advisory Group.
- 40+ organisations - developers, academia, test centres, industry associations.
- Introduction of concept of marine energy strategy and reinvigoration of the CfD for revenue support.
- Focus on seeking industry consensus, collaboration and political engagement.

‘Voice of the wave and tidal stream sector’

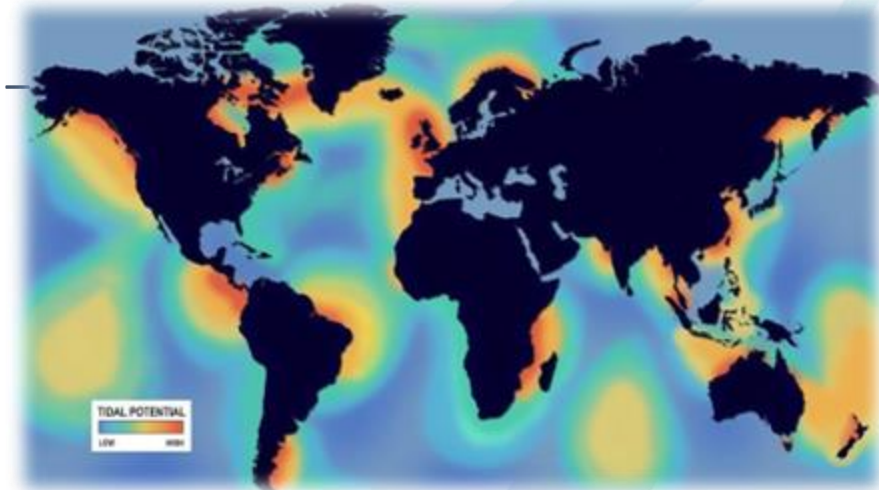
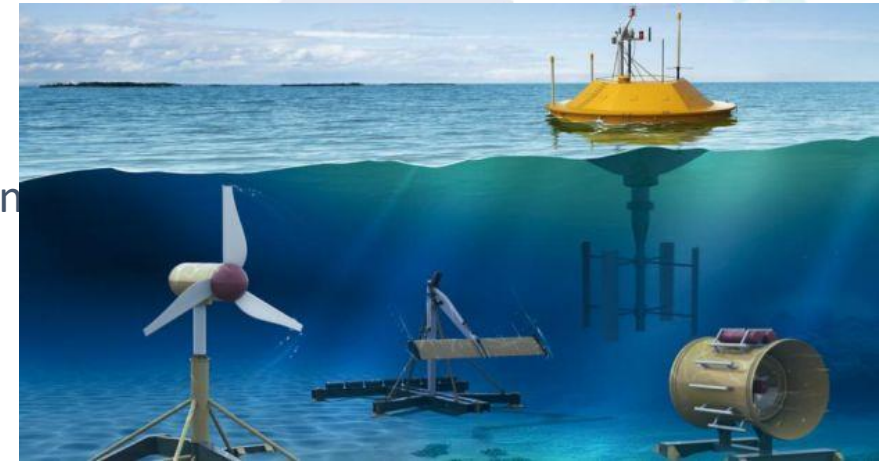
Delivering Net Zero



