Marine Energy as part of a clean growth strategy

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CATAPULT
Offshore Renewable Energy

The Catapult Network

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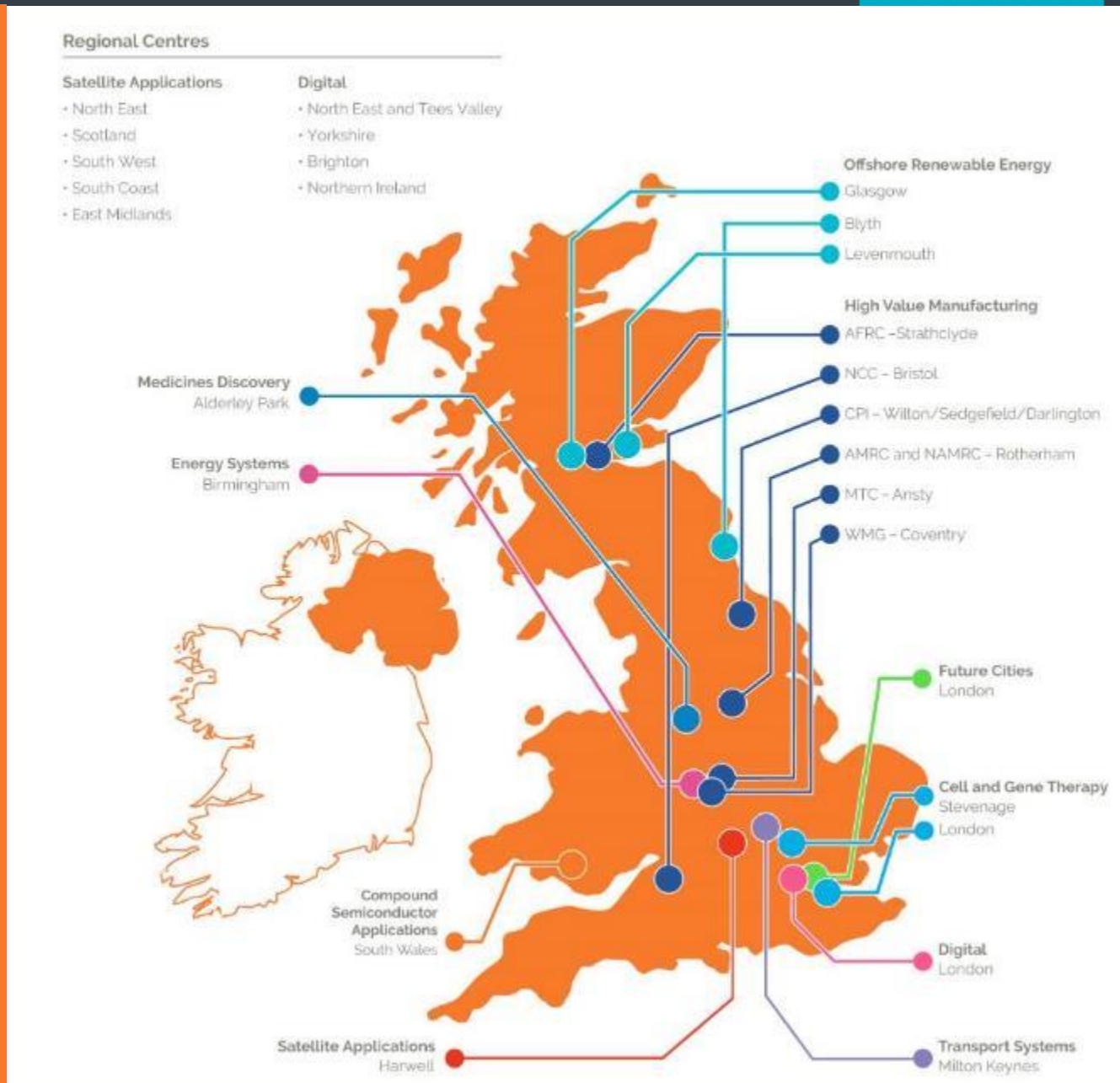
Innovate UK

- Designed to transform the UK's capability for innovation
- Core grant leveraged with industry and other public funding



