European Marine Energy Centre Limited (EMEC) – Written evidence (STS0061)

Executive Summary and Recommendations

1. Net Zero: the innovation sector has the knowledge, skills and facilities to drive change and adoption across the range of technologies needed:
   - A programme of core funding should be introduced which will allow proper capitalisation of the sector, boost applied research/demonstration, and increased support to industry.
2. Attainment of 2.4% of GDP investment in R&D: enhanced resources will be needed to deliver this goal.
   - Technology commercialisation requires appropriate support for emerging technologies – in order to expedite cost-reduction and scaling up, targeted funding schemes should be put in place to ensure the UK captures the economic benefits of, for example, the huge potential global marine energy market.
3. Levelling-up: R&D organisations are located throughout the UK, sited in economically disadvantaged regions.
   - The government should undertake a formal mapping exercise to acquire a clear understanding of the resources and capabilities which reside there.
   - EMEC has greatly benefitted from the EU Interreg programme and there is a need to examine the impact of non-participation by the UK in such programmes tackling specific regional challenges.

Introduction

EMEC was founded in 2003 in Orkney, Scotland and is the only accredited wave and tidal test centre for marine renewable energy in the world. More marine energy devices have been tested at EMEC than at any other single site: EMEC has hosted 20 wave and tidal energy clients (with 34 marine energy devices) spanning 11 countries. EMEC operations have developed significantly through the years as we have gained unprecedented experience in demonstrating ocean energy technologies. Today we're also pioneering the development of a green hydrogen economy in Orkney, having set up a hydrogen production plant onshore in 2016, next to our tidal energy substation. With the ability to use locally generated hydrogen to decarbonise across a range of power heat and transport applications, Orkney has become a leading example of a developing hydrogen economy.

Issues identified by the Committee

1. Are the right structures in place in Government to implement a science and technology strategy? *How should Government coordinate science policy across different departments, with different strategic priorities such as levelling up?* It is essential that science policy goes hand-in-hand with an ambitious overarching net-zero and wellbeing economy vision. The pandemic has shown us that the public sector is a key player in delivering systemic change, and overcoming silos across departments is crucial in developing such a vision. Collaboration across sectors would undoubtedly help share expertise and coordinate efforts towards the challenges of commercialising new low-carbon technology. Indeed, EMEC in Orkney

represents a successful 'cluster' approach where the academic, private and public sectors work together to develop R&D.

EMEC presents a compelling case study. The following points from EMEC's socio-economic impact study highlight the benefits of the organisation and low-carbon industries to regional and national economies:

- The UK government invested £10m as part of 5 phases of infrastructure development totalling £39m.
- An economic impact assessment of EMEC calculated a total GVA to the UK economy of £306m between 2003-2019, of which £108m GVA impact pertained to Orkney.
- EMEC's expertise has expanded into exporting consultancy with contracts in China, South Korea and the US, facilitating the development of a global export market.

Building on this Orkney has become a true hotspot for innovation, with natural resources and an island advantage as a 'living laboratory'. As such, there are plans afoot to create an Island Centre for Net Zero in Orkney as part of the Islands Deal to build on the pioneering low carbon projects and research infrastructure. Islands face unique challenges but also develop unique forward-thinking solutions, and Orkney is an example of this. Therefore, although we welcome the policy focus in the Levelling Up White Paper, the increasing investment towards R&D and the creation of an Islands Forum, we were disappointed in seeing little detail about them.

- *What role could the National Science and Technology Council play?*

The National Science and Technology Council must help R&D turn in to practical applications wherever possible. This is not to belittle 'blue skies' research, but it is necessary to better direct exploitation in the UK of the results of R&D. Taking ideas at the higher Technology Readiness Levels (TRLs) and driving them through to TRL 9 and into the Commercialism Readiness Levels is an important role.

- *Are the right levers and mechanisms in place for the delivery of a science and technology strategy?*

The levers seem to be there, but it is not always clear that they are connected to the mechanisms of Government. Generally, Treasury seem to have a disproportionate influence over the connectivity, and it seems that there is a lack of vision of the need to invest in R&D - particularly the 'D'.

- *Who should be accountable for the delivery of a science and technology strategy?*

EMEC would argue that the delivery of the Strategy should be 'owned' by BEIS. Whilst pure academic activity is of interest, it is imperative that the practical application of R&D should be the ultimate goal.