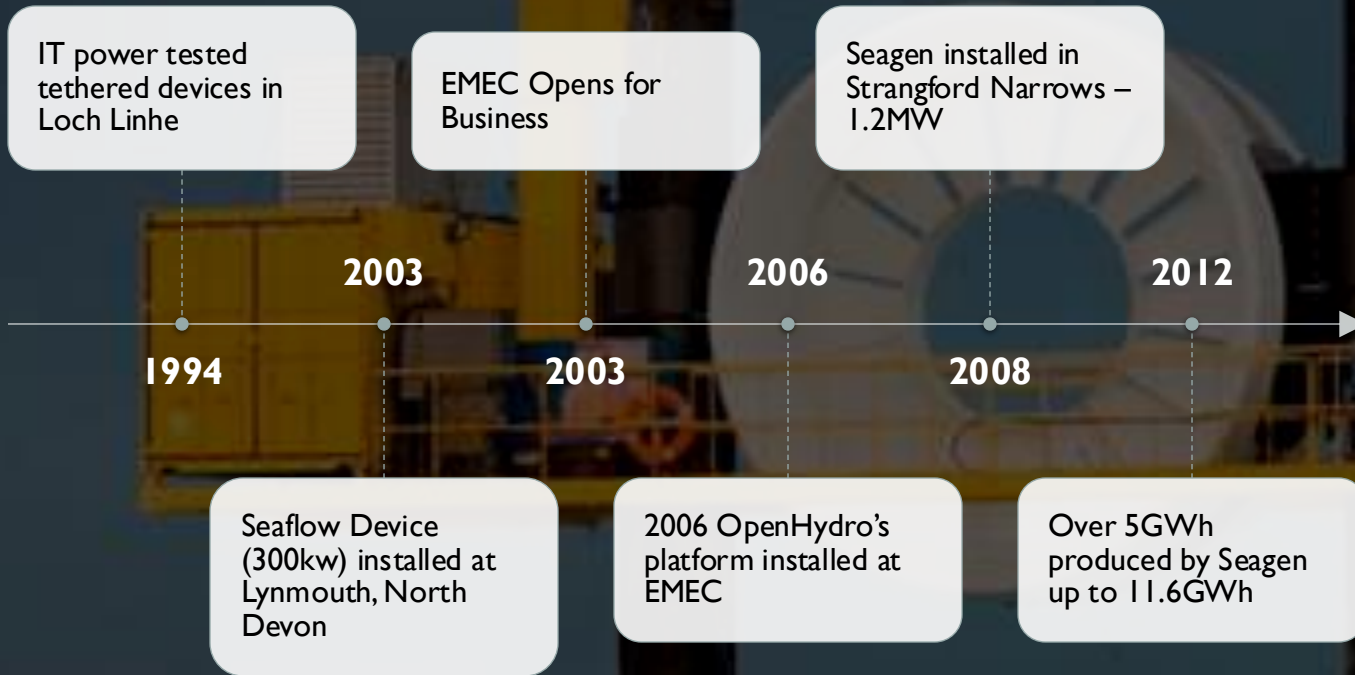
- The path to net-zero emissions is challenging: staying on it requires immediate and massive deployment of all available clean and efficient energy technologies.
- World Economic forum - **Without the support of policymakers, businesses and other organizations, the transition may not happen quickly enough to stay under the 1.5° Paris global warming target.**
- Reaching net zero by 2050 requires further rapid deployment of available technologies as well as widespread use of technologies that are not on the market yet.
- Clean energy innovation must accelerate rapidly, with governments putting R&D, demonstration and deployment at the core of energy and climate policy.

Tidal Stream Energy

- Tidal energy is generated by extracting kinetic energy from the power of moving water – tidal streams created by the gravitational pull of the moon and sun on our oceans.
- It is completely predictable.
- It is not driven by weather patterns avoiding intermittency.
- The UK practical resource is estimated at 34TWh/year equivalent to 11% UK energy demand or 11.5Gw potential.
- Currently the UK is one of the only jurisdictions to offer a route to market – **41MW of tidal stream energy were awarded 15 year CfDs @£178 MWhr in the last AR5 CfD auction.**
- **28MW awarded @£172 MWhr, 6 projects in AR6.**
- Demand for tidal stream development sites increasing, 128MW eligible capacity with roadmap.



1994 – 2003 Growing Ideas



2008 - 2013

OpenHydro installed a subsea gravity base foundation

Andritz Hydro installed the HS 1000 1MW turbine at EMEC

Alstrom ReDapt installed a 1MW turbine at EMEC

2010

2011

2013

2008

2011

2013

TGL installed Deepgen

Atlantis installed the AR 1000 turbine at EMEC

Voith Hydro 1MW HyTide turbine at EMEC



UK Tidal Energy – Current Position

- Significant Government and public investment to date (EMEC £34m, Morlais, £31m, WaveHub, Pembroke Dock Marine, R&D funding), leasing rounds and demonstration zones.
- Removal of the marine energy ‘ring fence’ in the 2019-2021 CfD allocation rounds.
- 2017 saw the Clean Growth Strategy & Industrial Strategy set out the policy positions.
- Marine sector – need to provide evidence on performance, cost reduction and collaborate.
- 2018 – ORE Cost Reduction report, MEC established, notable downturn in marine activity in UK.
- 2019-2021 – significant consultations with the UK Government.
- 2022 – **AR5 ringfence of £20m – delivering 41MW capacity @£178MWh**
- 2023 - £10m ringfence in annual auctions.
- 2024 – Over 65GWh on grid and 130MW in pipeline for 2029



Tidal Progress



Nova Innovation

- 2016 – deployed first tidal array x 3 100kW turbines
- 2018 – battery storage added
- 2024 awarded CfDs for projects at EMEC



Orbital Marine Power

- 2016 - launched the **SR2000**, the world's most powerful tidal stream turbine. It produced in excess of 3GWh of electricity over its initial 12 months. 2021 – 02 Launched, now generating.