Our Mission and Vision

Our mission

To accelerate the creation and growth of UK companies in the ORE sector

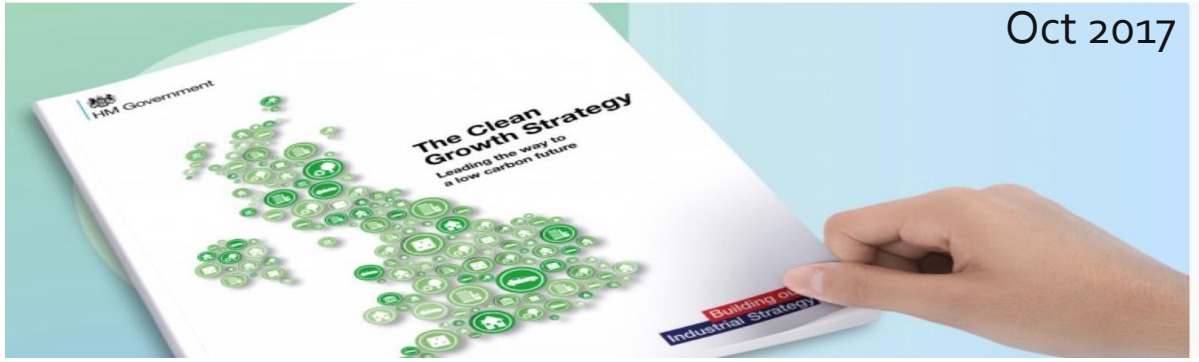
Our vision

By 2023, ORE Catapult will be the world's leading offshore renewable energy technology centre

- **Centres of Excellence**
- **Academic Research Hubs** in partnership with leading universities
- **Expanding our assets in Blyth and Levenmouth** the world's foremost open-access facilities

Marine energy has been assessed against 3 key tests

- The UK government's clean growth strategy has set out three tests.



1 Can we see a clear cost reduction pathway for this technology, so we can deliver low cost solutions?*

2 Can the UK develop world-leading technology in a sizeable global market?

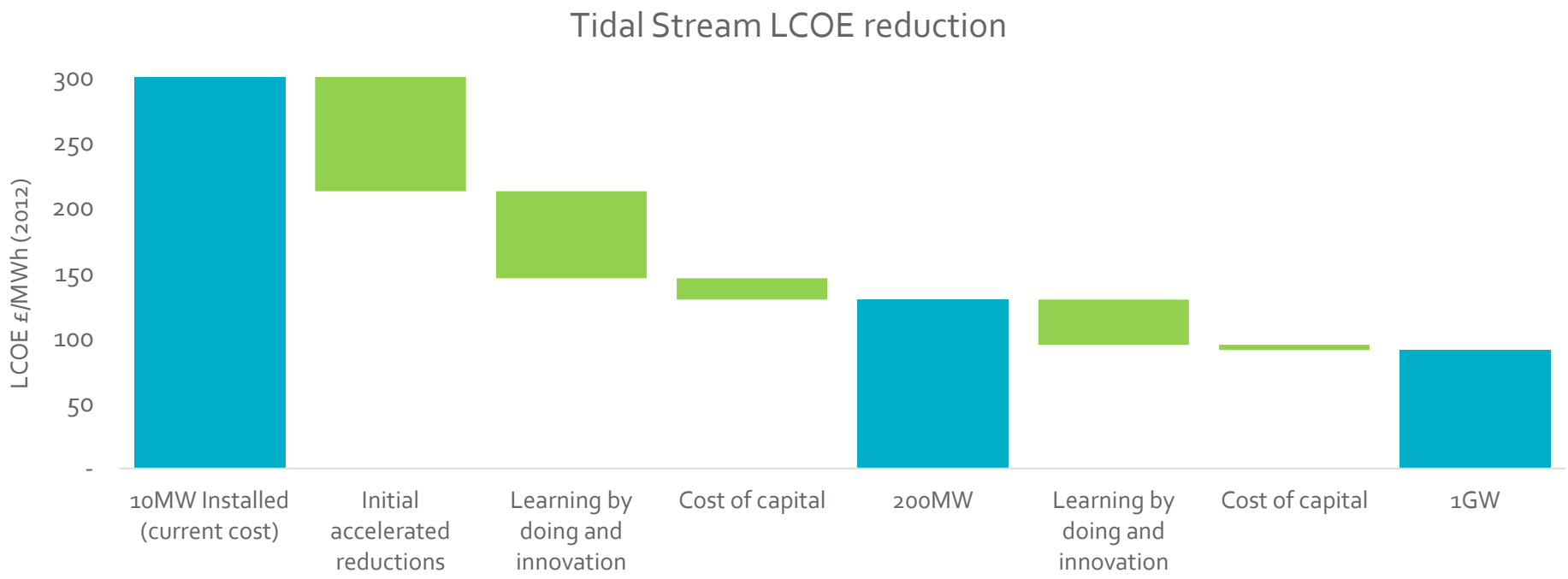
3 Does this deliver maximum carbon emission reduction?

