



Developments in the Tidal World

Paul Kent, Director
Maritime Tidal Energy Corp (MTEC)
Economic Opportunities, and Challenges of
Marine Renewable Energy Workshop

Nov 4-5, 2009



MTEC

- Founded in Halifax in 2006
- To facilitate the generation of electricity from the powerful Fundy tides
- To reduce GHG emissions
- To help level the rising cost of energy
- To participate in potential business opportunities



Worldwide Tidal Energy Development Status

- Seven tidal energy developers have successfully tested working, grid or application connected, demonstration tidal turbines
 - Marine Current Turbines - UK
 - OpenHydro - UK
 - Hammerfest Strom – Norway/UK
 - Verdant – United States
 - Clean Current – Canada
 - Lunar – UK
 - Atlantis Resources - Singapore



Worldwide Commercial-Sized Demonstration Plans

- OpenHydro, Marine Current Turbines, & Clean Current in Eastern Canada beginning in 2009 – 2010
- Lunar & Hammerfest Strom in Scotland beginning in 2009 – 2010
- Verdant with 30-unit array (1 MW in total) in United States beginning in 2009 - 2012



Plans for full scale commercial arrays in next 2 years

OpenHydro

Channel Islands
France

Marine Current
Turbines

Wales

Lunar

Scotland
Korea

Hammerfest
Strom

Scotland
Ireland

Verdant

United States
Central Canada

Atlantis
Resources

Australia
Scotland
and/or China



Leading Tidal Development & Commercialization Locations

- Scotland, Ireland, Wales, Channel Islands, Korea
- UK is the leading the way
- Why?
 - Government policy & targets
 - Streamlined regulatory processes
 - R&D funding
 - Infrastructure & support for demonstration projects
 - Feed-in tariffs/ support for early stages of commercialization



UK policy & targets

Renewable Energy Strategy (2009)

- 15% of energy from renewables by 2020 (a 7x increase).
 - 30% of electricity, 12% of heat, 10% of transportation energy will be renewable

Marine Bill (2009)

- Marine Management Organization has planning, monitoring, licensing & data collection role.

The Planning Act (2008)

- Streamlined approvals for infrastructure projects of national significance. Consent decisions in 9 months.



UK govt funding for marine renewable energy

Total govt R&D spending 1999-2005

\$25m

- \$11.6m (£6.5 m) for tidal stream energy
- \$7m (£3.9 m) for wave energy
- \$6.4m (£3.6 m) Research Council wave and tidal research program

Support for demo/ deployment 2006 →
\$106.8m (£60 m)



Demo/ test facilities and R&D strategy

New funding announced 2009

- \$14.2m (£8 m) to European Marine Energy Centre (EMEC)
- \$35.6m (£20 m) to Wave Hub and the South West, to create UK's first low carbon economic area
- \$17.8m (£10 m) for New and Renewable Energy Centre (NaREC)

R&D Strategy

- UKERC Marine Renewable Energy Technology Roadmap (2008)
- A guide for mobilising the wave and tidal energy community in the UK towards a target of 2GW installed capacity by 2020.



UK support for commercialization

“Renewable Obligation Certificates” (ROCs)
(= feed-in tariffs) plus other incentives.

Marine renewables: Approx 23 cents/ KWh

Higher in Scotland:

- Tidal 31 cents/ KWh
- Wave 47 cents/ KWh



South Korea

Tidal development

- Government intends to spend US \$87bn over 5 years to reduce GHG emissions.
- Target for “alternative energy” – 5% by 2011 - from 1.4% today
- Tidal developments
 - May 2009 – Uldolmok Plant completed: 1,000 KW; 100% domestic technology
 - Lake Sihwa - 250MW barrage-style tidal power plant nearing completion
 - Garolin Bay - 520MW – under consideration



Economic opportunity - UK industry's view

“Based on the experience of the solar and wind industries, the level of UK support for marine energy is not of the magnitude required to develop a world-class industry.”

- *Marine Renewable Energy State of the Industry report – October 2009. Prepared by Entec for BWEA.*



Denmark - Wind

- In 1990, set target of 10% renewable energy by 2000.
- By 2007, had achieved 20%.
- By 2025 – target 30%
- Wind industry has received over \$2.3bn govt support since 1993
- Wind industry annual revenues \$4.8bn.
- Wind turbines are now single biggest goods export
- Have over 50% of the world market.

- Energy technology exports are 10% of total exports
 - (incl wind, biomass, combined heat/power)



Japan - Solar

Govt support 1994 - 2011

- Market support and direct subsidies of around \$1.8bn to solar industry
- This has led to the development of a solar energy industry with sales of over \$4.3bn per annum.



Germany – wind & solar

Renewable Energy Sources Act

- Includes feed-in tariffs up to 7x market rates; declining over 20 years

Outcomes – in less than 10 years

- 22,000 MW of renewable energy – largely wind - added to grid
- Germany developed a major renewable power industry
 - Now worth \$240 billion; employs 250,000
 - By 2020, will more employ more than auto industry (currently Germany's biggest employer).

Cost/ benefit

- Cost of feed-in tariffs - \$38 per year / average consumer
- Conventional energy generation cost has risen, while renewable (wind, solar) has dropped dramatically.
- *“Most successful and cost-effective new job creation program ever”*

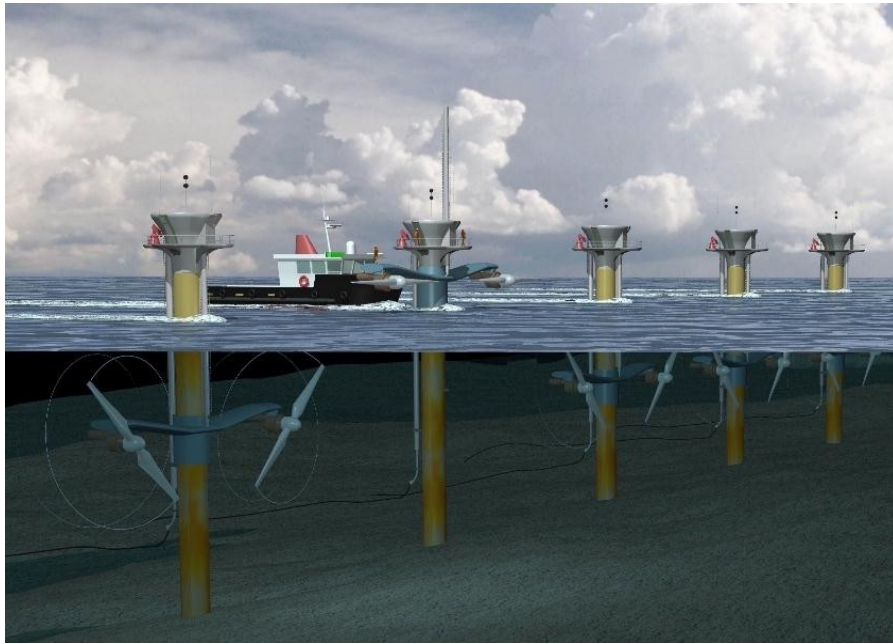


Observations

- Credible partnerships have been formed
- Ocean energy development is quickening
- Groundwork (policy, legislation, processes, incentives) is being put in place
- Full commercialization is imminent
- The UK will be the recipient of the bulk of the commercial installations
- There are no commercial tidal projects planned for Eastern Canada



Maritime Tidal Energy Corporation's Vision



- Multiple Commercial Tidal turbine farms in the Bay of Fundy
- Supporting industries in Nova Scotia
- Support that can compete on the world stage