The All-Party Parliamentary Group (APPG) for the Ocean
Future of Ocean Technology inquiry
Marine Energy Council (MEC) response

Introduction

The Marine Energy Council (MEC) welcomes the opportunity to respond to the APPG for the Ocean's inquiry into the future of ocean technology.

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 2035 ambition, 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.

Executive Summary

The UK has significant marine energy resource that can support a secure and cost-effective transition to net zero.

- The UK has over 30GW of tidal stream and wave energy capacity.
- Deploying just 12GW of this will lead to an annual reduction in energy system cost by over £1bn, whilst delivering to £41bn GVA benefit to the UK economy.[5]
- Both tidal stream and wave will be cheaper than new nuclear at 1GW of deployment. Tidal stream will reach £78/MWh by 2035 and below £50/MWh by 2050.[6]

Tidal stream projects are being delivered with over 80% UK supply chain spend.

- Tidal stream has already provided over 60GWh of predictable renewable energy to the UK system, and over 70MW is forecast to be deployed in British waters by 2028.
- The Government should seek to embed UK supply chain content not only in UK but global TSE deployment, with over 100GW of deployment potential.
- The London School of Economics (LSE) recent report into tidal stream found that the UK has the opportunity to be a world leader in tidal stream energy, enhancing net zero efforts, improving energy security and generating jobs across the country.

Wave energy is the world's largest untapped energy source and provides a significant opportunity for colocation with offshore wind.

- Co-locating wave and wind energy technologies will deliver a saving of up to 12% in the Levelised Cost of Energy (LCOE) for both projects.[7]
- Wave energy is reaching commercialisation. It is the world's largest untapped source of energy with the Intergovernmental Panel on Climate Change (IPCC) estimating that the potential annual global production at 29,500 TWh, which could provide clean electricity for over 500 million homes.

Support for marine energy will create green growth in coastal communities and across the UK.

- By 2030 the tidal stream industry could generate a cumulative benefit £1.4bn to the UK economy, whilst supporting 4,OOO jobs. With wave energy this could be over 22,000 jobs by 2040.[8]
- The Resolution Foundation in its Economy 2030 report notes that technologies like tidal 'are not only likely to generate relatively high national economic returns, but also have the potential to contribute to regionally balanced growth.'[9] Investments in wave and tidal technologies in less innovation-intense regions generate strong returns for those regions.

Key industry asks

To realise the UK's marine energy potential the UK Government should:

- Establish a ministerial-led taskforce with industry to realise the UK's marine energy potential.
- Set a 1GW deployment target for tidal stream target and 300MW for wave energy by 2035.
- Maintain a clear route to market through multiyear CfD budgets and ongoing ringfenced support.
- Accelerate the consenting process to get technology in the water more quickly.

[5] University of Edinburgh (2021) *What is the value of innovation ORE deployment to the UK economy?* Available online.
[6] ORE Catapult (2022) *Cost reduction pathway of tidal stream energy in the UK and France*. Available online.
[7] Offshore Wind Consultants Ltd (2023) '*Wave and Floating Wind Energy*'. Available online.
[8] ORE Catapult (2018) *Tidal Stream and Wave Energy Cost Reduction and Industrial Benefit*. Available online.
[9] Resolution Foundation (2022) '*The Economy 2030 Inquiry*'. Available online.

Questions

1. Are we currently experiencing an ocean technology revolution?

The UK has significant marine energy resource. Accessible wave and tidal stream resource, when harnessed, could provide over 30% of its current electricity resource. This resource, afforded by the UK's geography, is matched with the maritime and offshore expertise to harness this power.

With an enabling policy, regulatory and consenting environment the industry is ready to work toward delivery of over 30GW of marine energy potential.

In the 2022 renewable auction, the Government included a £20m ringfence for tidal stream energy. The industry responded strongly and over 40MW was contracted. With the announcement that the ringfence will continue in the current renewable auction, albeit reduced to £10m the UK is forecast to have over 70MW of tidal stream energy in its waters by 2028. This is more TSE capacity than has been deployed worldwide, ever.