SIMEC Atlantis

- The world's largest tidal-stream array ran for all of 2019, the longest ever period of uninterrupted generation from a multi-megawatt tidal turbine installation
- The MeyGen array, on the northern coast of Scotland exported energy equivalent to the **annual consumption of about 3,800 UK homes in 2019**
- **+62GWh** of electricity to the grid

Tidal Stream



April 2021 - From Dundee to Orkney

July 2021 – Generating power into UK grid

FORWARD 2030 Project



Global Opportunity

- Ocean Energy worth £76bn by 2050
- Over 65GWh on UK grid
- 1 GW leased sites
- High UK content – 80-95%
- LCOE costs set to match other forms of renewables.
- UK geographically diverse supply chain supporting a global market.
- 11 GW potential in UK waters
- Technology reaching higher TRL levels



Contracts for Difference – AR6

- 6 Projects, 28MW awarded in Wales and Scotland.

- HydroWing – 10MW in Wales

- MeyGen – 9MW in Scotland

- Seastar – 4MW in Scotland

- Magallanes – 3MW in Scotland

- Ocean Star Tidal – 2MW in Scotland



OUTLOOK

EUROPE

FUTURE DEPLOYMENT LOCATIONS

TIDAL STREAM
WAVE ENERGY

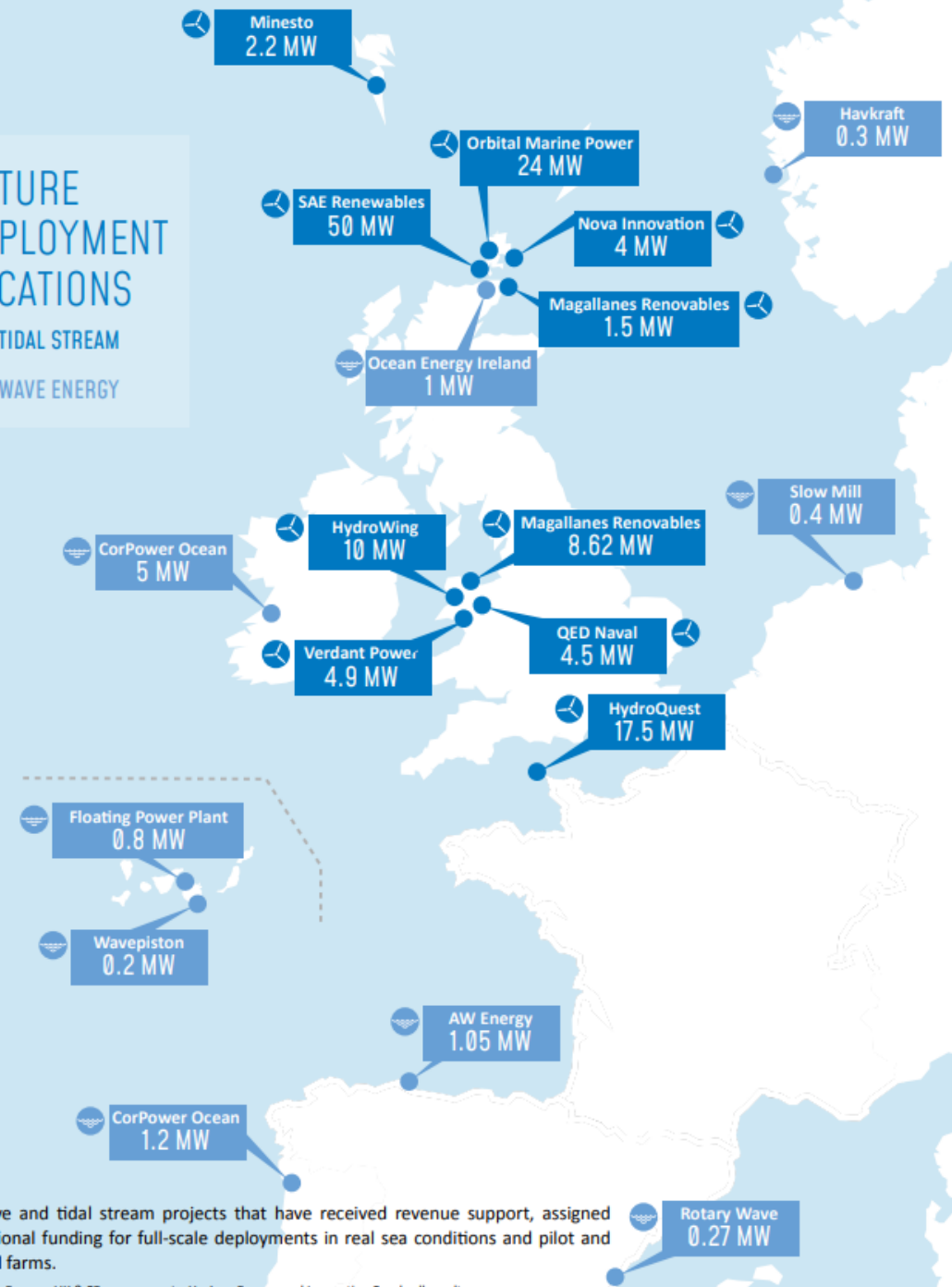


Figure 12: Wave and tidal stream projects that have received revenue support, assigned PPA, or EU/national funding for full-scale deployments in real sea conditions and pilot and pre-commercial farms.

Source: Ocean Energy Europe, UK & FR governments, Horizon Europe and Innovation Fund call results.

AR6 – Onward Consideration

At £172/MWh

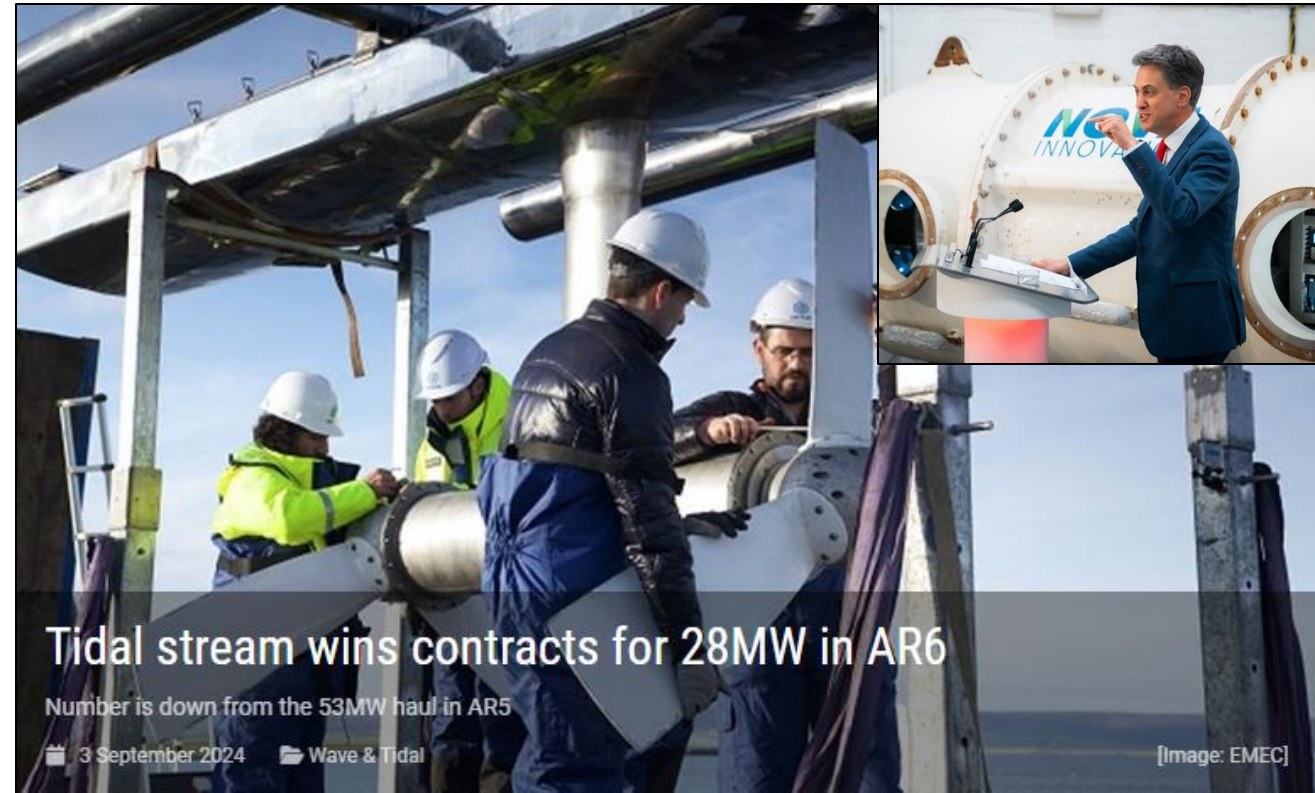
- A 34% saving against the Administrative Strike Price
- Highest saving in terms of % of any technology.

