Future prospects and challenges for the Wave and Tidal Stream Energy Sectors

Presentation to Coastal Futures 2015

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Today's presentation

- Current state of the UK industry
- Challenges to progress:
  - Technological
  - Regulatory and lack of infrastructure
  - Lack of long term policy and support
- Potential government enabling actions

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UK: acknowledged global leader in marine renewable energy

- Plentiful marine energy resource
- Unrivalled test facilities
  - EMEC, Wavehub, FaBTest NaREC
- Historically supportive government policies
- Skills base: Creative engineers plus transfer from offshore O&G sector
- Pentland leasing rounds

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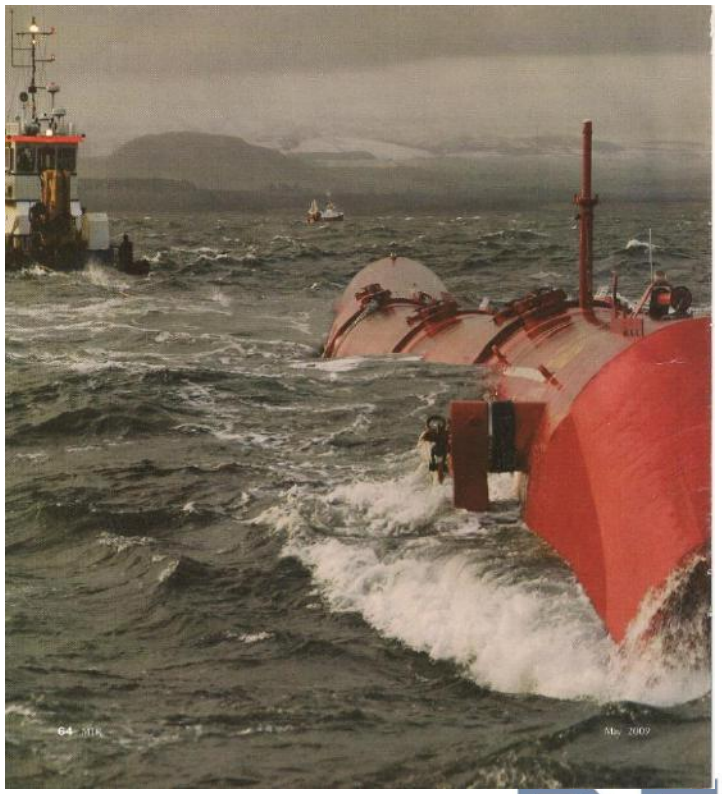
2014: Body-blow announcements for the wave and tidal energy sector

- Pelamis Wave Power in administration
- Siemens suspends MCT projects; offers the technology for sale
- 30 redundancies at Aquamarine Power
- Voith and RES exit marine renewables



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Seagen: a UK world first!

- 1.2 MW demonstrator in Strangford Lough, Northern Ireland
- Generated more than 9 GWh to the national grid
- Accredited as a UK generating station by Ofgem and is eligible for ROCs

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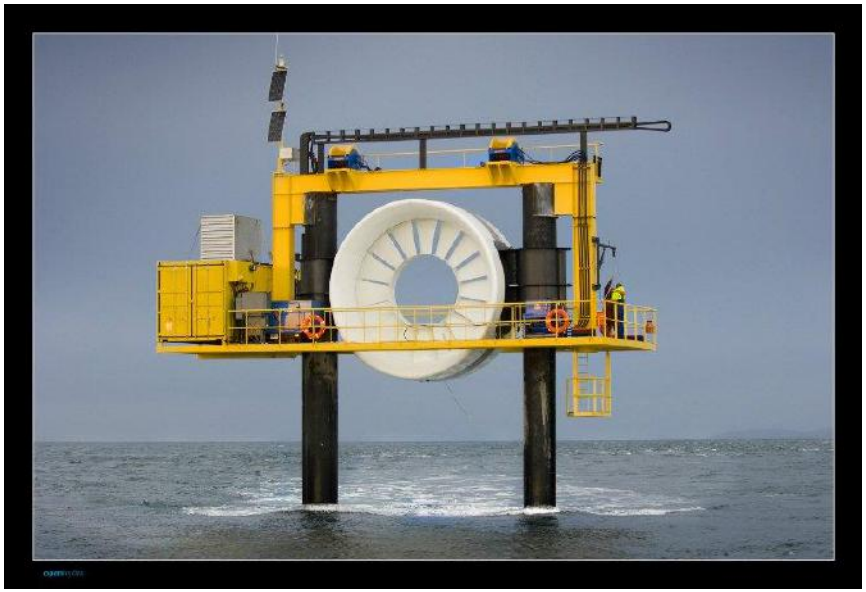
Tidal energy devices, clockwise from top left:

Atlantis, TGL, Hammerfest, Open Hydro



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Smaller scale tidal turbines UK designed and developed

- Scotrenewables:
  - Floating cylindrical tube with 2 horizontal axis rotors – 250 kW

- DeltaStream
  - 400kW full-scale demonstrator in Ramsey Sound, Wales

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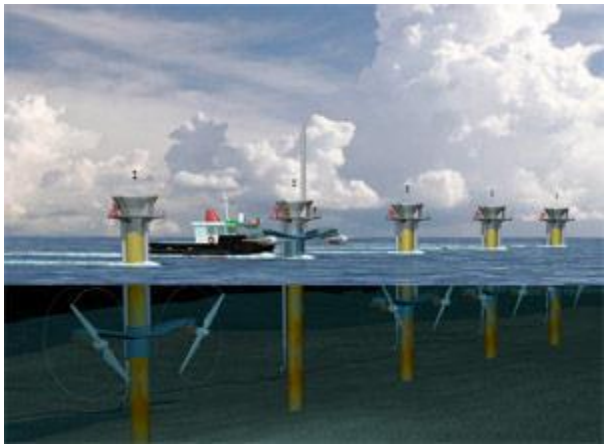
The next stage - arrays of tidal devices

- **MeyGen project**:
  - Between Stroma and NE tip of Scottish mainland
  - Stage 1 of 398MW plant
  - Financial close in 2014
  - 10MW: AH Hammerfest and Atlantis turbines
- Projects in the pipeline:
  - Scottish Power Renewables, Islay: 10MW,
  - Seagen Anglesey: 10MW,
  - Seagen Kyle Rhea: 8MW,



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3-4 MW of wave energy installed capacity in UK waters

- At EMEC:
  - Oyster 1 (0.800 MW)
  - 2 x Pelamis P2 (0.75 MW)
  - Wello / Penguin (0.5 MW)
- At Wavehub /FaBTest
  - Seatricity / Oceanus 2 (0.16 MW)
  - Fred Olsen BOLT
- On Islay:
  - Limpet (0.5 MW)

  Operational since 2001. Delivers 0.25 MW power to the grid

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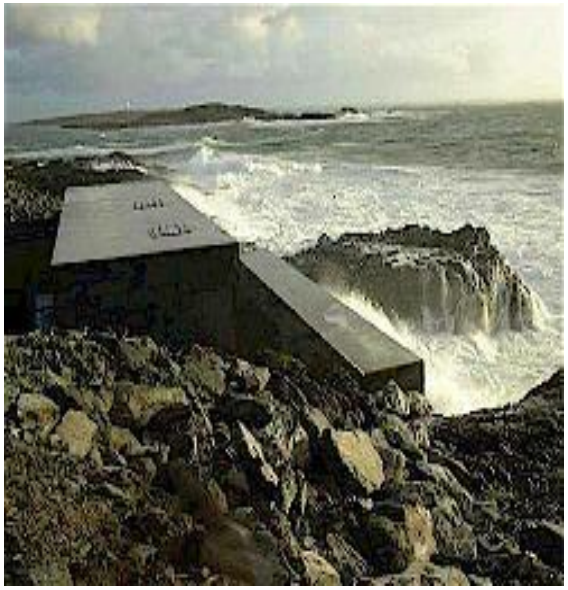
Wave energy devices, clockwise from top left:

Oceanus 2, BOLT, Penguin, Limpet



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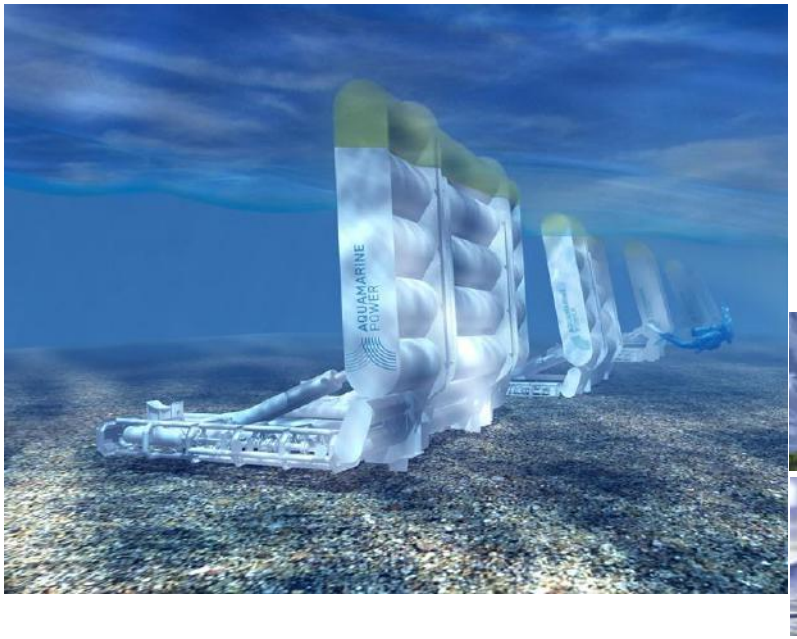
The next stage - arrays of wave devices

