

## Industrial Strategy Response

### The European Marine Energy Centre (EMEC) Limited, Stromness, Orkney Islands

Firstly, EMEC strongly supports the RenewableUK submission to the Industrial Strategy Green Paper consultation. This response seeks to add to that, to show how clever, early, UK government investment in research facilities has already brought about successes in relation to many of the pillars of the Industrial Strategy.

EMEC cites itself as an example of a success story; a success built upon government vision to invest for the future and build infrastructure ahead of need. By building our facility, the UK has nucleated an industry here. It has enabled private investment to flow into a new area of endeavour and it has created sustainable, useful economic activity in areas other than the South East.

EMEC sees the same vision being shown in the Industrial Strategy and is willing to commit itself to help drive the essential innovation the country will need.

#### EMEC's context:

At the dawn of the new millennium, the UK government laid out a bold vision. A study by DTI to assess the marine energy resources around the UK coastline had shown that Britain had one third of Europe's wave resource and over half Europe's entire tidal resource. This helped identify the huge opportunity for industrial innovation and security of our energy supply.

In 2001 the House of Commons Science and Technology Committee recommended creating a research centre to enable and help exploit this great opportunity. It suggested that if technology companies could be attracted to the UK for research and testing in some of the best marine conditions in the world, the UK could build an exciting new industry as part of the domestic energy mix, and as a huge export market.

The European Marine Energy Centre (EMEC) in Orkney was the result of that vision - it is the world's first, and still the leading, wave and tidal test site. Since its establishment in 2003, EMEC has brought about a clustering of supply chain companies, academic institutions and innovative developers in the Scottish Highlands and Islands. The £36M invested to date has delivered the UK a GVA of £249.6M<sup>1</sup>. Proof positive of regional, industrial innovation driven by timely and bold government intervention.

#### This response:

Rather than comment on every aspect of the questions raised in the consultation EMEC will restrict itself to commenting upon the most important pillars of the Strategy as we see them:

1. Investing in science, research and innovation
2. Developing skills
3. Upgrading infrastructure
4. Supporting businesses to start and grow
6. Encouraging trade and inward investment policy
7. Delivering affordable energy and clean growth
8. Cultivating world-leading sectors
9. Driving growth across the whole country

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<sup>1</sup> HIE (2016) EMEC Economic Impact Study

## 1. Investing in science, research and innovation

Around £36m of public funding has been invested by the Scottish Government, Highlands and Islands Enterprise (HIE), the Carbon Trust, the UK Government, Scottish Enterprise, the European Union and the Orkney Islands Council<sup>2</sup>. This funding has enabled the centre to now become financially self-sufficient and achieve a cumulative GVA of £103m to the Highlands and Islands and £249.6m to the UK as a whole.

EMEC has attracted 18 different companies from 10 different countries to test 28 marine energy devices over the last 14 years. In 2017 the EU funding across 13 live research projects at EMEC totals €64,935,238, of which € 28,711,231 has been levered by UK companies.

Much has been written about how to create an innovation culture<sup>3</sup>. In EMEC's opinion, an example of the innovation the Industrial Strategy seeks to foster is already happening here underpinned by earlier bold action. However the transition to commercialisation that follows innovation has been notoriously weak in recent decades and EMEC believes this area needs urgent encouragement and support. Without the right environment to enable innovative businesses to flourish there is no point in spending money on R&D. The pillars of the Industrial Strategy can provide the support for the bridge back to an industrial renaissance and EMEC is very encouraged by the range of areas covered.

Speaking from its long experience in the marine energy sector EMEC's opinion is that we must not lose our present industry lead by failing to support real sea testing. EMEC has shown that this is where 'learning by doing' leads to cost reductions and real performance data, however, importantly is also provides real useful jobs in otherwise marginalised coastal areas.

## 2. Developing skills

Marine energy already fits neatly within the skill sets of Britain's proud maritime history.

