Marine Renewable Energy

Legal and Policy Challenges to Integrating an Emerging Renewable Energy Source

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Overview

- Marine renewable energy:
  - Sources
  - The resource
  - Technologies
  - Status

- The importance of suitable legal and policy frameworks

- Law and policy challenges
  - Permitting
  - Seabed ownership
  - Impact assessment
  - Grid connection
  - Incentives

- Concluding thoughts
Marine Renewable Energy Sources

- Wave energy
- Hydrokinetic energy
  - Tides
  - Ocean currents
- Ocean thermal energy
  - Utilising the temperature differential between water at different depths
  - Very few locations where this is possible
  - Not well developed
- Osmotic energy
  - Utilising the pressure differential between saltwater and freshwater
  - Also not well developed – one small plant in Norway
The Resource

Average Annual Wave Power (kW/m)

Source: wrsc.org
Europe: Average Annual Wave Power (kW/m)

Courtesy of Sustainable Energy Authority of Ireland
High Potential Areas for Tidal Resources

Canada: British Columbia, the Bay of Fundy and the St. Lawrence seaway are some of the world's best tidal current resources and are close to significant electricity demand.

UK: ~18TWh/yr of technically extractable tidal current resource. 40% of it is concentrated in the far north of Scotland (Pentland Firth and Orkney Islands).

India: The Gulf of Kutch and the Gulf of Kambhat in the State of Gujarat both have significant tidal power resource >250MW.

Korea: In the south, around Mokpo, the tidal currents are amongst the fastest in the world. According to KORDI, the Korean resource for tidal current power is 500MW.

US: Alaska, Washington, California and Maine have good power density. Clear process for gaining exclusivity over particular sites.

Chile: At least 500MW potentially available.

France: Strong tides around the Channel Islands.

China: Has enormous tidal current resources as well as river resources. Best large tidal sites found in Shanghai and Zhejiang province region.

Japan: Excellent resources between the islands.

Australia: King Sound in the North West has some of the highest tides in the world (~10m).
Resource Estimates

- 0.1% of the oceans’ renewable energy converted into electricity would satisfy present world demand for energy 5 times over
- 15% of US electricity needs by 2030
- 15% of Europe’s electricity needs by 2050

Courtesy of Atlantis Resources

UK Marine Foresight Panel, 2000
Press release, EurActive. 20 July 2010
Current Development Status

- Emerging technology on the brink of commercialisation
- More than 300 projects around the world
- “Will be ‘make or break’ in the next five years”
- “commercialization… will take place in the next 5-10 years as the technology evolves and production costs decline”
- Competitive with wind by end of decade (UK)

Pike, Ocean Energy Could Reach up to 200 Gigawatts of Power Generation by 2025, January 19, 2010
Current Development Status

- Large-scale utilities, energy agencies and industrial companies making significant investments in the sector
  - E.g. Siemens recently bought Marine Current Turbines

- Testing centres
  - E.g. European Marine Energy Centre
    - 8 full-scale devices generating to the grid
    - ‘Nursery’ sites for prototypes

- Military interest
  - US naval base in Hawaii
  - Naval base in Western Australia agreed to be 100% marine-powered

Courtesy of Marine Current Turbines
The Importance of Law and Policy

- Good regulation facilitates development and sustainable deployment of renewable energy technologies:
  - Certainty
  - Sustainability
  - Investor confidence
  - Knowledge development
  - Equitable use
  - Timescales

- At the point of commercialisation: important to get it right now!
  - Avoid the ‘Valley of Death’

- Success depends upon
  - “government policies to support development and deployment… the sector requires a comprehensive policy framework”
  - “swift and targeted policy actions and EU support…”

Press release, EurActive. 20 July 2010
Adapted from Ross Fairly, Burges Salmon
Law and Policy