2. Is the UK realising the potential of its research investment?

EMEC provides state-of-the-art testing facilities for tidal stream and wave technologies. The sector stands ready to deliver the decarbonisation of our energy

system by developing and deploying projects around the coasts of the British Isles. The UK leads the world in marine energy as a result of our innovative UK tidal and wave companies, our well-developed project portfolio, and our excellent indigenous resources.

The most recent installation at EMEC has been Orbital Marine Power's O2 2MW tidal turbine. This machine was conceived in Orkney, designed in Orkney and Edinburgh, built in Orkney and Dundee (in a yard that last launched a ship 40 years ago), with blades from the Solent, anchors from Wales, using Scottish steel. The project used UK flagged vessels to install the device and overall the project has more than 80% UK content. It is delivering fully green electricity into the UK grid from UK territorial waters using principally indigenous businesses.

The O2 is a prime example of the way in which the UK marine energy sector can directly support the UK's decarbonisation drive, contributing to energy security with innovative and world-beating technology, while also creating jobs across the Union. In that regard, the marine energy sector coupled with electrolytic green hydrogen (essential as a storage option) can help 'level-up' regions of the UK, including post-industrial or maritime-focused areas like remote islands. Moreover, the marine energy industry has the potential to deliver the UK £25bn of a £76bn global market by 2050.

Nonetheless governments have, to date, failed to effectively support the marine energy sector, and are at risk of losing the country's competitive advantage, given that other countries are heavily committing to ocean energy. For instance, whilst we welcome the ring-fenced allocation for tidal energy in round 4 of the Contracts for Difference scheme this must be seen as the next stage in support. In order to facilitate continued R&D and to expedite cost-reduction and scaling up, targeted funding schemes should be put in place to ensure the UK captures the economic benefits of the huge potential global marine energy market.

By undertaking more R&D in the UK, the likelihood is that high value commercial opportunities will 'stick' in the UK. Such commercial opportunities will utilise skilled people and access their knowledge, benefitting places across the regions of the UK, including economically disadvantaged regions, and securing vast export markets.

Beyond ocean energy, strong and explicit commitment is needed in the UK Government's decarbonisation R&D plans for *green* hydrogen, and its use in the decarbonisation of maritime transport and aviation, coupled with appropriate targets and revenue support as advised by the industry. The government could support test and demonstration programmes to de-risk the transformation of these vehicles into clean energy users, an idea which we strongly welcome engagement on, given our experience with the HyDIME and HIMET maritime projects and the SATE and HyFlyer aviation projects.

EMEC has experienced a range of examples of bureaucratic impediments to marine energy, such as the need to secure Section 36 consent for electricity generating devices above 49MW on land, but 1MW at sea (it is not clear why this threshold is

different and what it offers). Decommissioning consent applications are also tortuous and disproportionate when compared with other equipment at sea. Our experience in the hydrogen sector thus far has also presented a range of regulatory barriers to decarbonising maritime applications for example. New initiatives such as ARIA will inevitably see new ways of working. However, it is also important that it learns from existing experience and ensures it does not reconstruct processes that are flawed. EMEC would be happy to provide more specific examples.

- *How can the Government better incentivise and support interdisciplinary research and innovation?*

The active inclusion of a requirement to communicate learning to the wider technical community as a condition of grant would be a useful addition to incentivise interdisciplinary research. Such activities need to be 100% funded and sit outside present intervention rate limits.

- *Does the Government's strategic direction and the current allocation of research funding align with the UK's scientific and economic strengths?*

Technology commercialisation is a chain of activities. It starts with innovation and research and progresses through R&D into deployment, demonstration and finally product development. The UK tends to lose interest around the deployment point and is terrible at supporting demonstration and productisation. EMEC can provide extensive examples of the value of demonstration projects to commercialising R&D - only when something is subject to sea trials do we really understand how well it works. We are testing installability, survivability, operability, availability, maintainability, scalability and all through a lens of cost reduction.

The Marine Energy sector presents a perfect case study, where early-stage technology development has been grant-funded, but a lack of appropriate market incentives has led to many companies finding themselves stuck in the chasm between invention and application, as described by the Prime Minister[1].

