Written evidence submitted by the European Marine Energy Centre Limited (EMEC) (IND0031)

1 Executive Summary

- Over the last 20 years EMEC's facilities have put early stage, pre-commercial technological solutions to the test, through R&D projects totalling £538 million for the development of the renewables industry.
- An economic impact assessment commissioned in 2023 showed that, as a result of EMEC's operations over the last two decades, £370 million GVA has been added to the UK economy. This represents approximately £9 returned to the economy for every £1 of public investment.
- Tidal stream and wave energy (marine renewable energy) will play an important role in the UK becoming a Clean Energy Superpower.
- Marine energy could provide over 30% of current electricity demand (11+GW and 25+GW respectively).
- The sector has the potential to add £40+bn GVA to the UK economy.
- Deployment of 12GW of marine energy reduces energy system cost by £1bn.
- The University of Edinburgh have produced a recent report which shows that in Scotland alone marine energy could add £37bn GVA by 2050, creating 62,400 jobs. Around half of these jobs will be in device construction, at 15,000 high-value jobs located in coastal communities. For context there are currently around 20,000 people employed by the wind industry (offshore and onshore).
- The LSE's Grantham Institute research has singled tidal stream out as a technology where the UK could lead the world, capture export opportunities from high-value products.

To realise the benefits of these emerging technologies:

- **Ring-fenced revenue support for wave and tidal stream emerging technologies** to secure project investment.
- **Dedicated innovation support** for wave and tidal stream technologies to reduce the time, cost and risk of commercialising emerging technologies and securing UK benefits.
- **Build ahead of need.** There is a very real risk of an exclusive focus on 'now' but at the expense of 'what next' and this should be avoided since the innovation space is one in which the UK has a demonstrable track record.
- **Develop a marine energy sector plan.** To date an overarching strategy for delivery of tidal stream and wave between government and industry has been absent. A marine energy sector plan would help to align industry and government efforts behind a common goal.
- **Set deployment targets for marine energy:** 1GW of tidal stream energy and 300MW of wave energy by 2035
- **Continue and increase CfD ring fence** for wave and tidal energy
- Seek to **embed UK content in projects deployed here and around the world**

2 Introduction

EMEC was set up in 2003 in Orkney, Scotland, to kick start an ocean energy sector in the UK and boost economic development in the Highlands and Islands.

As a not-for-profit plug-and-play facility, EMEC helps reduce the time, cost and risk of testing innovative sustainable technologies and is the world's leading centre for demonstrating wave and tidal energy converters in the sea. More marine energy devices have been tested at

EMEC than at any other single site in the world: EMEC has hosted 22 wave and tidal energy clients (with 35 marine energy devices) spanning 11 countries.

Over the last 20 years EMEC's facilities have put early stage, pre-commercial technological solutions to the test, through R&D projects totalling £538 million for the development of the renewables industry spanning marine energy, green hydrogen and e-fuel R&D, floating offshore wind and island decarbonisation. Building on our experience around offshore demonstration in ocean energy sector, EMEC is exploring options for developing a National Floating Offshore Wind Test Centre to the west of Orkney.

An economic impact assessment commissioned in 2023 showed that, as a result of EMEC's operations over the last two decades, £370 million GVA has been added to the UK economy.[1] This represents approximately £9 returned to the economy for every £1 of public investment.

Written submission

1. **How can UK plc capture its fair share of the economic potential of emerging or less developed energy technologies?**

The UK has over 30GW of tidal stream and wave energy potential, enough to meet over 30% of its electricity demand. When developing the next stage of the Industrial Strategy, and considering the subsectors under Clean Energy industries, tidal stream and wave energy, or marine energy, should be established as a subsector, with a clear plan to realise the UK's significant potential.

The UK has an existing leadership position within tidal stream and can benefit from a large export market for wave energy. To date, an overarching strategy for delivery of tidal stream and wave between government and industry has been absent. Through the Industrial Strategy, government should develop a **marine energy sector plan,** to align industry and government efforts behind a common goal.

World-leading progress is being made in **tidal stream energy** in the UK. Given the success of tidal projects in recent CfD allocation rounds, and further projects coming to the EMEC sites securing £70M Horizon Europe funding, there is a significant pipeline of first tidal arrays to be deployed in UK waters. We believe marine energy can be a significant future contributor to the UK's green energy system and Great British Energy's decarbonisation agenda and help to build a diverse renewable energy sector. However, delivery is predicated upon the successful scaling up of proven technologies. **This is precisely where the UK finds itself: machines transitioning from testing to array-scale deployment.**

The London School of Economics' Grantham Institute has identified tidal stream as an area where the UK is a specialised innovator, and could lead in developing, deploying and exporting tidal stream turbines around the world.