- Technology advancing ahead of policy
- “Scholarly literature—whether on the science, environmental effects, or legal aspects of wave energy—is scarce, but growing.”
- Understanding of science and environmental impacts improving rapidly, but lawyers and policymakers only just starting to get involved

Law and Policy

- No ‘winners’ yet: technology and regulatory methods varied

- Need to:
  - Be flexible and adaptable
  - Facilitate the deployment of small-scale prototypes
  - Look to the future: plan for large-scale deployment
  - Manage potential environmental impacts, human use conflicts and likely competition over sites
  - Ensure balance between sustainability and exploitation
Law and Policy Challenges

- Few coherent and considered regulatory frameworks
- Some jurisdictions have started reform - still far from best practice
- Even leading jurisdictions, e.g. the UK (Scotland in particular), face considerable issues
- Obtaining consents for a project can take years and cost millions of dollars
What would a suitable regulatory framework for marine renewable energy look like?
Law and Policy Challenges

- Permitting
- Seabed ownership
- Environmental impact assessment
- Grid connection
- Incentives

‘The Oyster’
Courtesy of Aquamarine Power
Permitting

- In many jurisdictions, developers have created a process through ad hoc negotiation/discussion with local authorities/government.

- Some countries have developed a more considered process and/or a department that acts as a first port of call for developers.

- ‘One stop shops’ for consenting
  - e.g. the UK’s Marine Management Organisation

Port Fairy, Vic., Australia - site of BioWave prototype deployment, courtesy of David Kleinhart
Permitting Case Study
Australia

- Ad hoc approach: local government authorities assessing projects on a one-off basis as and when companies approach
- Simply applying existing laws to new technology
- “The absence of … a framework for regulating marine energy… means companies … are required to ‘forge a process’ for approval of their projects.”
- Victoria keen on developing renewables (but, note change of state government)
  - Inquiry on approval processes for renewables generally and discussion paper on marine renewables specifically
  - Explored a range of options for permitting/tendering
  - Committed to a whole-of-government approach

Victorian Government, Marine Energy Discussion Paper
Permitting Case Study
England

- Established the Marine Management Organisation and a licensing process for marine energy
- This has not proved effective, yet
- MMO requires extensive consultation and reporting etc.
- Very slow process – sometimes years rather than months
- High monitoring costs to satisfy permit obligations
  - E.g. Marine Current Turbines spent GBP 3million on environmental monitoring for deployment of one device
Seabed Ownership

- How the seabed is owned/managed varies greatly between jurisdictions

- Determining who can own the seabed and how it can be leased is essential for project security
  - Difficult to make an investment decisions without certainty that seabed is secured for sole use

Image: smartplanet.com
Seabed Ownership/Leasing

- Australia
  - States own seabed from 3nm
  - But approach to leasing has been inconsistent/ad hoc

- UK
  - All seabed is owned by the Crown and managed by Crown Estate
  - The Crown Estate has conducted 3 leasing rounds for seabed space
  - Developers tender on a competitive basis
  - Slow process, high competition, costly application

- US
  - State/federal distinction also
  - But, only recently clarified which agency responsible for administration
  - US distinguished by the ease fees (rent and royalties) charged to developers
Impact Assessment

- Marine renewable energy could potentially interfere with:
  - Marine habitats
  - Marine mammals
  - Navigation
  - Fisheries/fishing
  - Recreation

- Marine renewables enter an already congested marine environment, traditionally regulated in a single-sector manner:
Impact Assessment

- Environmental Impact Assessment (EIA) is part of regulatory process in all jurisdictions
- Can be expensive, requiring numerous reports
- Little baseline data – costly and time consuming for developers to gather this data, cf. onshore technologies
- Other technologies have homogenised – marine renewables are diverse
  - E.g. Tidal barrier systems involve large-scale alteration of the surrounding landscape and significant impacts on the ecosystem
  - However, freestanding/submerged turbines have a much lower impact
- Therefore need flexibility in EIA processes
Rance Tidal Power Station, Brittany, France
BioWave device
Courtesy BioPower Systems
EIA vs. SEA