There is significant progress within wave energy. For example, Mocean's work with Baker Hughes and Verlume (more details provided in Q3) and CorPower piloting its technology in Portgual, demonstrate a sector nearing commercialisation. Wave energy should have a ringfence in future renewable auctions, and near-term policies to incentivise its uptake in islanded systems offshore where local power provision can save cost and carbon by avoiding the need for running long cables from shore to electrify offshore equipment.

There are, however, a series of issues that may hamper the ocean technology revolution:

Marine energy requires a clear route to market

The tidal stream industry currently has no certainty that support will be available in the next auction round (AR6 in 2024) and beyond. The industry requires clarity from the UK Government to attract the private investment needed to drive the technology down the cost reduction curve. Costs are forecast to reach £78/MWh by 2035, cheaper than new nuclear projects, and below £50/MWh by 2050, provided the right policy framework is in place.

This could be solved by setting out multiyear CfD budgets with an ongoing ringfence for tidal stream or setting a 1GW target for 2035.

The UK Government should seek to introduce a ringfence for wave energy in future renewable auction rounds and consider supportive innovative deployment. As noted in our response to Q2 co-locating wind with wave could reduced the LCOE by 12% for both technologies.

Accelerate consenting

UK consenting processes are holding back delivery of tidal stream projects. For example, in Scotland the consenting process can take, at a minimum, 4 years, and often longer. Consent is a required for a project to be eligible to bid into the CfD process and access revenue support.

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

The UK should reduce the consenting review approval times from 12 to 3 months as targeted by the EU, adopt a proportionate approach to Section 36, and provide capacity to key organisations like Marine Scotland, the Marine Management Organisation (MMO) and Natural Resources Wales (NRW) to expediate the consenting process.

2. What role can new ocean technologies play in mitigating and adapting to climate change?

Marine renewables can have a key role in a secure and cost-effective net zero energy system. Research by the University of Edinburgh through Project EVOLVE has found that deployment of just under 13GW of marine energy will reduce annual dispatch cost from £13.54bn to £12.51bn. This is 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.[10] A key contributor to these benefits is that wave energy supply profiles typically match demand profiles more closely than other renewables (e.g. wind and solar). A more diverse grid, with wave and tidal energy included, brings economic benefit in terms of grid efficiency as well as energy security from potentially home-grown sectors and UK deployments.

Co-location of renewable assets will be critical to ensure the UK is making efficient use of energy system infrastructure. Wave and wind is a clear example of two technologies that when deployed together will deliver mutual benefits to the project developers and make efficient use of network assets. Waves provide a more consistent generation profile than wind and can be harnessed 3-8 hours after the energy is initially harnessed by wind farms.

A study by Offshore Wind Consultants found that co-locating wave and wind would reduce LCOE for the combined projects by 12%.[11] As the UK works towards realising its target of 50GW of offshore wind by 2030, competition for sea space will increase. Co-locating therefore supports efficient use of infrastructure (through sharing network assets) and space in the net zero transition.

3. Assess the effectiveness of emerging sustainable ocean technologies.

MRE is effective in supporting energy security

Tidal stream energy has already provided over 60GWh of clean predictable electricity to the UK energy system. Its predictability will mean it can have a key role in supporting energy security. Modelling by Imperial College London demonstrates that TSE alone can reduce the UK's required CCGT capacity by over 40%, from 8.1GW to 4.9GW. As more than half of UK gas is imported, firmer power renewable energy resources like tidal stream will be key in supporting the UK's energy security, a cost-effective transition to net zero that protects UK households from international gas price shocks.[12]

MRE is effective in decarbonising offshore activity

Marine renewables are very effective at decarbonising offshore activity. This is being demonstrated by Mocean's Renewables for Subsea Power (RSP) project launched in March 2023. The £2million demonstrator project, called Renewables for Subsea Power (RSP), has connected Mocean's Blue X wave energy converter with a Halo underwater battery developed by Aberdeen intelligent energy management specialists Verlume. The project aims to show how green technologies can be combined to provide reliable low carbon power and communications to subsea equipment, offering a cost-effective alternative to umbilical cables, which are carbon intensive with long lead times to procure and install. Large traditionally O&G focused players (e.g. Bridge Petroleum, PTTEP, Harbour Energy, Serica Energy, Total Energies) are realising such benefits and co-invested in the RSP project.[13] Such