- Projects:
  - Aegir, Shetlands: 10MW, up to 14 Pelamis devices
  - West coast of Lewis: 10MW and 30MW, up to 40 Oyster devices
- As Stage 1 of Pentland and Orkney Waters leasing round:
  - Four Point (Pelamis) : 7.5 MW
  - Brough Head (Oyster): eventually 200MW



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Technological challenge

To prove long term operation, reliability and ability to deliver power – reduce risk and provide investor confidence

- Deployment and maintenance are difficult in a high energy environment
- Survivability: the marine environment is corrosive and hydrodynamic forces can be destructive
- Equipment (e.g. cables, gearboxes) must tolerate continual immersion in seawater

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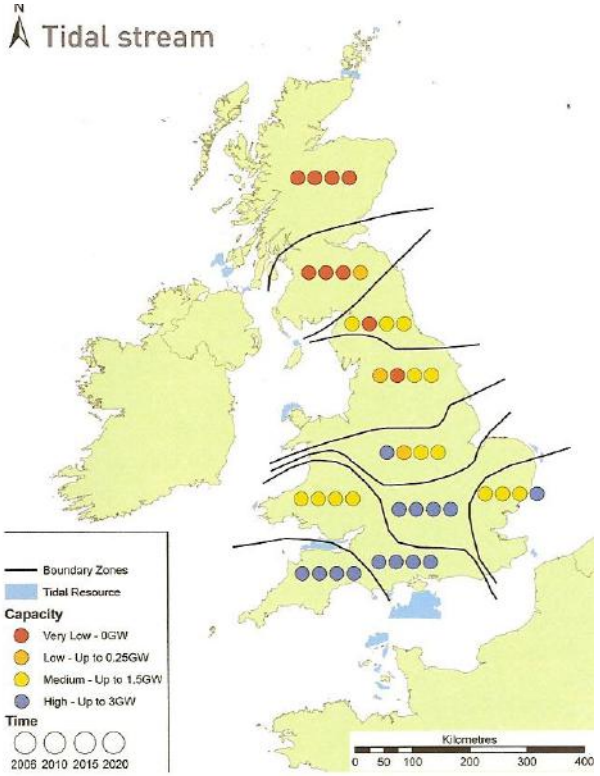
Barriers to progress

- Limited grid capacity and access in areas of good resource
- Absence of long-term commitment and inconsistent messages from government leading to lack of investor confidence
- Lack of private investment
- Limited support for supply chain



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Government Financial Support

- Marine deployment is too expensive for industry to develop alone
- Marine energy projects too risky for private investment
- Why offer financial support?
  - Marine RE could generate 2100 jobs by 2020, £900m by 2030
  - The opportunity was lost in 1980s for the UK wind industry

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Market support mechanisms

Contracts for Difference

- Government “tops up” the price the generator is expected to receive for power to the “Strike price”
- No obligation on suppliers to purchase renewables
- 15 year contract: £305/MWh for marine RE
- 30MW project cap
- Scheme now open but no certainty beyond 2019

Renewables obligation

- Obligation on electricity suppliers to purchase renewable electricity and surrender RO certificates to the regulator
- Projects earn certificates for 20 years
- Scheme closes to new entrants in 2017

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Government mixed messages

- Currently good financial support for marine
- Marine Energy Action Plan
  - Marine Energy Parks and Offshore Catapult

BUT

- Capital support schemes do not work
- Move from Renewable Obligation Certificates to Contracts for Difference removes obligation and reduces period of support
- Refusal to sign up to EU legally binding renewables targets for 2030

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If government wishes to capitalise on the UK lead in marine renewables, a new paradigm for sector support is needed

- Long term initiatives that cannot be overturned by successive governments – provide investor comfort
- Clear strategy with firm targets – e.g. 150 MW of tidal energy generators deployed by 2020
- Use MeyGen as funding template – 95% capital provided from public sources
- New models for private investment
- Government-owned and run pre-consented sites, offering grid access and power purchase agreements, technology agnostic
- Wave Energy Scotland?

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Thank you for listening

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