The current model of public support is focused on university research. ~85% of government funding is spent via the Research Councils and Research England (and its Devolved Administration counterparts), with ~15% funding assigned for applied research and development. AIRTO has called for redress of the imbalance (More D![2]) and there are indications from government that this is recognised (Innovation Strategy[3]). The increases in government's current investment strategy provide an opportunity to rebalance this.

For commercialisation, much of the finance required can come from the private sector, but the risks and uncertainties associated with proving novel technologies

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[1] https://www.conservatives.com/news/2020/boris-johnson-unveils-a-new-deal-for-britain

[2] https://www.airto.co.uk/wp-content/uploads/2020/03/AIRTO-More-D-Position-Statement-31-MARCH-2020-web.pdf

[3] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1009577/uk-innovation-strategy.pdf

will hold this back. The public sector has thus an essential role. Boosting demonstration activities in the UK will increase the likelihood of innovation being translated into commercial success from work undertaken in the UK.

The IRT sector has the knowledge, skills and facilities to deliver innovation necessary to drive change and adoption across the range of technologies needed. A programme of core funding across the IRT sector should be introduced which will allow proper capitalisation of the sector, boost generic applied research, and the delivery of increased support to industry.

3. What more should be done to encourage private-sector investment in research and development in the UK? *What policies could incentivise private sector research spending in the UK?*
The most important underpinning factor is that of the level of confidence created. Innovators need to know that there is to be a potential market for the invention. The supply chain needs to know that it is worthwhile tooling up to support the innovation. The investors need to know it is worth putting money into support innovation. None of this will happen if government flip-flops on policy. The recent announcement by the Prime Minister of support for tidal energy was welcomed and vital. It replaced the missing support that was removed by earlier changes of policy. However, if that support become faint-hearted then investment made will be wasted. Constancy enables innovation.

- *What more could be done to incentivise collaborations between academics and industry? Are there barriers preventing this collaboration that could be removed? What can be learnt from local innovation ecosystems, such as the Cambridge Science Park?*

In terms of local innovations systems Orkney would offer an alternate model. The organic nature of the growth of an innovation culture has been driven in part by dynamic and evangelical individuals operating at the edge of technical knowledge, but with the active involvement of the community. EMEC would be happy to elaborate on this further.

- *What stage of the pipeline, from innovation to industry, is presenting the most significant problems for commercialising discoveries in the UK?*

The main risk in commercialising discoveries is the inconsistent and erratic plans to fund innovation, the fragility and paucity of the funding regimes and the eagerness of government to withdraw funding as soon as it feels it can. The problem is that Government's judgement is skewed by Treasury's need to reduce expenditure and this results in the premature removal of support. This hampers R&D and it is extremely inefficient at delivering systematic change.

- *What contribution should public procurement make to achieving the aims of the science and technology strategy?*

Government often fails to notice its procurement power. Government could use its energy needs to drive innovation in the electricity sector by procuring innovation,

i.e. 'Buy xTWh of electricity from tidal energy' would provide significant and useful support to commercialising R&D in the sector.

4. How well does the UK collaborate on research with international partners and what can it learn from other countries?

In our experience, not too well, and likely to worsen post-Brexit. EMEC has sought to build and international community of other marine energy test centres to share experience and interact. This allows us to learn from others and allows the UK to innovate faster and more cheaply by learning from others' mistakes and successes.

- *In which areas of science and technology is collaboration, or negotiating access to existing projects, more appropriate than competition or seeking comparative advantage?*

EMEC's activities have been made possible by the support it receives through EU structural funding, specifically funding from the EU Interreg programme. Between 2016 and 2020 EMEC received £17.4 million through Interreg projects, accounting for 51.9% of the organisation's total funding. Following Brexit, this funding will soon cease and it is imperative that a clear replacement is established to build on the successful innovation generated through these schemes.

The EU Interreg programme is designed to support cooperation across borders through project funding aimed at tackling common challenges and finding shared solutions. The UK Shared Prosperity Fund (UKSPF) has been positioned as a replacement to EU structural funds, however the Levelling Up White Paper makes no reference to the replacement of Interreg funding specifically. The White Paper suggests that the UKSPF will be allocated entirely through local authorities. While this geographic approach will have some benefits, there is a real risk that we will lose out on opportunities if funding is not also provided to tackle common challenges and missions. A clear replacement to via the UKSPF or another mechanism is urgently required so organisations such as EMEC can continue vital work in support of our Net Zero mission.

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