All tidal stream capacity for delivery 2028/29

- The CfD mechanism has **121MW of contracted tidal stream capacity from ARs 4,5 and 6.** (83MW in Scotland, 38MW in Wales)
- Government now reviewing GB Energy and marine energy future – supply chain, economic benefits, distributed and supporting generation all considerations.

Energy Minister Michael Shanks said:

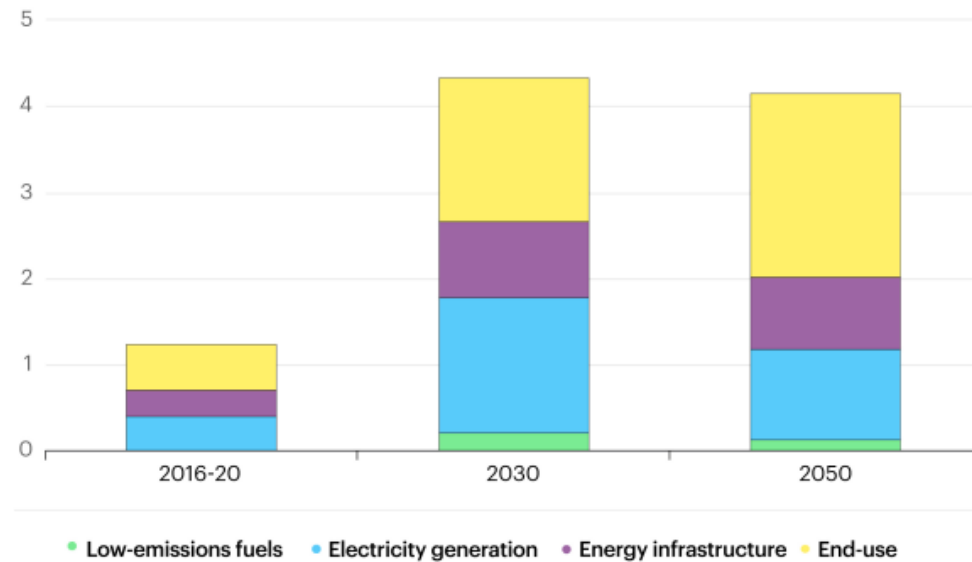
- “ Securing new wind turbines, solar panels and cutting-edge technologies such as tidal will boost growth, catalyse investment and support good jobs across Great Britain.
- “ We’ve done this while ensuring value for money for billpayers, delivering the biggest auction round to date at competitive prices, helping turbocharge our mission for energy independence and clean power by 2030.”





Clean energy investment in the net zero pathway

trillion USD (2019)



2050 – Horizon Scan

- By 2050, global energy demand is around 8% smaller than today, but it serves an economy more than twice as big and a population with 2 billion more people.
- Almost 90% of electricity generation comes from renewable sources, with wind and solar PV together accounting for almost 70%.
- Marine energy has a role to play in coupling with storage in the additional 20%, unique applications and spatially diverse generation.
- Creates highly skilled, job creation close to point of deployment and UK wide. High per MW job creation – diversification and growth.

A sea change to net zero

The tide is turning for the UK's marine energy market, writes **Sue Barr**, chairperson of the Marine Energy Council

Our current climate crisis demands innovation in energy generation. To reach our targets, we must change how we generate, distribute, and consume electricity. Renewables have, on certain days, reduced coal power generation to zero but we need diversity in energy generation. Today, the UK leads in ocean energy – harnessing the power of the waves and predictable tides around our islands. Our coastline accounts for 35 per cent of Europe's wave resources and 50 per cent of its tidal resources.

Estimates predict 20 per cent of UK electricity could be supplied by ocean energy with a net cumulative benefit of £1.4bn by 2030 from tidal energy providing 4,000 new jobs in regional economies, while wave energy is predicted to support 8,100 jobs by 2040. However, marine energy needs a market. The UK Marine Energy Council believes that marine energy can meet the UK government's "triple test" for support in the following ways:

Achieving maximum carbon reduction

For every kWh generated by marine energy, 39.4g of CO₂ is saved in

comparison to conventional generation. Marine energy could provide a reduction of 4 MtCO₂ per year from 2040.

Cost reduction pathway

Marine energy is becoming cheaper. With 200 MW of deployment, tidal stream generation could reach £150 MW/h. Further rapid reductions in costs can also be achieved.

The UK's global advantage

We lead in the development of technology, with UK companies such as Orbital Marine Power, QED Naval, Marine Power Systems, and Nova Innovation.