• **Environmental Impact Assessment**
  • Localised environmental assessment conducted by developer as part of licensing process
  • Onus is on the developer

• **Strategic Environmental Assessments (SEA)**
  • Broader assessment conducted by the government in order to manage the use of an area
  • Sometimes part of a broader Marine Spatial Planning process
  • Can remove some of the burden from developers
  • Helps to identify suitable locations for development
Approaches to Impact Assessment

• Requires high scientific certainty
• Preferred by conservation groups
• But:
  • disregards the environmental benefits of renewable energy
  • can never have 100% certainty

Precautionary

• Elements of precautionary and deploy and monitor approaches
• SEA combined with EIA
• Adaptive management
• Factors in broader policy considerations
• Allows for some ‘paradoxical harm’
• Strike a balance

The Middle Way

• Deploy devices and conduct ongoing monitoring
• Assumes minimal environmental impact
• Allows for fast deployment
• Preferred by some developers
• Suitable for small-scale and prototypes

Deploy and monitor

Precautionary

Developer friendly
Impact Assessment Case Study
Crest Energy’s Tidal Power Project

- Crest proposes to establish an array of 200 turbines in the seabed of the Kaipara Harbour, New Zealand (200MW)

- No specific marine renewable energy legislation/processes as yet – approvals made under range of existing legislation
  - Inherently favours established technologies
Crest’s Tidal Power Project

- Key issues:
  - marine life
  - fish and fisheries
  - sustainable management
  - navigation
  - coastal planning processes
  - Maori cultural issues

- Staged deployment: 3, 20, 40, 80 and 200

- Three year gap between each addition – 15 years until full capacity

- Adaptive management:
  - collect baseline data
  - setting objectives
  - monitoring results
  - amending environmental management plan
Maui’s Dolphin
Courtesy of Kaitiaki
Impact Assessment Case Study
Orkney Waters SEA

- Comprehensively identify potential interactions and suggest best locations for balancing competing rights/priorities
- Collates existing baseline environmental data
- Identifies gaps and commissions studies to fill them
- 1.6GW of wave and tidal now pre-consented in this region
- Takes considerable burden off developers

However:
- Early days
- May not work so well in a more extensive area
- Will developers use it? Experience in oil and gas?
- Is there sufficient detail to be useful for individual projects?
Grid Connection

• All marine renewable technologies need onshore infrastructure – many also need subsea electrical cabling/connections

• “Significant constraint to the future development of marine renewables”

• Marine renewables don’t conform to the traditional model for transmission investment, i.e. large onshore power stations close to existing infrastructure

• Most jurisdictions face a distance problem
  • i.e. resources far from grid
  • Transmission charging potentially an issue
Grid Connection

UK
- Special offshore transmission regime
- Transmission network owners bid to build, own and operate offshore transmission platform and line

Germany
- Clustered connections of offshore wind

Courtesy of WaveHub
Policy Measures

- Measures to actively encourage marine energy, concurrent with improved regulation:
  - Feed-in tariffs. e.g.:
    - France: €150/MWh for 20 years
    - Portugal: €260/MWh for first 4MW installed, down to €76/MWh for 20-100MW installed
    - Ireland: €220/MWH
  - Grants, subsidies and tax breaks, e.g.:
    - UK: £22million Marine Renewables Proving Fund
    - NZ: NZ$8 million Marine Energy Deployment Fund
Concluding Thoughts

- More problems than solutions!
- Technology is far ahead of policy and regulation
- Many countries need to start reforming now to avoid stunting industry development in 5-10 years
- Research needed to ensure reforms are suitable: preliminary evidence suggests problems persist
- Need to learn from past experience:
  - Other renewables
  - Offshore oil and gas
- Emerging consensus that SEA, streamlined consenting and grid clustering are necessary
  - Now we need to assess how each of these should be approached
Thank You

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