Energy Security and Net Zero Committee Inquiry
Keeping the Power on: our future energy technology mix
Marine Energy Council response

Introduction

The Marine Energy Council (MEC) welcomes the opportunity to respond to the Energy Security and Net Zero Committee's inquiry into the UK's future energy mix.

The MEC is the voice of the UK's tidal stream and wave energy industries. Established in 2018, the MEC's membership spans technology and project developers, associations, manufacturers, and small and medium sized enterprises working in the supply chain. Our vision is for the marine energy sector to support a secure, cost-effective, and fair transition to net zero, enabling investment, exporting great British innovation, and levelling up with employment opportunities across the UK.

A diverse generation portfolio is critical to a secure and cost-effective transition to net zero. The UK has been successful in deploying wind and solar and now must take the necessary steps to harness its waves and tides.

- **Tidal stream energy** is entirely predictable and can provide 11%[1] of the UK's electricity demand. Tidal stream turbines capture the kinetic energy of the currents that flow around coastal areas, unlike tidal lagoons or barrages which require large barriers to be built. This firm power energy resource can directly displace dependence on imports and can be deployed rapidly, with the construction time of a consented tidal stream farm being less than three years.
- **Wave energy** could provide up to 20%[2] of the UK's electricity demand. When wave energy converters are collocated with offshore wind reduce the levelised cost of energy for both projects by 12%.[3] This harmonious relationship with offshore wind means that wave energy will support a more cost-effective and efficient energy system. [4]

Predictable and consistent renewable generation, in a system that becomes increasingly reliant on intermittent sources, will be critical in delivering the UK Government's decarbonisation targets, and in ensuring economic growth opportunities are created and shared in coastal communities and beyond in the transition to net zero.

[1] Coles et al (2021) *A review of the UK and British Channel Islands practical tidal stream energy resource*. Available online.
[2] Jin et al (2021) *Wave energy in the UK: Status review and future perspectives.* Available online.
[3] Offshore Wind Consultants Ltd (2023) *Wave and Floating Wind Energy*. Available online.
[4] In this response 'marine energy' is used to refer to tidal stream and wave energy.

1. Is the energy sector open enough to new generation technology?

and

2. Does the Government sufficiently support development of innovative energy infrastructure?

The UK energy sector responds to policy and regulatory signals. The CfD has been successful in rapidly increasing renewable deployment in the UK. However, a focus on the Levelised Cost of Energy (LCOE) rather than on the value different technologies can provide within the generation mix, has led to market distortions that the Government is seeking to address through the Review of Electricity Market Arrangements (REMA) process.

To ensure that the energy sector is open to technologies that will be critical to a secure and cost-effective transition to net zero, the Government should ensure the following support is provided:

New generation technologies require a clear and consistent route to market

The development of tidal stream energy (TSE) in the UK has been hampered by a lack of a clear and consistent route to market, with no revenue support in the UK from 2016 until 2022 and the introduction of a £20m ringfence within the CfD mechanism. The industry responded strongly and over 40MW of contracted TSE capacity was secured. With the CfD changing from biennial to an annual auction, the UK Government announced that the ringfence will continue at £10m in AR5. While this is a welcome development the industry has no certainty that support will be available in the next auction round (AR6 in 2024) and beyond.

New generation technologies require clarity and a consistent route to market to attract the private investment needed to drive the technology down the cost reduction curve. For TSE, costs are forecast to fall to £78/MWh by 2035, cheaper than new nuclear projects, and below £50/MWh by 2050, provided the right policy framework is in place.[5]

In addition, for capacity to be 'eligible' to bid into the CfD mechanism, a project requires having a lease agreement, marine licence and grid offer in place. This is a costly process that projects will only go through if there is a clear and consistent route to market.

Currently wave energy technology competes within Pot 2 of the CfD. Without a ringfence for wave energy there will not be a successful project, despite the significant grid and economic benefits that are outlined in our response to the next question. The EU is supporting delivery of a 5MW array in Ireland, and there is a risk that the industry in the UK does not develop due to a lack of ringfenced support.[6]

Currently the Government announces ringfences months prior to the allocation round closing. A commitment to maintaining a ringfence for TSE, and introducing one for wave energy, will help prime supply chains to maximise UK content. This approach would create the environment to attract technology agnostic developers to invest in new sites, obtain development rights and increase the amount of eligible capacity available to be bid into future rounds.

Regulatory regimes need to be proportionate with the risk posed by the projects.

The offshore regulation regime was designed for large-scale wind rather which is not proportionate for other technologies. Relatively small-scale marine energy projects are required to go through the same consenting process as multi-GW offshore wind farms and face greater hurdles than onshore projects where a Section 36 consent is required for projects over 50MW (offshore requires a Section 36 consent

[5] ORE Catapult (2022) *Cost reduction pathway of tidal stream energy in the UK and France*. Available online.
[6] Offshore Energy (2023) *EU innovation Fund backs two major ocean energy projects*. Available online.

for projects over 1MW). These issues are exacerbated by consenting agencies not having the capacity to respond in a timely manner to applications.

