



Ocean Energy Progress Report

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Low Carbon Transition

Scottish Enterprise

Ocean Power Innovation Network

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Why Ocean Energy – size of the prize

International Energy Agency:

By 2050, potential to deployed **300 GW** of installed capacity, create **680,000** jobs and saved 500 million tonnes of CO₂ emissions.

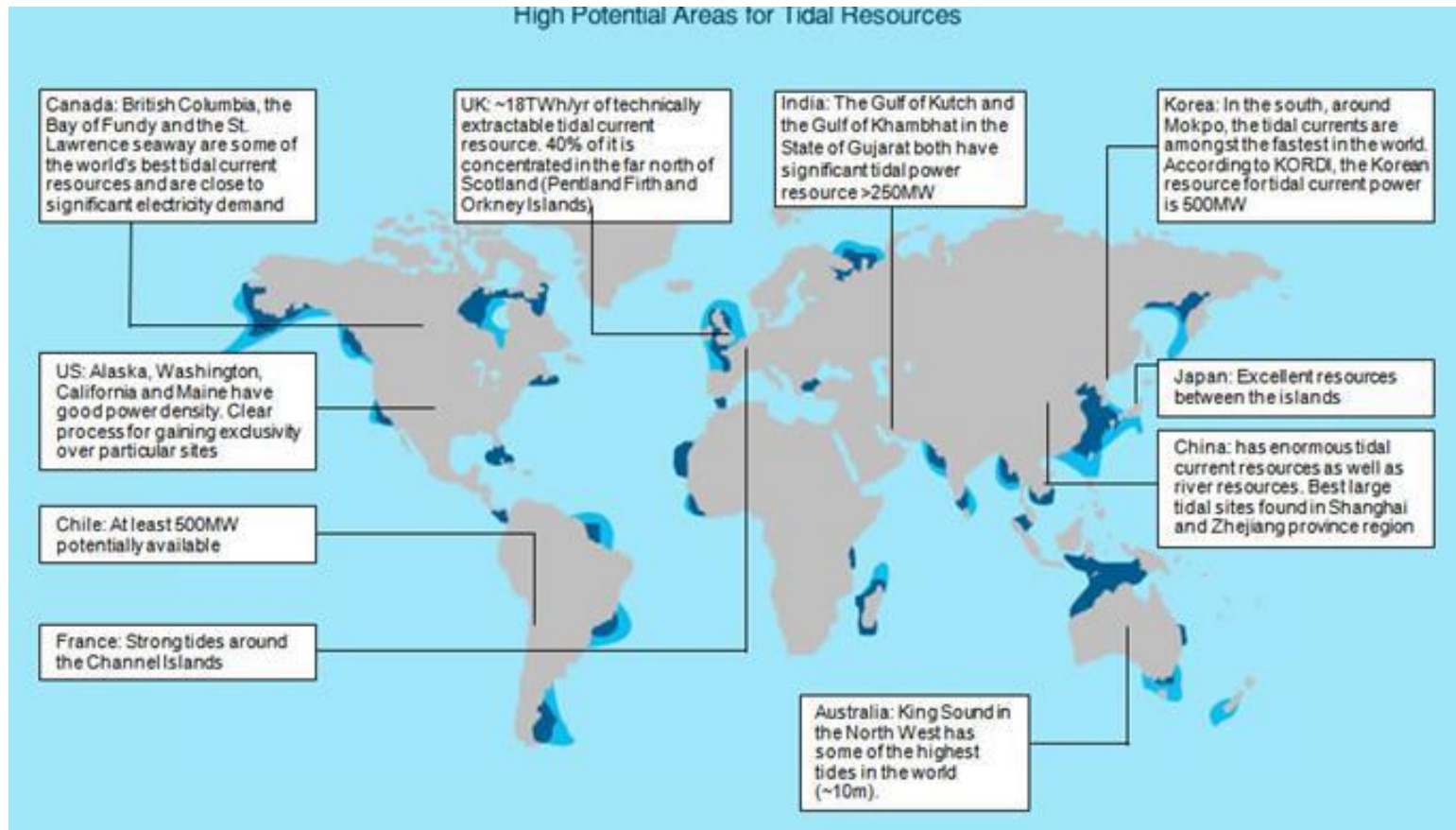
Ocean Energy Europe:

