All Energy '07

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Marine Current Turbines: an update

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www.marineturbines.com

MCT's Progress

- → 1993: DTI Tidal Stream Review pessimistic results: DTI relegates sector to "watching brief" status
- → 1994-5: MCT's parent develops World's first tidal turbine -10kW - tested on Loch Linnhe at Corran Narrows
- → 2000: MCT formed as independent entity and lobbies DTI
- → 2001: DTI agrees to support Tidal Stream following positive findings of consultant's review of MCT Seagen Concept
- 2003-7: MCT installs and tests Seaflow, 300kW experimental test rig 3km off Lynmouth in Bristol Channel
- → 2007: MCT designs, builds and is ready to install 1.2MW Seagen Commercial Demonstrator in Strangford Narrows -
- → 2007: MCT starts work on 10MW Seagen Array project

Background: 15kW Tidal Current Turbine (1994-5)





PROOF OF CONCEPT PROJECT (IT Power. Scottish Nuclear & NEL) Loch Linnhe, Scotland

World's first tidal current turbine







what has 'worked' *the basic concept*

- Axial flow rotor
- Marinised drive train
- Surface breaking monopile
- Structural integrity
- Low cost intervention
- No significant environmental impact

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SeaGen Prototype

Some key features:-

- 2 x 600kW rotors:16m diameter
- installed on steel pile
- rotors and nacelles raised above sea level for maintenance
- transformer and electrical connection to grid in accessible and visible housing at top of pile
- deployment in arrays or "farms".
 of hundreds of turbines



Assembly at H&W - cross arm (above) pile (below)



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Rotor blades - carbon/glass epoxy composite



Fully optimised geometry - expected free-stream Cp > 0.45

Rotor assembly at H&W - 16m diameter - 600kW





ATA INA

Seagen - complete and ready for installation at Harland & Wolff, Belfast - April 2007



SeaGen 1.2MW Commercial Demonstrator

- soon to be tested in Strangford Narrows, NI
- will be used as testbed for SeaGen technology
- will have continuous environmental monitoring
- mean max current 7.8kt
 water depth 25m ± 2m



Seacore Jackup-rig Excalibur visits Strangford 16-19 April 2005, to complete SeaGen geotechnical survey

Seacore

Key Project Costs - short-term cost trend



Marine Current Turbines Early Project Costs

Location	Rated Power (MW)	Capital cost (£k/MW)	Life Cycle Unit cost (p/kWh)
Strangford	1.2	5,191	16.8
Anglesey Skerries demo	10.5	2,537	11.7
Anglesey Skerries Commercial	51.0	1,489	7.9
Anglesey Skerries if developed fully (after 500MW installed)	30.0	923	5.2

Cost projections from due diligence report by Black & Veatch in an independent assessment



Niche Market? Turbine Bridge



Route towards Second Generation Technology



3. Deploy suitably sized array of rotors across current

.... but we need to develop a suitable structure to hold them

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MCT 2nd Generation - horizontal array structure

Comparisons: how many <u>kW per tonne</u> of equipment?

MCT Seaflow tidal turbine ~ 2.3 kWe per tonne 130t & 300kWe

MCT Seagen prototype ~ 3.1 kWe per tonne 390t & 1200kWe

Vestas V80 windturbine ~ 3.4 kWe per tonne offshore at North Hoyle 590t & 2000kWe

MCT 2nd Gen Technology ~ 4.5 kWe per tonne 1100t & 5000kWe

world leader in tidal turbine development

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