[10] Supergen (2023) *What are the UK power system benefits from deployments of wave and tidal stream generation?* Available online.
[11] Offshore Wind Consultants Ltd (2023) '*Wave and Floating Wind Energy*'. Available online.
[12] D. Pudjianto, G. Strbac (2022) *Role and Value of Tidal Stream Generation in the Future UK Energy Mix*.
[13] Offshore Energy (2023) *Wave power for subsea equipment demo grabs oil and gas industry's attention.* Available online.

projects will be crucial in helping to meet North Sea decarbonisation targets. The energy sector is not on track to meet 2030 targets, as recently stated by the North Sea Transition Authority.[14]

MRE is effective in creating green jobs and growing UK supply chains

Support for marine renewables is effective in delivering the UK's energy goals, but also in the Government's broader aims. Tidal stream projects have far exceeded offshore wind's UK supply chain content target of 60%: Nova Innovation and Orbital Marine Power have both achieved more than 80% UK content for site construction in their most recent installations. Nova Innovation have gone on to retain 98% UK content in their operational supply chain. Research has demonstrated that TSE projects can deliver around 76 full time equivalent jobs during a project's construction, and 5.5 jobs for each MW and year during operation.[15]

The Resolution Foundation in its Economy 2030 report notes that technologies like tidal 'are not only likely to generate relatively high national economic returns, but also have the potential to contribute to regionally balanced growth.'[16] Investments in wave and tidal technologies in less innovation-intense regions generate strong returns for those regions.

The tangible societal benefit of supporting marine renewables is evidenced by the impact of the European Marine Energy Centre (EMEC) in Orkney. Since its establishment in 2003, EMEC has contributed 370 million gross value add (GVA) to the UK economy. £263 million of that was accrued in Scotland; and half of that, £130 million, in the Orkney Islands. To date £42 million public funding has been invested in the centre by public sector organisations; thus over £8 has been accrued for every £1 spent by the public purse. EMEC has created highly skilled, high value jobs and is now one of the top 20 employers in Orkney. The number of people directly employed increased from 44 to 85 between 2017 and 2023, with average earnings higher than the Orkney average.[17]

4. Outline key methods for sustainable ocean technologies.

No answer provided.

5. If there is enough funding and support for research to develop new technologies?

The UK is currently the world-leader in marine renewables. However, in terms of support in funding and research the UK's leadership has been heavily reliant on EU support. Between 2017-22 UK wave energy received £57m (£35.5m of which was the Scottish Government's support for Wave Energy Scotland) and TSE projects only received £17m of innovation funding from the UK Government and devolved administrations.

Should the required levels of technology funding for accelerated and sustained innovation be provided, UK developers have the potential to increase cost reduction rates and maintain the UK's leadership in this international sector.

Targeted innovation funding has also been proven to greatly reduce the overall cost associated with providing the market pull mechanisms required to support emerging renewable energy technologies. For example, an increase in the technology learning rate from 10% to 15% has the potential to reduce

[14]North Sea Transition Authority (2022) *'Emissions Monitoring Report'*. Available online.
[15] Element (2019) *Socioeconomic Analysis Plan.* Available online.
[16] Resolution Foundation (2022) '*The Economy 2030 Inquiry*'. Available online.
[17] Biggar Economics (2023) *'20 Years of EMEC Instigates UK Wide Economic Impact'*. Available online.

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.[18]

Despite this clear role in delivering cost reductions there is limited innovation support or demonstration programmes are available for MRE in the UK, and ongoing uncertainty around UK participation in the Horizon programme is damaging.

As the EMEC example, illustrates supporting marine renewables has significant benefits for coastal regions. A recent report by the London School of Economics found that:

> "Investments in tidal stream energy innovation yield higher estimated economic returns for the UK relative to other clean technology areas. Moreover, returns to investments made in innovation-intensive regions have high spillovers to the rest of the country, so that the economic benefits reach other UK regions too. In this way, investments in tidal stream energy can contribute to regionally balanced growth."[19]

The UK Government should consider introducing a dedicated programme to develop and accelerate marine renewable innovations, in addition to ongoing participation in Horizon Europe. The UK can seize the opportunity of exporting marine energy globally whilst support green sustainable jobs across the UK.

6. What are the current barriers for emerging ocean technologies, including those which enable marine science research, as well as marine and ocean-based renewable energy technologies?