- This study is assessing how the UK's Tidal Stream and Wave Energy industries can perform against these tests.

- *Tidal stream has been assessed against all three test and wave energy against tests 2 and 3.

Link to report:
https://s3-eu-west-1.amazonaws.com/media.newore.catapult/app/uploads/2018/11/19142426/Tidal-Stream-and-Wave-Energy-Cost-Reduction-and-Industrial-Benefit.pdf

Test 1: Cost Reduction Pathway



Initial Accelerated Reductions

- Economies of Volume
- Economies of Scale
- Accelerated Learning

Learning by Doing & Innovation

- Optimised processes & manufacturing
- Real life operational & weather data
- Collaborative shared learning

Cost of Capital

- Increase project debt
- Reduce equity risk

LCOE expressed in pre-tax real, 2012

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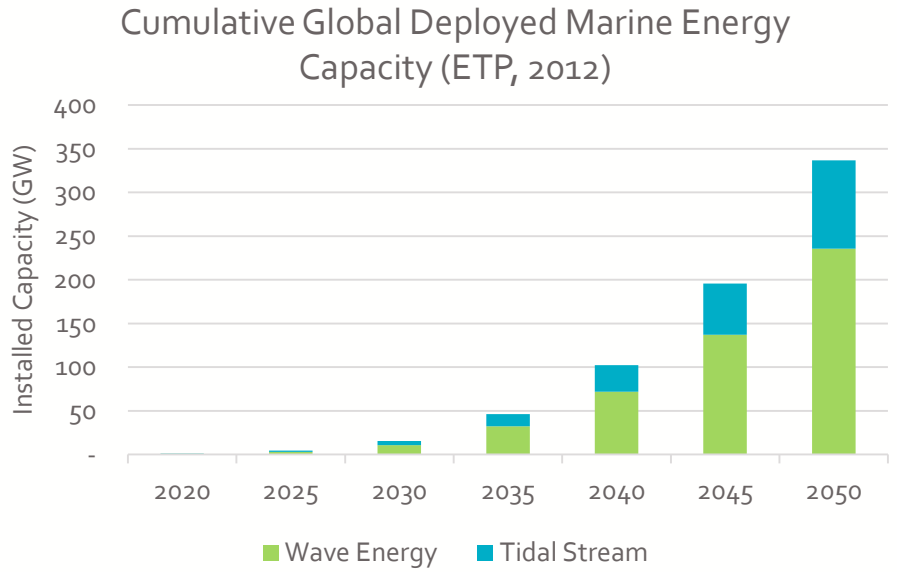
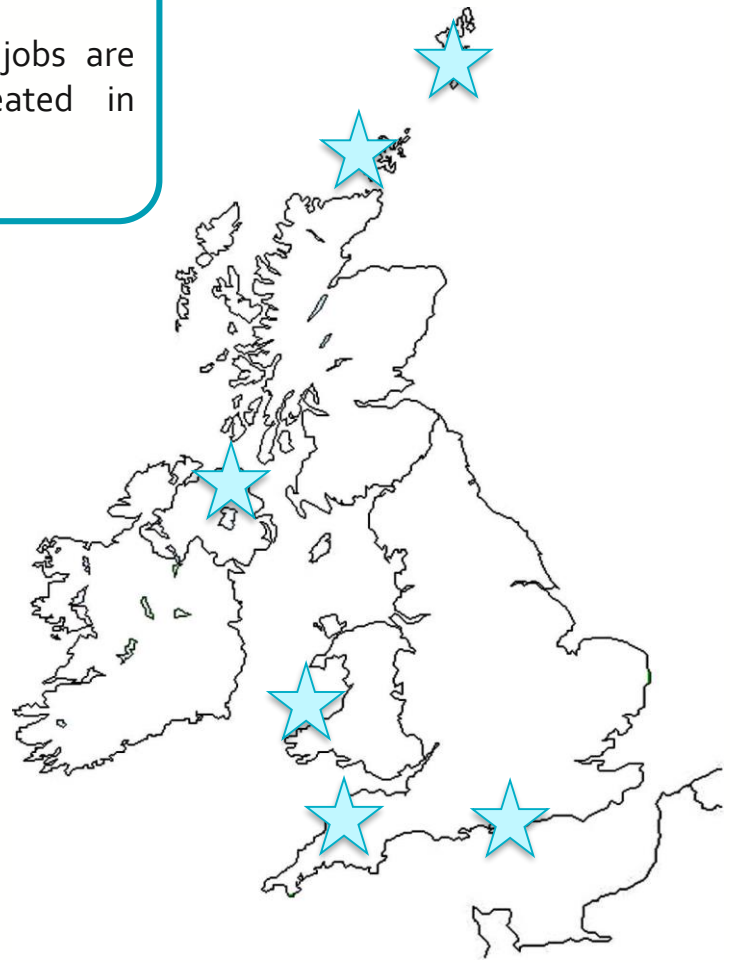
Test 2: UK - A global leader in marine energy