The economic opportunity that emerging marine technologies presents the UK is significant. Research by the University of Edinburgh has found that if the UK leads in these technologies, it can add **£41bn GVA to its economy**. This means high value jobs, supporting the renewables sector, in coastal communities and opportunities to contribute to global efforts to achieve net zero which provide growth and economic benefit to the UK economy. Edinburgh University have produced a recent report[2] with a focus on economic benefits in Scotland, with a number of policy recommendations to develop essential sector infrastructure, focusing on:

[1] https://www.emec.org.uk/20-years-of-emec-instigates-uk-wide-economic-impact/

[2] Future Economic Potential of Tidal Stream & Wave Energy in Scotland - POLICY AND INNOVATION GROUP

- **Develop skills for a Just Transition:** Development of soft infrastructures, such as preparing a pipeline of workers with relevant skills and training.
- **Cross-sector collaboration**: Opportunities to collaborate with, and share, the supply chain and infrastructures of other established offshore sectors, including offshore wind.
- **Prioritise infrastructure upgrades:** The build out of hard infrastructure, such as ports, harbours, and national grid capabilities

2. What more can the Government do to encourage greater domestic supply chain investment in the energy industry by 2035, including through the Contracts for Difference scheme?

A strategic view about the importance of a diverse generation mix, which will need to include reliable and predictable generation and how different technologies will interact in the future is fundamental to achieving net zero in a secure and cost-effective manner.

- **Ring-fenced revenue support for wave and tidal stream emerging technologies** to secure project investment.
- **Dedicated innovation support** for wave and tidal stream technologies to reduce the time, cost and risk of commercialising emerging technologies and securing UK benefits.
- **Build ahead of need.** We know that the most cost-effective net zero energy system of the future will not be achieved by solely deploying the cheapest renewables available today. There is a very real risk of an exclusive focus on 'now' but at the expense of 'what next' and this should be avoided since the innovation space is one in which the UK has a demonstrable track record.
- **Develop a marine energy sector plan.** To date an overarching strategy for delivery of tidal stream and wave between government and industry has been absent. A marine energy sector plan would help to align industry and government efforts behind a common goal.
- **Provide industry a clear and consistent route to market** and a **long-term strategy for growth.** The nature of the CfD, and the announcement of budgets, means we do not have clarity on what be available in the future. This hampers investor confidence and the creation of 'eligible' capacity.
- **Set deployment targets for marine energy:** 1GW of tidal stream energy and 300MW of wave energy by 2035
- **Continue and increase CfD ring fence for wave and tidal energy**
- **Embed UK content in projects deployed here and around the world**

The Government should engage with industry where data indicates the UK has a global advantage and where benefit can be secured across the UK. It should for example better utilise research that identifies where public investment can secure high returns. Average returns (on public investments in innovation) in marine energy projects and TSE is comparatively higher than investment in other renewable technologies and strongly supports balanced economic growth (https://economy2030.resolutionfoundation.org/wp-content/uploads/2022/05/Growing_clean_report.pdf)

The UK has the offshore engineering expertise, supply chain and natural resources to lead the world in tidal stream and wave energy. Marine energy projects are currently being developed, deployed and exported with over 80% UK supply chain content spend. This is significantly higher than other renewable technologies. The industrial strategy should seek embed UK content in projects deployed here and around the world.

Over 90% of the world's economies now have net zero targets. The UK Government is right therefore to see the transition and development of renewable industries as an area of significant growth. The transition to net zero requires a diverse energy mix. Tidal stream is predictable and can be harnessed whether the sun is shining or wind blowing. Wave energy is incredible complimentary resource with wind. The UK leading in these two technologies will provide significant economic growth and export opportunities for its coastal communities and beyond.

The National Energy System Operator's recent report into achieving clean power for Great Britain by 2030 noted that tidal stream is predictable and will feasibly play a role in delivering that target if costs continue to fall. The UK has demonstrated a long history of enabling cost reduction in renewable generation as it scales, this similar approach can be applied to wave and tidal stream, with strategic oversight and planning for the sector. The Offshore Renewable Energy Catapult has identified ten areas where it expects the cost of tidal stream to fall significantly, in its tidal stream technology roadmap (https://cms.ore.catapult.org.uk/wp-content/uploads/2024/03/ORE-Catapult-Tidal-stream-roadmap-report-2024.pdf). The UK can lead in developing engineering and expertise, to position itself to export around the world. This includes anchoring, hydraulics, tidal stream rotors and optimising wet mate connectors.

In marine energy the single biggest step forward in recent years was the establishment of the ring fence for tidal energy in the CfD. This should be maintained in place and expanded as the industry grows. The CfD ringfence should be increased to £30m for Allocation Round 7, and a £5m ringfence for wave energy needs to be introduced to ensure the UK keeps pace with countries like the US and China

In order to set the ring-fence in context, this should be part of a Marine Energy Sector Plan which should include Government setting a deployment target for 1GW of tidal stream energy and 300MW of wave energy by 2035 as supported by the UK Marine Energy Council. In EMEC's opinion the present lack of targets is a significant barrier and one that Government could easily address.

3. Does the UK have the supply chain capacity to deliver the required energy infrastructure by 2035, including an expanded electricity network?