This process is disproportionate and time-consuming. In Scotland the consenting process can take, at a minimum, 4 years, and often longer. As noted above a consent is a required for a project to be eligible to bid into the CfD process and access revenue support.

Renewable deployment mechanisms currently do not support innovate approaches to deployment

Diversity and innovative deployment of renewable technologies will be key in optimising how the energy system is utilised. Waves are created by winds but provide a more consistent generation profile and can be harnessed 3-8 hours after the energy is initially harnessed by wind farms. Co-locating offshore wind and wave energy converters allows technologies to share assets and can reduce costs by 12% for both projects.[7]

The Government could consider committing to a pilot hybrid wind-wave project as a step toward commercialisation and position the UK to be a world-leader in innovative offshore renewable deployment. This follows the example set by Denmark for floating solar power, where the next generation of offshore wind farms are expected to deploy 5MW of floating solar capacity. This requirement is set to ramp up to 100MW for the next leasing round, creating a long-term market that will attract investment into innovative technology. A similar approach could be used to support hybrid deployment of wave power.

TSE is strongly positioned to, when partnered with battery energy storage system (BESS) technology, provide renewable baseload energy. Scottish tidal energy developer Nova Innovation has already piloted this approach with a pioneering BESS and tidal project, which has been operating since 2018 at their Shetland Tidal Array, providing flexible, reliable power to the grid.

The UK Government should provide innovation support for marine energy technologies.

There is currently limited innovation support or demonstration programmes available for marine renewables in the UK, and ongoing uncertainty around UK participation in the Horizon programme is damaging. Between 2017-2022 wave energy received £39m funding (with Wave Energy Scotland accounting for £35m of that total) and TSE only £15m in the UK.[8] This lack of investment puts the UK's global lead at risk and should be addressed with urgency. The Net Zero innovation Portfolio set out funding opportunities for range of different technologies but excluded wave and TSE. This should be addressed as a matter or urgency.

R&D support will continue to be crucial in enabling further step-change technology cost reductions, with significant impact on overall learning investment to reach competitive LCOE. A 2021 paper by Kerr et al. suggests that a 10% step-change cost reduction can reduce overall learning investment by approximately a third on the road to achieving target LCOE.[9]

An increase in the technology learning rate from 10% to 15% has the potential to reduce the total investment required for tidal stream from **£18.6bn to £3.3bn** and reduce the total investment required for wave from **£20.5bn to £3.0bn** when delivering 6GW of each technology by 2050.[10] This learning rate can be achieved through making more funding available for innovation.

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[7] OWC (2023) *Wave and Floating Wind Energy, opportunities for sharing infrastructure services and supply chain.* Available online.
[8] Supergen (2023) *What is the Optimal Balance of Development and Deployment Policy Support Mechanisms for Wave and Tidal Power?*
[9] P. Kerr et al. (2021) – Implementing Radical Innovation in Renewable Energy Experience Curves. *Energies,* 14(9), 2364. Available online.
[10] University of Edinburgh (2023) *Ocean Energy and Net Zero: Policy Support for the Cost-Effective Delivery of 12GW wave and Tidal Stream by 2050.* Available online.

The UK Government can support innovative deployment through replicating the incentive structure provided to North Sea oil and gas.

A PwC survey of its clients found that 89% of businesses believe green incentives will stimulate investment in the scenario that it would provide additional or accelerated tax relief, with only 7% stating there was no need for a green investment scheme. The Government has designed capital allowances to incentivise investment in North Sea oil and gas. These allowances have not been provided through the Electricity Generators Levy. [11]

Addressing this discrepancy is a means of competing against the US's Inflation Reduction Act (IRA), and the EU's response, without burdening UK households or taxpayers. The IRA is already pulling investment and supply chains from the UK and is making over $1.7bn available to marine projects. [12] [13]

[11] PWC (2023) *Capital allowances reform – a green opportunity?* Available online.
[12] The Times (2023) *Biden's green subsidies could lure gigafactory away from Dundee.* Available online.
[13] US Government (2023) *Building a Clean Energy Economy: A guidebook to the inflation reduction act's investments in clean energy and climate action.* Available online.

3. **Is the Governments plan for energy security sufficiently long term?**

and

4. **What current technologies could usefully be deployed at scale to deliver better energy security in the UK?**

and

5. **Are there technologies that have not been able to develop their potential and should be abandoned?**

The UK has over 30GW of unharnessed marine energy resource and the British Energy Security Strategy (BESS) committed to aggressively exploring renewable opportunities afforded by UK geography. The marine energy sector requires more clarity as to what this will look like in practice. When harnessed marine energy could provide around a third of the UK's current electricity demand.

TSE is a proven technology, that has already delivered over 70GWh of entirely clean, predictable electricity, to the UK system. Its predictability means it is well suited for replacing the firm power role that fossil fuels currently play on the energy system. Modelling by Imperial College London has shown that TSE can reduce the UK's required CCGT capacity to meet its energy needs by over 40%, from 8.1GW to 4.9GW.[14]

As the UK becomes increasingly dependent on wind and solar energy, which will dominate the UK's future energy mix, TSE and wave energy will support this transition and provide a critical service to the energy system.