In Orkney, local supply chain companies have formed from diversification – Green Marine is a vessel operator who diversified from fishing; Leask Marine a marine service and engineering company diversified from diving. Both have worked on a great number of test projects at EMEC and have used their knowledge of the sea to provide invaluable support services to developers through their own bespoke tools and techniques.

In addition, the potential for transferable skills from offshore engineering in the North Sea to renewables is huge as the oil and gas sector seek to improve their own efficiencies and sustainability.

With pressures on North Sea oil and gas operations, EMEC has seen new business startups focusing on helping the O&G sector reduce costs by using renewable technologies.

Award-winning East Coast Oil and Gas Engineering (EC-OG) has recently installed their innovative Subsea Power Hub (SPH) at EMEC. This represents an example of cross-over innovation that could not have been foreseen when EMEC was envisaged, but is a perfect illustration of the benefits of an innovation oriented culture and landscape.

## 3. Upgrading infrastructure

EMEC is glad to note that the icon on the cover of the Industrial Strategy that covers Orkney is that of 'Upgrading Infrastructure'. We hope this was not just an accident. The presence of EMEC has brought strong development into the local area as evidenced to the Institution of Civil Engineers and the National Infrastructure Commission.

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<sup>2</sup> [ibid](#)

<sup>3</sup> [UKERC -Innovation timelines from invention to maturity](#)

Orkney Islands Council's £8.4m development plan to extend the Hatston Pier to cater for marine energy devices brought in £3.2m in support from ERDF and transformed the pier into Scotland's longest commercial deep-water berth, serving not just marine energy but Cruise ships also<sup>4</sup>.

The former naval base at Lyness on the island of Hoy has been re-developed by the Council and a new pier built in Stromness for the same reason – to service marine energy operations<sup>5</sup>.

This local business ecosystem has supported research institutions including the development of Heriot-Watt's International Centre for Island Technology in Stromness and the planned Orkney Renewable Innovation Centre <sup>6</sup>.

The most significant infrastructure need for marine energy will be the grid. Built to supply power from pit-head power stations to remote areas, the present grid configuration is no longer suitable for the demands placed on it by more dispersed energy sources. Unless there are grid upgrades from the resource rich areas then the UK will fail to capitalise on the untapped energy sources.

Orkney has made its case repeatedly through numerous consultations and most recently that on Island Wind CfD and will not repeat them all here. However, there is a fundamental principle that investing in such infrastructure upgrades is needed in order to access an opportunity. The Industrial Strategy paints such upgrades in this light and EMEC would urge that this is continued. The opposite of seeing these investments as just costs clearly fails to recognise the benefits that arise from the economic activity of the investment, but also of the opportunities that will be foregone if investment is left un-made.

Whilst the grid upgrades are awaited Orkney is not standing still. The next significant infrastructure development is the introduction of hydrogen storage into EMEC's tidal test site. Due to the grid infrastructure investment not keeping up with demand, it was necessary for EMEC to explore energy storage solutions. The arrival of the British built ITM Power electrolyser in Orkney this month is the start of an exciting new chapter of EMEC providing energy storage demonstration, and hydrogen production and trading.

The 'Surf 'n' Turf' project aims to develop plans to integrate tidal and wind technologies to produce hydrogen as an alternative source of fuel. The project will also investigate the potential to develop a low carbon power source for auxiliary systems aboard an inter-island ferry. This can be built on to show how not just marine energy, but all parts of the UK energy system can benefit from innovative storage.

#### 4. Supporting businesses to start and grow

There are numerous examples of businesses that have benefitted from the vision to set up EMEC, however just 3 are cited here:

**Scotrenewables** now have the world's largest tidal turbine at sea and generating. As a UK company, they went through their R&D phases in Orkney and tested their 250kW machine at EMEC. They built their 2000kW machine at Harland and Wolfe and installed it at EMEC using British vessels and supply chain. None of this would have happened without EMEC. This once again shows the importance of the infrastructure being there ahead of need. EMEC can attest to the 'build it and they will come' model and Scotrenewables are a perfect example of this. Note too that they have secured significant inward investment from Norway and France to achieve this.