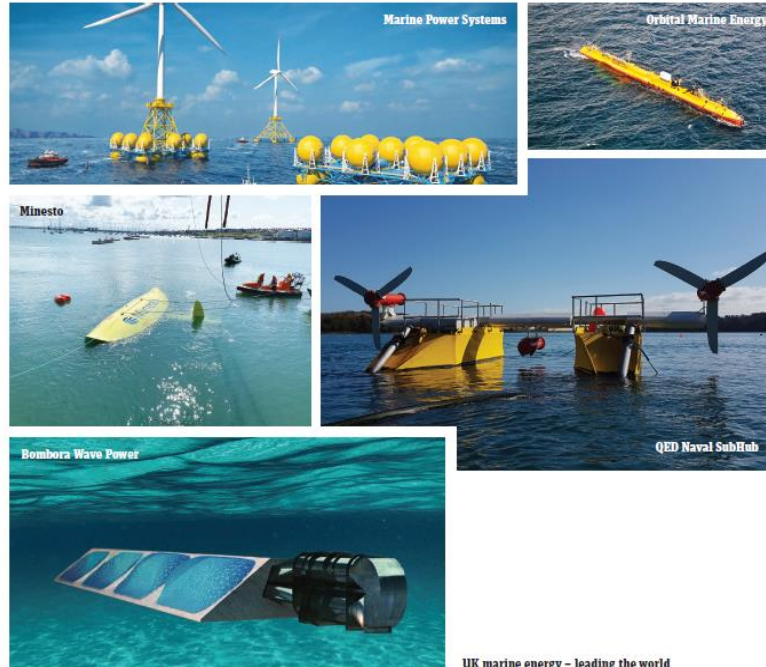
The European Marine Energy Centre (EMEC) established in 2003, is a world first, hosting multiple projects, including the FORSEA Interreg NWE project. Through FORSEA Orbital's SR2000 2MW, the world's most powerful tidal turbine, produced over 3 GWh of generation in 12 months powering over 800 homes. That represents 7 per cent of Orkney's electricity demand – so for one day in every 14, a community ran completely on tidal energy.

MeyGen, the world's largest tidal array was deployed in Scotland by Simec Atlantis and the UK hosts several global companies. Swedish tidal developer, Minesto, based operations in Anglesey, and Bombora Wave Power, an Australian wave energy company, has headquartered European operations in Pembrokeshire.

UK tidal technology is also part of the €46.8m Interreg Tidal Stream Industry Energiser Project to deliver tidal energy in France and the UK with investment driving significant supply chain development. A diverse range of firms now have unprecedented experience in the sector, exporting skills globally.

Economic opportunity

Marine energy can deliver regional economic opportunities to areas such as the Highlands and Islands of Scotland,



UK marine energy - leading the world

Ocean energy could be worth £1.4bn by 2030

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and the South West of England and the coast of Wales. Up to 60 per cent of the economic benefit of both GVA and jobs will be in coastal areas. The International Energy Agency forecasts that around 337 GW of ocean energy capacity could be deployed globally by 2050. This represents a £76bn market and a huge opportunity to export.

The UK lead is at risk

Government support of marine energy is critical to deliver this sector. The Marine Energy Council has proposed three interlinked support models to

deliver marine energy to a cost-competitive position and secure a predictable, clean energy supply for the UK. This includes an Innovation Power Purchase Agreement (IPPA) and innovation "pot" for emerging technologies through the Contracts for Difference (CfD) framework. Revenue support will deliver our marine energy future, supporting the government's own clean growth targets.

Ocean energy can commercialise here in the UK and ensure that we retain the world lead in this emerging industry.