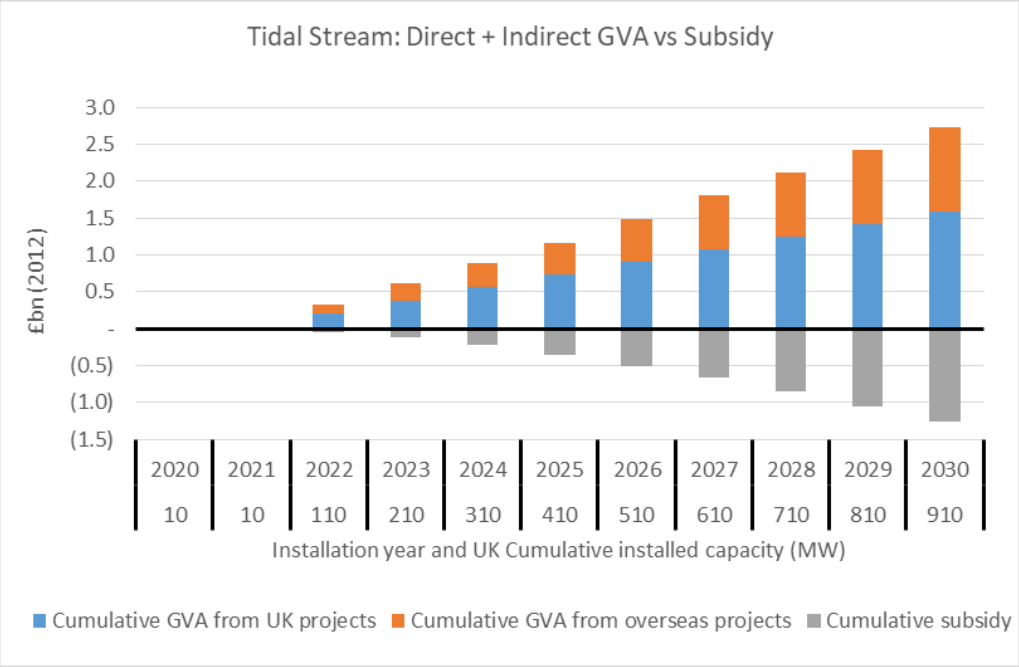
- Hubs of activity in South West, Scottish Highlands and Islands, Wales, Northern Ireland and South Coast
- 50-60% of GVA and jobs are expected to be created in coastal areas