In Europe alone, plans to deploy **100GW** of production capacity by 2050, meeting **10% of electricity demand**. That's enough to meet the daily electricity needs of **76 million households**. Deploying 100GW of ocean energy will also mean creating a new industrial sector based firmly in Europe, and **400,000 skilled jobs all along the supply chain**.

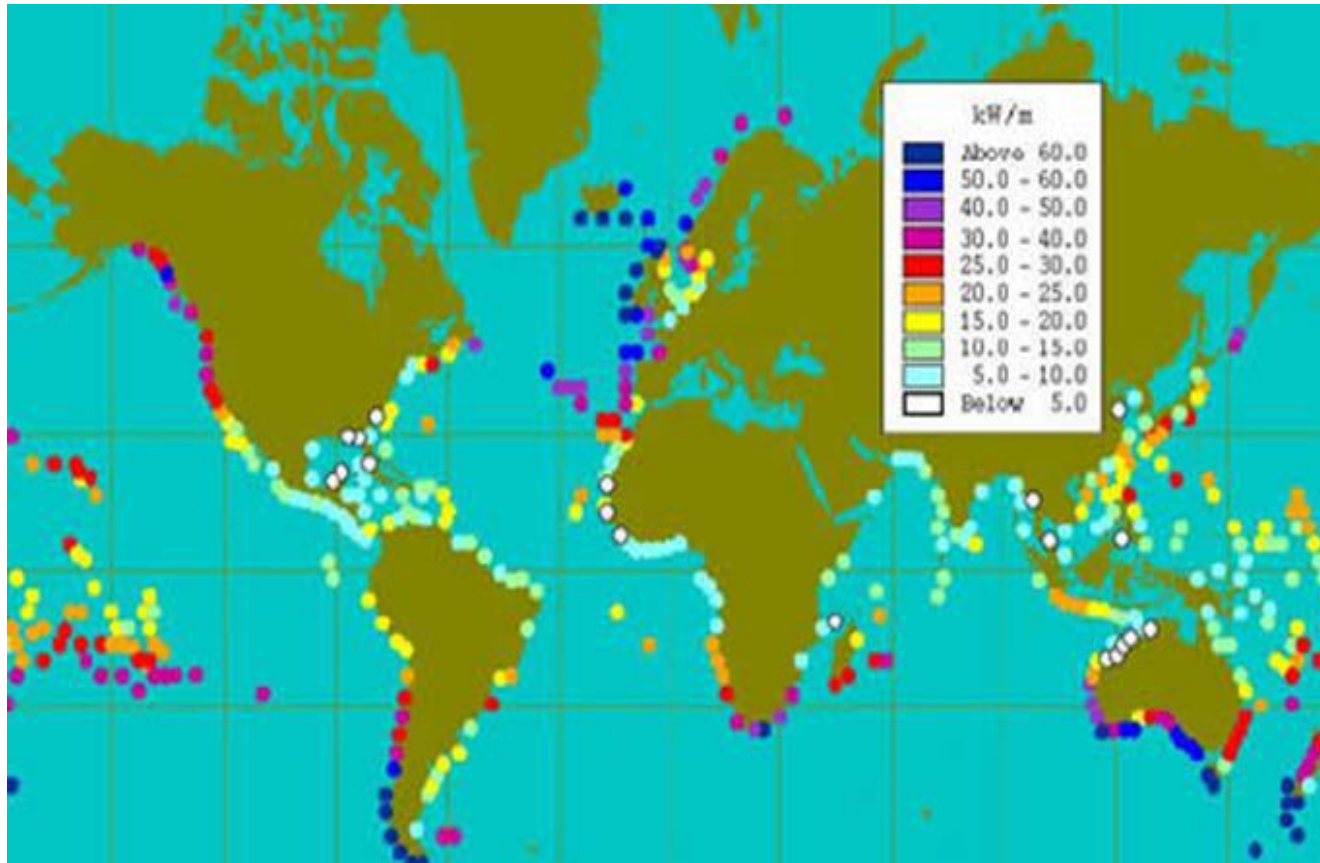
ORE Catapult:

With UK deployment of 100MW pa and a realistic share of a growing global market, tidal stream could generate a net cumulative benefit to the UK by 2030 of **£1,400m GVA**, support **4,000 jobs** by 2030 and **14,500 jobs** by 2040.

Global Market Tidal – 60 GW



Global Market Wave – 180 GW



Progress accelerating....Tidal Stream is happening

Orbital Marine Power: o2 2MW floating tidal turbine

- The world's most powerful floating tidal turbine, capable of powering 1,700 homes
- Abundance closes largest investment to date, raising £7 million
- Scottish Government funding of £3.4 million
- €10m Horizon 2020 funding FloTEC project
- Scottish based TEXO Group awarded the main manufacturing contract



Progress accelerating....Tidal Stream is happening

SIMEC Atlantis Energy – MeyGen

- In 2019, MeyGen exported over **13.8GWh** of electricity, equivalent to the average annual electricity consumption of around 3,800 homes
- Phase 1A of MeyGen operates with 5 ROCs, total revenues to date £7.1m



Progress accelerating....Tidal Stream is happening

Nova Innovation

- The €20 million flagship EU project, Enabling Future Arrays in Tidal (EnFAIT), has **reduced the cost of tidal energy by 15 per cent** and grown its supply chain from four to 14 EU countries.

QED Naval and HydroWing

- Announce a new collaborative European joint venture with acquisition of Holland's premier tidal turbines business, **Tocado** - standardised, **off-the-shelf catalogue** of tidal turbines, platform foundation solutions



Progress accelerating ... Wave Energy Scotland

- £40m invested to date in innovation programme
- 88 R & D contracts involving 200 organisations
- 2 wave devices - to be demonstrated in Orkney from summer 2020, with £7m from WES:
 - **AWS Ocean - Archimedes Waveswing** - Malin Renewables has secured a £1 million contract to supply a fifty-tonne wave energy converter.
 - **Mocean Energy – Blue Horizon** - prototype will utilise a purpose-built power take-off generator, [C-GEN](#), designed and built by Edinburgh University – also a recipient of a WES award.
- Aberdeen-based offshore engineers Apollo, subsea specialists SRP and electrical components provider Ditrel Industrial feature in the seven winning projects totalling around £460,000 as part of a £2 million award for **quick connection solution**

New Markets ... global opportunities

SIMEC Atlantis Energy

Contract with **Kyuden Mirai Energy** to supply tidal generation equipment and offshore construction services for a demonstration project in Japan



Nova Innovation

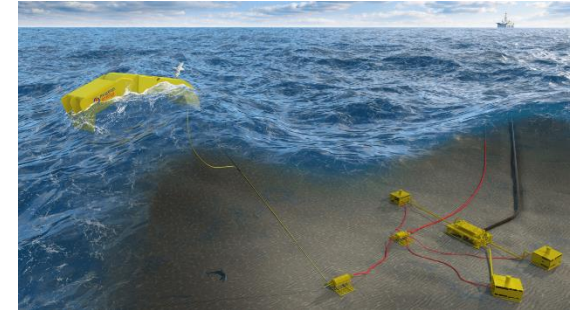
To develop a 15 turbine, 1.5MW tidal array in Petit Passage, in the Bay of Fundy

Sustainable Marine Energy and **Minas Tidal** to co-develop their adjacent berths at FORCE and will utilise SME's PLAT-I floating in-stream tidal energy technology to deliver up to 9MW of tidal energy to the Nova Scotia grid