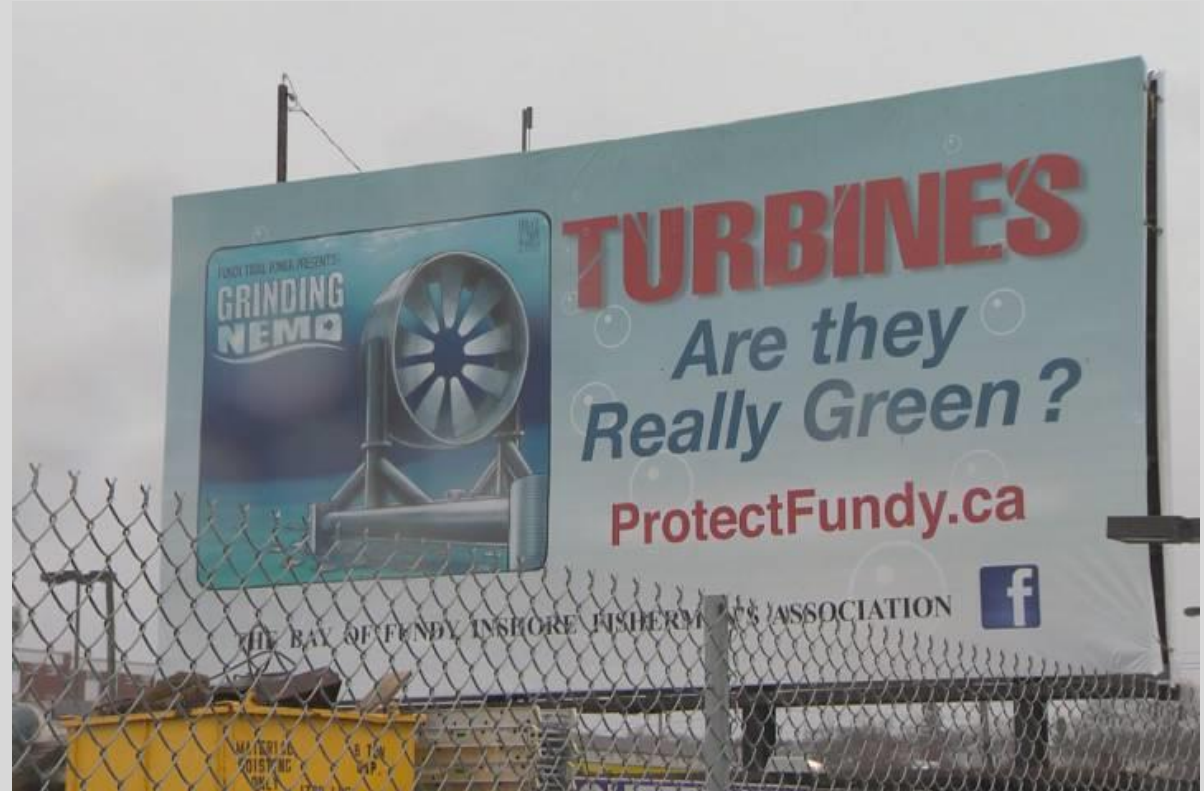
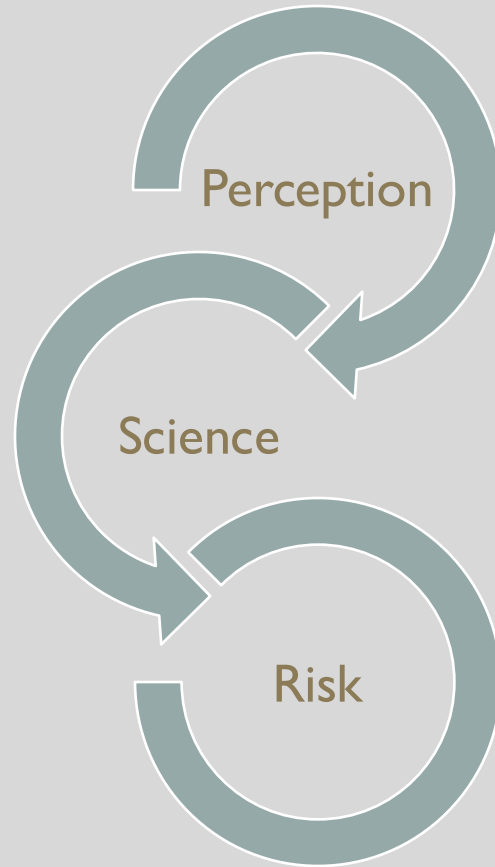
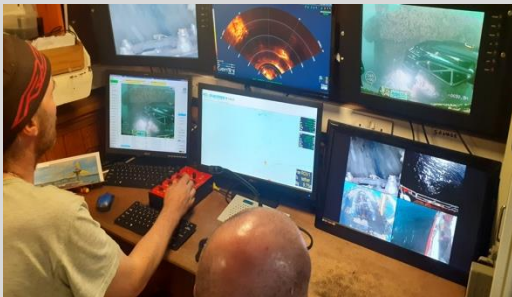
Are you with us?