**Andritz Hydro Hammerfest** deployed their 2<sup>nd</sup> generation turbine at EMEC in 2011. Following tests, they then secured a contract to supply the Meygen project (owned by another customer of EMEC – Atlantis Resources Corporation). Between them they have now installed four 1.5MW turbines in the

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<sup>4</sup> EMEC (2013) [Press release: Pier extended to service marine renewables industry](#)

<sup>5</sup> EMEC (2011) EMEC – Lyness first client

<sup>6</sup> EMEC (2017) [Press release: £6.5m agreed for Orkney renewables research and innovation campus](#)

Pentland Firth. Atlantis only moved from Singapore because of the UK market, Andritz only tested in Orkney because EMEC was here and ready to provide them the services they needed.

**Openhydro** deployed their first turbine at EMEC in 2006 and have gone on to undertake R&D over six iterations at the EMEC test site. They have spent an estimated £23M in the local economy and now have projects in France and Canada with others lining up around the world. In addition they are preparing to deploy in the Pentland Firth to exploit the UK resource. Once again they would neither have made as much progress as they have without there being EMEC to use, and they certainly would not have made the inward investments that have allowed this success.

EMEC would also point out that this is not just a matter of inward investment. The development of local companies has also been supported. Through funding by the Scottish Government, the local fleet of non-specialised vessels were able to demonstrate their ability to meet the challenges of deploying and maintaining marine energy devices in difficult sea conditions. The success of this project has brought new business for local vessels and significant cost reductions for tidal and wave energy developers.

The [Orkney Vessel Trials project](#), facilitated by Orkney consultancy Aquatera Ltd, in association with EMEC, took place during the quieter winter months of 2015 in Orkney, with 20 local organisations, and over 120 individuals, working together on over 60 vessel operations.

The study investigated and trialed ways to reduce costs of operations required for the marine energy industry, and to demonstrate that vessels available in Orkney waters can carry out complex marine operations efficiently and cost effectively. One trial demonstrated a 70% cost saving for the key installation task and has led to this technique being used in actual projects.

## 6. Encouraging trade and inward investment

In addition to the investments cited above, the European Commission is acutely aware of the industrial opportunities presented by marine energy, and as such are supporting a range of innovation projects via Horizon 2020 and other R&D funding mechanisms. EMEC is a partner in 13 live projects, each with an average duration of 32 months.

The total value of EU funds across the 13 EMEC contracted projects totals €64,935,238, of which €28,711,231 was received by UK companies.

The projects have attracted €21,899,606 of private funds.

It is essential that the UK continues to support R&D&I – closely linked to the objectives of the Industrial strategy.

In Orkney, EMEC has hosted 28 devices from 18 companies in some of the harshest marine environments. 50% of companies who have tested new technologies at EMEC are from overseas (Norway, Finland, Austria, France, Ireland, Singapore, Germany, Spain and the Netherlands).

An economic impact assessment, commissioned by Highlands and Islands Enterprise, estimates that EMEC has generated a gross value added to the wider UK economy of £249.6 million.

## 7. Delivering affordable energy and clean growth

The early stage of much of the work done at EMEC has shown enormous ingenuity and promise. It has allowed device developers to begin to 'graduate' and secure sites outside the test environment. In addition developers have been able to continue with product development on site and supply chain companies have been attracted to supply products and services.

All of these steps are needed in order to build the industry that will supply affordable, carbon-free energy.

EMEC has seen significant cost reductions on elements of schemes and confidently lives by the mantra that it needs to 'get metal wet'. EMEC firmly believes in the advantages of practical experience in a R&D environment and the inevitable cost savings that occur through repetition and iteration. Learning rates will begin to emerge as repetition itself is repeated and EMEC is well placed to help capture that learning and recycle it efficiently for the benefit of the industry. This would not be possible without the existence of EMEC; itself a product of government vision.