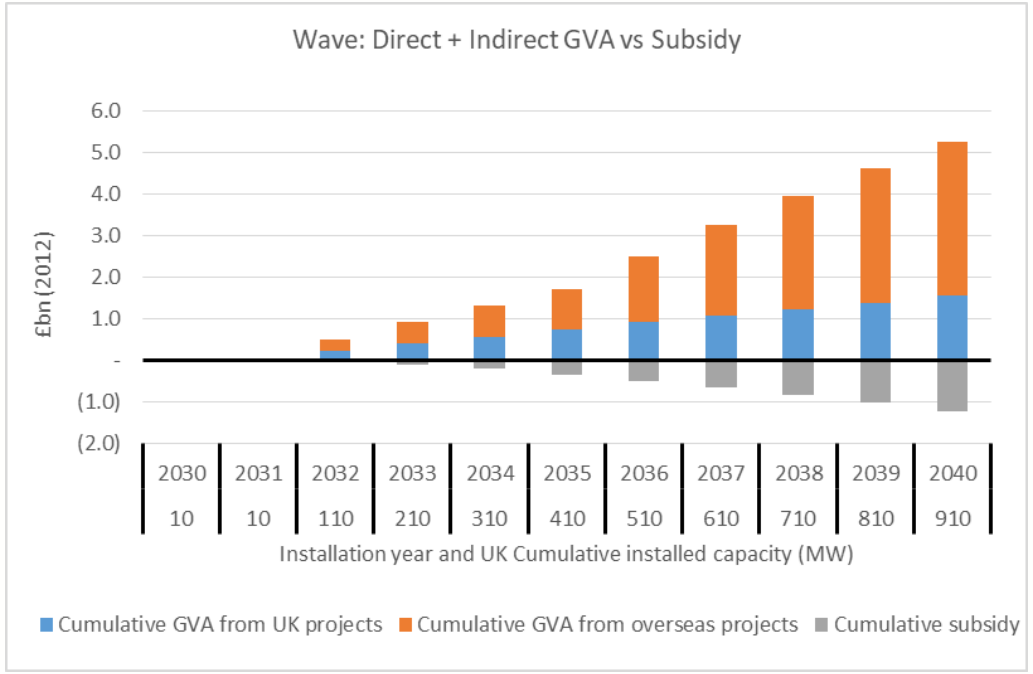


- 20+ tidal stream & 20+ wave technology developers in the UK
- 850 supply chain companies
- 1GW tidal stream deployed in the UK by 2030
- 1GW wave energy deployed in the UK by 2040
- 1,700 jobs today growing to 23,000 by 2040*

*Direct and indirect jobs supported

Test 2 - UK economic benefit





Tidal

- UK average deployment of 100MW per year from 2021/22
- Global cumulative capacity of 3.5GW by 2030
- Cumulative GVA by 2030 of £2.7bn; cumulative cost of £1.3bn
- 4,000 total jobs supported by 2030

Wave

- Expect a 10 year lag behind tidal stream
- Global cumulative capacity of 10GW by 2040
- Cumulative GVA by 2040 of £5.2bn; cumulative cost of £1.2bn
- 8,100 total jobs supported by 2040

Challenges facing the industry

Environment	• Equipment must deal with huge loads, turbulent conditions and withstand salt water and marine growth. • Onshore and test tank development cannot fully replicate conditions to prove operability and survivability. • Operating offshore is very expensive
Consenting	• Regulators demand significant environmental data collection and ongoing monitoring. • The Offshore Renewables Joint Industry Programme (ORJIP) is a UK-wide collaborative programme which aims to reduce consenting risks for offshore wind and marine energy projects.
Offshore Working	• Both wave and tidal rely on offshore vessels for installation, and subsequent operations and maintenance. • Bottom-mounted tidal requires heavy lift capability to position circa 100-200T turbines on subsea support structures. • Floating devices use simpler vessels such as multicats to tow devices to site and install anchoring points.
Condition Monitoring	• Arrays are often located in remote areas and are difficult to access due to tides and weather • Devices must have elevated levels of health monitoring to provide warning of component and system failure to maximise the time for maintenance planning.
Subsea architecture	• Subsea cabling is expensive to lay and prone to damage. Both wave and tidal need to develop cost-effective subsea architecture that minimises cabling in large arrays, provides a means of connecting multiple devices and allows for quick and simple retrieval for maintenance.

Current status and next steps

Marine Energy Council

- Provide a unified voice for the industry and engage with government through trade associations (RenewableUK and Scottish Renewables)
- Members include technology and project developers, supply chain, test centres and consultancies

Continuing Focus

- Pursuing 'Innovation PPA' for small scale projects (~ < 5MW) and a bridging mechanism for utility scale projects
- Scottish Renewables Socio-economic Impact report
- ORE Catapult looking at Emerging Innovation Priorities for Scottish Government with technology developers

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