There is a latent lack of electrical engineering capability in the UK. This is a historic shortcoming and will only be addressed by more effective education policies to drive STEM subjects and then the means to stop the brain drain into more ephemeral areas such as finance through pay and status. (i.e. Engineer to become a protected term).

The historic lack of the investment in the grid is a significant barrier and one that has been widely highlighted. In effect the UK needs to quadruple its electricity use (ESO – FES 2024) in the coming years and that will require significant investment in grid. The risk is that we once again just build it big enough for envisaged demand and then are surprised that it is incapable of working with new demands placed upon it. The present regulatory mind-set of crushing the grid plans to the bare minimum need to end. It has served us poorly in the past and it will fail to serve us well in the future.

There is an example in Orkney where a 220 MW undergrounded connection is being installed across the county. The ducts for a second cable could also be installed for marginal additional cost without any further disruption to the community but they are not being installed because there is 'no business case' for them despite there being a clear practical advantage in doing so. This 'business case' led approach lacks vision and so reduces the pace of delivery, increases the costs and results in less cheap energy being available to the UK consumer.

For the UK to lead the world in marine energy as a sector will require new entrants into the supply chain. In establishing an open data approach as part of the marine energy subsector this could assist companies interested in providing services or goods to the marine energy sector identify opportunities. Commissioned by Crown Estate Scotland, EMEC in collaboration with the ORECAT recently published a report on alternative offtake opportunities for tidal stream energy given existing grid constraints.[3] There is an abundance of tidal resource around coastal communities in the UK and turning tidal-derived electricity into green hydrogen as an offtake offers major opportunities for decarbonising industries, and manufacturing clean synthetic fuels. For example, repurposing assets such as oil terminals like Flotta in Orkney and Sullom Voe in Shetland to industrial hydrogen production sites offer ideal infrastructure and transition of workforce skills, whist being ideally located to take advantage of tidal and surplus wind resources. This offers a practical approach to resolving deliverability constraints whilst increasing energy resilience on a local level for remote communities; and creating jobs.

In addition, for the UK to lead the world in marine energy as a sector will require new entrants into the supply chain. In establishing an open data approach as part of the marine energy subsector this could assist companies interested in providing services or goods to the marine energy sector identify opportunities.

4. To what extent would growing the domestic supply chain bolster UK energy security?

The Invest 2035 consultation rightly notes that over 90% of the global GDP is now covered by Net Zero targets. For countries to achieve this ambition in a secure manner they will be required to deploy a range of different renewable technologies. For example, we know the UK's future energy mix will be dominated by wind and solar, but that these technologies will not be sufficient to deliver net zero or provide the same levels of economic growth potential due to the stage of the industry.

Tidal stream's predictability can replace the firm power role that fossil fuels currently play in the energy system, reducing costs associated with curtailment, and the need for reserve gas capacity caused by supply/demand mismatch. Modelling carried out by Imperial College London demonstrated that tidal stream alone reduces the UK's required CCGT capacity by over 40%, from 8.1GW to 4.9GW.

The UK can also lead the way in terms of innovative approaches to renewable deployment. For example, co-locating wave and wind energy will deliver a saving of up to 12% in the Levelised Cost of Energy (LCOE) for both projects. The distance between offshore wind turbines can be as much as 1km, providing ample opportunity and space for wave energy converter deployment. As well as optimising offshore assets and reducing LCOE, wind and wave energy farms can significantly reduce storage capacity requirements (with power capacity up to 20% and energy capacity up to 35%)

The International Energy Agency has forecast that 120GW of tidal stream capacity could be deployed by 2050. Developing this initial capacity would see tidal stream provide 30% of New Zealand's, 11% of the UK's and 10% of Indonesia's current electricity demand. There are significant opportunities for tidal stream to play a key role in local electricity systems. For example, Alaska's tidal stream capacity represents 5x its annual electricity demand, for China's Zhoushan province 150% and the Bay of Fundy in Nova Scotia, 50% of their demand. The UK can play a leading role in exporting tidal stream turbines, technology, and

[3] Tidal power has potential to address energy challenges faced by Scottish coastal communities : EMEC: European Marine Energy Centre

expertise to these countries, supporting the Government's ambition to make the UK a Clean Energy Superpower.

The Intergovernmental Panel on Climate Change (IPCC) identified wave energy as the world's largest untapped renewable energy resource with over 29,500TWh potential, ten times more than Europe's annual electricity consumption. Wave energy could provide electricity for 500m homes whilst supporting 400k jobs globally. Its abundance means the economic opportunity for the UK is tremendous.

British companies like Nova Innovation, Inyanga Marine, Orbital Marine Power and Mocean Energy are exporting technologies to the USA, Canada, Japan and Indonesia. With a strong supportive marine energy sector plan the UK can continue to lead in tidal stream and expand its capabilities to reap the benefits of a growing wave energy market.

5. What are the key concerns with respect to the availability of raw materials in the supply chain and how might those be addressed?

N/A

February 2025