DEMONSTRATING CAPABILITY

IN ASSOCIATION WITH



Blue being Green



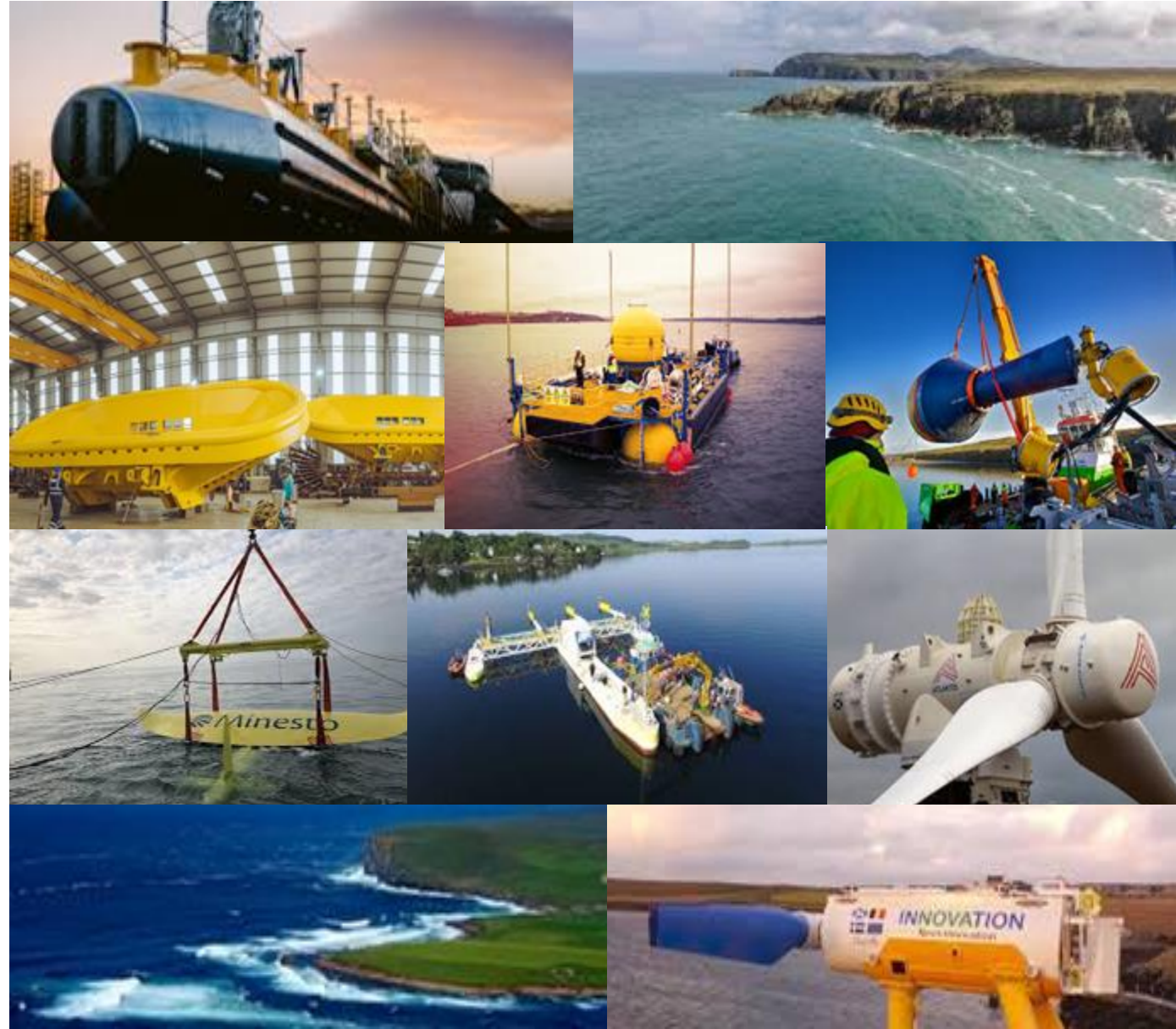
Must determine what data and studies will answer the real scientific challenges and increase confidence.

EMR and CfD Considerations.

Unlocking the Wave and Tidal Stream Market in the UK



- Long term visibility on revenue, including strategy and delivery pathways to secure the benefits.
- Evidence and shared collaboration on cost and reliability.
- Ability to consider non-price criteria – through eligibility or policy.
- Collaborative market determination – CfD becomes responsive and long term visibility.





Benefits to Economy

- Tidal stream alone could reduce the UK's required gas capacity by over 40%, from 8.1GW to 4.9GW
- 6.2GW of tidal stream deployment by 2050 would lead to a **reduction in the annual dispatch cost from £13.5bn to £12.5bn.**
- Tidal stream could provide £1.4bn benefit to the UK economy by 2030 whilst supporting 4000 jobs. Forecast to be worth up to £17bn Gross Value Added per annum to the UK economy by 2050.
- Tidal stream projects have over 80% UK supply chain spend.
- Tidal stream turbines are currently generating electricity in Shetland, the Pentland Firth and Orkney, and have produced over **65GWh** of clean, predictable renewable electricity, equivalent to the annual consumption of 20,000 households.
- Wave energy can follow closely, providing significant balancing benefits and multi-use advantages.



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THANK YOU

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