In addition to the need to provide a clear route to market and accelerate consenting (addressed in Q1), and to provide innovation funding support (addressed in Q5), the following issues will act as barriers to the UK reaching its marine energy potential in a timely manner:

The perception of risk damaging investor confidence

The perception of risk has a direct consequence on the LCOE of TSE, increasing this by upwards of 30%. Current rules around decommissioning means TSE projects are required to provide security for decommissioning costs of up to £1m/MW. The legal structure makes it difficult for developers to obtain bonds and are not permitted to build up the security during the lifetime of the project. This is an exorbitant cost for projects deploying emerging technologies to provide security in the form of cash deposits. This problem is exacerbated a single line in the Decommissioning Act (Section 105), which allows the Secretary of State to call in the bond at any time.

The UK Government should review the decommissioning requirements to minimise the upfront cost.

The cost of capital poses a significant barrier to the development of TSE. There is a gap between what commercial insurers can provide and what financiers expect to see. The increasing cost of capital for the TSE sector is a function of its ability to raise project finance. Until data is available to enable competitive commercial insurance and finance options, this gap will remain a barrier to growth. The Government should endorse the Ocean Energy Accelerator and act as a public sector guarantor to directly reduce the costs of deployment, and 'crowd in' commercial insurers.[20]

The current tax regime does not incentivise investment in marine renewable projects

As warned by the London School of Economics the UK is in a race against countries like Canada, China, France, and the US to seize the TSE opportunity.[21] Projects are currently being delivered with upwards

[18] 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.
[19] London School of Economics (2023) *Seizing sustainable growth opportunities from tidal stream energy in the UK.* Available online.
[20] TIGER Report (2022) *The Ocean Energy Accelerator*. Available online.
[21] London School of Economics (2023) *Seizing sustainable growth opportunities from tidal stream energy in the UK.* Available online.

of 80% UK supply chain content. The UK Government must act to embed UK content in delivering TSE nationally and internationally, by making it cheaper to build manufacturing capacity and capability. It could achieve this by providing capital support for setting up manufacturing facilities in the UK.

In addition, the Government should align its tax regime with net zero, by replicating what is being provided for investment for O&G in the North Sea, into renewable technologies where the UK can lead the world. By providing capital allowances or alternative tax credit for investment from qualifying entities into marine renewable projects the UK can accelerate the industries' growth.

7. What is the impact of AI and software on future ocean technologies?

No answer provided.

8. How can the new Departments for Science, Innovation and Technology, and for Energy Security and Net Zero, best support growth into the future of ocean technology?

Establishing a Strategic Taskforce

The Marine Energy Council strongly supports the UK Government establishing a strategic taskforce to realise its tidal stream and wave energy potential. This can follow the successful model of the Offshore Wind Industry Council.

The Taskforce will bring industry and government together to address the barriers and implement solutions that we have outlined in this response.

Maintain a clear route to market by setting multiyear CfD budgets

The TSE industry responded strongly to the ringfence that was set in 2022 and over 40MW of contracted 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 the ringfence being maintained is a welcome development the industry has no certainty that support will be available in the next auction round (AR6 in 2024) and beyond.

The industry requires clarity from the UK Government to attract the private investment needed to drive the technology down the cost reduction curve. Costs are forecast to reach £78/MWh by 2035, cheaper than new nuclear projects, and below £50/MWh by 2050, provided the right policy framework is in place.[22]

Multiyear CfD budgets could provide clarity to the sector in terms of the Government's commitment to tidal stream energy. This will allow UK companies working in this space to attract increased investment based on a clear pathway for deployment.

Setting deployment targets

The UK has a range of ambitious targets including 50GW of offshore wind by 2030 (5GW of which will be floating) and 70GW of solar by 2035. If it is not possible to set multiyear CfD budgets, setting a target for marine renewables will be helpful in providing clarity on government support. The MEC supports a 1GW target for TSE and 300MW for wave energy by 2035.

Provide innovation support

As noted in response to Q5 innovation support will accelerate learnings within marine energy and substantially reduce the cost of delivering 12GW of capacity. An established marine energy

22

programme as part of Innovate UK can be the mechanism for innovative project delivery, in addition to the UK's ongoing membership of Horizon Europe.