Marine energy reduces overall system cost

Deployment of just under 13GW of marine energy will reduce annual dispatch cost from £13.5bn to £12.5bn, an annual saving of over £1bn for UK households. This cost reduction comes from a higher dispatch of renewable energy – by up to 27 TWh (+6%), and thus a lower requirement for expensive peaking generation – by as much as 24 TWh (-16%) when wave and tidal generation are part of the electricity mix, compared with a scenario without marine energy generation.[15]

This system benefit is not currently valued in the CfD mechanism. The Review of Electricity Market Arrangements (REMA) consultation provides an opportunity to address this issue.

The UK can harness its indigenous resource with indigenous supply chains

Marine energy is being delivering with significant UK supply chain content spend. Orbital Marine Power's O2 device was delivered with 80% UK supply chain spend. The O2 was conceived in Orkney, designed in Orkney and Edinburgh, built in Dundee with steel from Motherwell, blades from the Solent, anchors from Anglesey and hydraulics from the Midlands. In the first 18 months of operation of Nova Innovation's world-first offshore tidal array in Shetland, 98% of supply chain expenditure went to UK companies, with 60% going to companies in the Highlands and Islands region.

The UK's ability to act independently in developing supply chains and harnessing its marine resource is significant. By supporting marine energy now, the UK Government not only bolsters energy security

[14] Frost (2022) Quantifying the benefits of tidal stream energy to the wider UK energy system, available online.
[15] Supergen (2023) *What are the UK power system benefits from deployments of wave and tidal stream generation?* Available online.

but could embed UK supply chain content in projects around the world. Ocean energy has a global potential of 350GW by 2050.[16] The UK should seek to capture as much of this market as possible.

The Government's current approach to renewable technologies will not deliver its net zero targets

The majority of respondents to the REMA consultation do not believe current electricity market arrangements will not deliver the UK's decarbonised electricity system by 2035 target. Prioritising deployment of lowest LCOE renewables today needs to be combined with a system view of delivering the most cost-effective net zero energy system in the future. TSE and wave energy will have key roles in providing part of the solution to how electricity is generated when the wind doesn't blow, or the sun doesn't shine.

As the International Energy Agency Net Zero roadmap outlines, reaching net zero requires rapid deployment of available technologies as well as rapid commercialisation of technologies that are not on the market yet.[17] Major innovation efforts must occur over this decade to bring these new technologies to market in time. At this point abandoning technologies like TSE or wave energy would undermine net zero efforts at a point in which a ramp up of ambition and support is required.

[16] IRENA (2023) *Scaling up investments in ocean energy technologies.* Available online.
[17] International Energy Association (2021) *Net Zero by 2050 A Roadmap for the Global Energy Sector.* Available online.

6. What energy generation mix will get us to net zero the quickest in the most affordable way?

and

7. Are the energy solutions universal across the UK or are there regional and local approaches on fuel and energy?

The transition to net zero needs to be contextualised and considered with the UK's broader aims and targets

The transition to net zero provides a significant economic opportunity to grow the industries of the future, whilst creating jobs opportunities and supporting supply chains across the UK. The UK government has launched the Non-Price Factors Consultation, to consider how the CfD can deliver more for the UK. This recognises that the CfD has not delivered the job growth or UK supply chain content spend that is desired.

In the 1980s Denmark invested early in their wind energy industry, delivering projects with high levels of local content, and developing its domestic market. In the process it gained first mover advantage and in exports alone its wind sector generates over £7bn annually for the Danish economy. In 2012, 88% of Denmark's exports were associated with tidal turbines and components.[18] By contrast the UK's wind sector, Europe's largest generator of wind energy, exports less than £0.5bn annually and is a net importer of wind technology, principally from Denmark.[19]

With the right support marine energy will deliver significant economic benefit to the UK, and up to £41bn Gross Value Added to the UK economy by 2050.[20] As noted marine energy supply chains span across the UK, and a significant amount of the economic benefit (50-60%) is expected to be generated in coastal areas that have been targeted in need for economic investment.[21] Investment in marine energy will consolidate the UK's global lead in this sector, creating jobs and boosting exports, following the example set by Danish wind.

The London School of Economics has found that average returns on public investments in innovation in TSE is comparatively higher than investment in other renewable technologies, and that marine energy **strongly supports balanced economic growth.**[22]

Considering net zero outside of the Government's other aims for green growth, levelling up and Global Britain. Over 90% of the world's economies are now covered by net zero targets. The demand for harnessing the resources provided by oceans' waves and tides will continue to grow. The UK should seek to lead in developing and deploying these critical technologies, investing in green technology, and exporting it to the world.

[18] Deloitte (2012) *Study of the macroeconomic impact of Wind Energy in Denmark.*
[19] State of Green (2021) *The economic benefits of wind energy*. Available online.
[20] University of Edinburgh (2021) *What is the value of innovation ORE deployment to the UK economy?* Available online.
[21] Catapult ORE (2018) *Tidal Stream and Wave Energy Cost Reduction and Industrial Benefit*. Available online
[22] Resolution Foundation (2022) *The Economy 2030 Inquiry.* Available online.