New Markets energy users, local systems

Mocean Energy has teamed up with energy major Chrysaor, subsea energy storage experts **EC-OG** and AUV specialist Modus to look at using renewables for subsea power, supported by the Oil and Gas Technology Centre



SIMEC Atlantis Energy

Announced ambitions for a tidal-powered data centre in Caithness, powered via a private wire network from the MeyGen site



Surf 'n' Turf project in Orkney, harnessing tidal power from EMEC's tidal test site. Hydrogen is produced on Eday, shipped to Kirkwall, where a 75 kW fuel cell converts hydrogen back to electricity, used as auxiliary power for the ferries when docked in the harbor



Challenges – cost reduction

Learning by doing – through deployment

Learning by research – innovative R&D

Economies of volume - bulk discount factors

Economies of scale – cost reductions due to increasing scale of individual devices

Therefore need:

- further research, realising step-changes in cost through innovation
- deployment – gaining experience in installation, operation and maintenance, verifying device performance in the long term
- collaborative learning
- route to market

ORE Catapult: We will only reach £150/MWh with extensive commonality across the installed capacity



Blades

- Instrument blades to feed better understand performance
- Fatigue life testing
- Identify manufacturing facilities that can expand with industry



Pitch Control

- Record and share data on failures
- Work with key suppliers to share learnings and secure continuous improvement



Subsea Hubs

- Subsea cabling is expensive to lay and prone to damage
- Hubs are being deployed by Atlantis and NOVA. Combine learnings to accelerate development



Wetmate Connectors

- Not currently designed for voltage required and harsh environment
- Collaborate with industries experienced using the technology, such as oil and gas



Nacelle Deployment & Recovery

- Limited operating windows
- Assess requirements against capabilities of Scottish vessels
- Explore opportunities to develop harbour infrastructure in the North of Scotland.

Challenges - technical

- Modelling, resource and site assessment
- Device design
- Materials, components, sub-systems and systems
- Structures, foundations and moorings
- Installation, logistics and infrastructure
- Power transmission, grid connection and integration

Challenges – economic, regulatory

- LCoE analysis and cost reduction strategies
- Market / revenue support, access to development funding
- Scaling and arrays
- Industry and supply chain development
- Synergies with other sectors
- Insurance and finance
- Standards
- Health & safety
- Environmental impact assessment and monitoring

OPIN Value Chain Study, BVG, 2019 - Opportunities

- **Full project lifecycle**
 - 1. Development and project management
 - 2. Device supply
 - 3. Balance of plant (inc. transmission)
 - 4. Installation and commissioning
 - 5. Operations, maintenance and service (OMS)
 - 6. Decommissioning
- **Detailed mapping/analysis by OPIN country / regions**
- **Opportunities for collaboration** e.g. Collaboration between manufacturing facilities and device suppliers to understand:
 - where cost savings could be made
 - where bespoke solutions could be displaced by more generic, low cost ones

Support and Funding

European

- Horizon 2020 / Horizon Europe – research and innovation
- Horizon Europe Clean Energy Transition Partnership
- European Investment Bank – loans, equity
- European Innovation Fund - demonstration of innovative low-carbon technologies
- European Green Deal
- Interreg, LIFE, Eurostars.....

National / regional development agencies, cluster and funding programmes e.g.

- Scottish Enterprise Collaborative R&D grants
- Scottish Investment Bank

Support and Funding

A number of projects offer access to technical or commercial support or testing facilities for ocean energy companies:

North-West Europe Marine Energy Alliance (MEA)

<https://www.nweurope.eu/projects/project-search/nwe-mea-north-west-europe-marine-energy-alliance/>

Blue-GIFT (Blue Growth and Innovation Fast Tracked) <http://bluegift.eu>

OceanDEMO: <https://www.nweurope.eu/projects/project-search/oceandemo-demonstration-programme-for-ocean-energy-pilot-farms-and-supporting-technologies/>

MaRINET 2

<http://www.marinet2.eu/>

and of course, **Ocean Power Innovation Network....**