## 8. Cultivating world-leading sectors

EMEC has exported its knowledge to 18 countries since it was established in 2003. In 2016 its consultants provided expertise to Belgium, China, Ireland, Peru, Singapore, South Korea, Sweden and the USA. It employs 25 people.

EMEC is the only centre in the world to offer accredited independently verified performance assessment of wave and tidal energy devices. In 2016 the centre was also granted accreditation from UKAS to ISO 17020 for the world's first accredited verification scheme dedicated solely to ocean energy.

28 ocean energy devices from 18 different companies have been tested at EMEC, more than any other site in the world. EMEC has an unprecedented global reach, having participated in over 100 marine energy conferences across 16 countries. This experience is highly sought after and has led to EMEC working with local, national and international partners to devise ocean energy support programmes, review testing infrastructure requirements, create country specific road maps and develop technology assessment processes.

As China turns its attention towards the global potential for marine renewable energy, they invited EMEC and other UK industry experts to visit their developing 'blue silicon valley' in Qingdao, discussing the creation of a Chinese version of EMEC: CMEC.

The Prosperity Fund project, supported by the UK Foreign and Commonwealth Office and China Britain Business Council (CBBC), was set up to help progress policy support in China towards developing a demonstration site to facilitate innovation in wave and tidal energy. The project involves EMEC providing feasibility studies around the creation of a CMEC facility as part of a brand new £200 million (2 billion Yuan) marine laboratory campus in Shandong Province, China.

Qingdao National Laboratory for Marine Science and Technology will serve as the base for the project, drawing researchers from a number of Chinese universities. An ocean energy demonstration site has already been identified as a key aspect of the lab's innovation activities.

It is important to note too that EMEC's activity has helped foster an eco-system centred in Orkney that is enabling other companies to develop and thrive. Local consultancies, diving companies and vessel operators are now all able to sell knowledge obtained by working on EMEC's sites and with EMEC's customers to others around the world. A hub of knowledge has therefore been created through the creation of EMEC.

## 9. Driving growth across the whole country

Orkney comprises around 70 islands in the north of Scotland, of which 19 are inhabited. An Orkney population change study produced in 2009 emphasized the islands ageing population and the net loss of population amongst the 16-24 age group as young people leave for higher education. The 2011 Census recorded the population of Orkney at 21,349, an increase of 10.9% from 2001 and the third largest increase of the local authority area in Scotland.

Between 2011 and 2014 it is estimated that the population increased further by 1.1% to 21,590. Between 2004 (when EMEC opened) and 2014, a significant proportion of the population growth can be attributed to employment at EMEC and related activities. The marine energy sector is providing a growing source of relatively highly paid jobs. There are more than 40 businesses in Orkney involved in renewables employing around 250 people operating locally, nationally and internationally. Note that Orkney's traditional industries, including agriculture and fishing have declined, (-10% and -24%

respectively in 2014), but we are seeing transferable skills from fishing and offshore engineering form an important part of the new local workforce.

It is EMEC's opinion that the professional and other well-paid jobs that marine energy development in Orkney provides has helped retain young families, attract back those who previously moved away for work or higher education as well as attract new in-migrants.

## Summary:

The innovators and pioneers working at and with EMEC are benefiting from the strategic investment that led to EMEC. The jobs created are a perfect illustration of green growth and they are enabling sustainable low carbon fuel sources to be developed for both the UK's use, but also for export.

EMEC can evidence how the visionary investment in a test centre and in the support for innovative technologies at critical stages has led to the UK building a world lead in the sector.

The vision shown by the Industrial Strategy outlines critical elements needed to enable the UK's industrial renaissance.

## Conclusion:

In conclusion: EMEC is extremely grateful for the opportunity to comment on this document. EMEC welcomes the intent it signals for the UK to once again recognise the value of an industrial base.

The UK's hitherto world leading economy was built on policies that enabled innovation and development. EMEC is keen to help work with Government in this environment and drive the change we all need.

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