Increase electricity grid capacity to accommodate marine renewable growth

As with all renewables the deployment pathway for MRE will be hampered by electricity grid capacity unless this is increased significantly in the coming years. Fortunately, we know where that potential exists and the capacity that will be required at those sites. Through the Taskforce industry and government could provide clarity to the ESO and electricity network operators as to where expansion is required.

9. Do you feel that the Government is doing enough to support future ocean technology projects? What action would you like them to take?

The Government should be applauded for setting a ringfence for tidal stream in AR4 and maintaining this into AR5. This demonstrated international leadership and we have seen from recent responses by France and China its reverberations in energy policy elsewhere.

The global market has over 100GW of TSE potential and projects are being delivered with over 80% UK supply chain spend. Through taken further action the UK Government can embed UK supply chains not only in projects deployed in our waters, but around the world. 90% of the world's economies are covered by net zero targets the demand for predictable renewable generation will continue to grow rapidly.

The UK Government has not gone far enough in innovation support, and the industry has had to depend on funding from EU schemes like Horizon and EuropeWave. The industry understands the cost-of-living pressures and the need to demonstrate value for money. This is part of the motivation for the UK Government looking into non-price factors in the Contracts for Difference (CfD) scheme. We know that investment in tidal stream will deliver broader benefits for coastal communities. By 2030 the tidal stream industry could generate a cumulative benefit £1.4bn to the UK economy, whilst supporting 4OOO jobs. With wave energy this could be over 22,000 jobs by 2040.

As demonstrated by the Resolution Foundation, average returns (on public investments in innovation) in tidal stream is comparatively higher than investment in other renewable technologies and strongly supports balanced economic growth. Therefore, we have a strong basis for arguing that support for marine renewables should not only be seen as supporting the net zero journey, but in levelling up, boosting British exports, and creating green growth and opportunities across the UK.

In the 1980s Denmark invested heavily in wind, 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. By contrast the UK's wind sector, Europe's largest generator of wind energy, exports less than £0.5bn annually.[23]

The UK should seek to follow the path Denmark took in wind, to its own marine energy journey.

10.Where can ocean technology go next?

Marine renewables, with the right support, can support a cost-effective and secure transition to net zero. With projects being delivered with over 80% UK supply chain content spend the UK Government can be ambitious about the role UK manufacturing and industry could play in unlocking tidal stream energy globally. This in turn will create significant economic opportunities, growing UK supply chains,

[23] State of Green (2021) *The economic benefits of wind energy*. Available online.

creating well-paid green jobs in coastal communities, and meeting the global demand for renewable firm power.

Wave energy is reaching commercialisation. It is the world's largest untapped source of energy with the Intergovernmental Panel on Climate Change (IPCC) estimating that the potential annual global production at 29,500 TWh, which could provide clean electricity for over 500 million homes. The UK has 25GW of practically accessible wave resource[24], which can deliver economic and carbon saving benefit to the UK grid, but also jobs and supply chains. Differently to tidal stream, commercial opportunities exist for wave at different power scale. There are near-term opportunities to deploy wave energy converters delivering 10-100s of kW as part of islanded systems – e.g. to decarbonise off-grid equipment in the North Sea (e.g. CCUS, replacing long cables from shore, electrification of subsea assets), which are being demonstrated now via partnerships and joint demo projects with technology integrators and energy operators.[25] These enable immediate energy transition benefits, and can act as a springboard for future larger scale technology development. At the MW scale, wave energy converters can be co-located with wind farms to maximise value for money of spatial footprints, with a forecast LCOE reduction of 12%.

Together tidal stream and wave energy can deliver up to £41bn GVA benefit to the UK economy by 2050.[26] Industry is ready to work with the UK Government to harness the power of its tides and waves and deliver net zero in a way that benefits the UK economy and supports a varied renewable generation portfolio for coastal communities and countries around the world.

[24] EVOLVE (2023) *A review of practical deployment locations for European ocean energy projects.* Available online.
[25] Offshore Energy (2023) *Wave power for subsea equipment demo grabs oil and gas industry's attention.* Available online.
[26] University of Edinburgh (2021) *What is the value of innovation ORE deployment to the UK economy?* Available online.