Marine Renewable Energy

Legal and Policy Challenges to Integrating an Emerging Renewable Energy Source

Glen Wright
College of Law, Australian National University

IKEM International Summer Academy on Energy and the Environment
Energy Transition: Expansion and Integration of Renewable Energy Sources
Berlin, July 2012

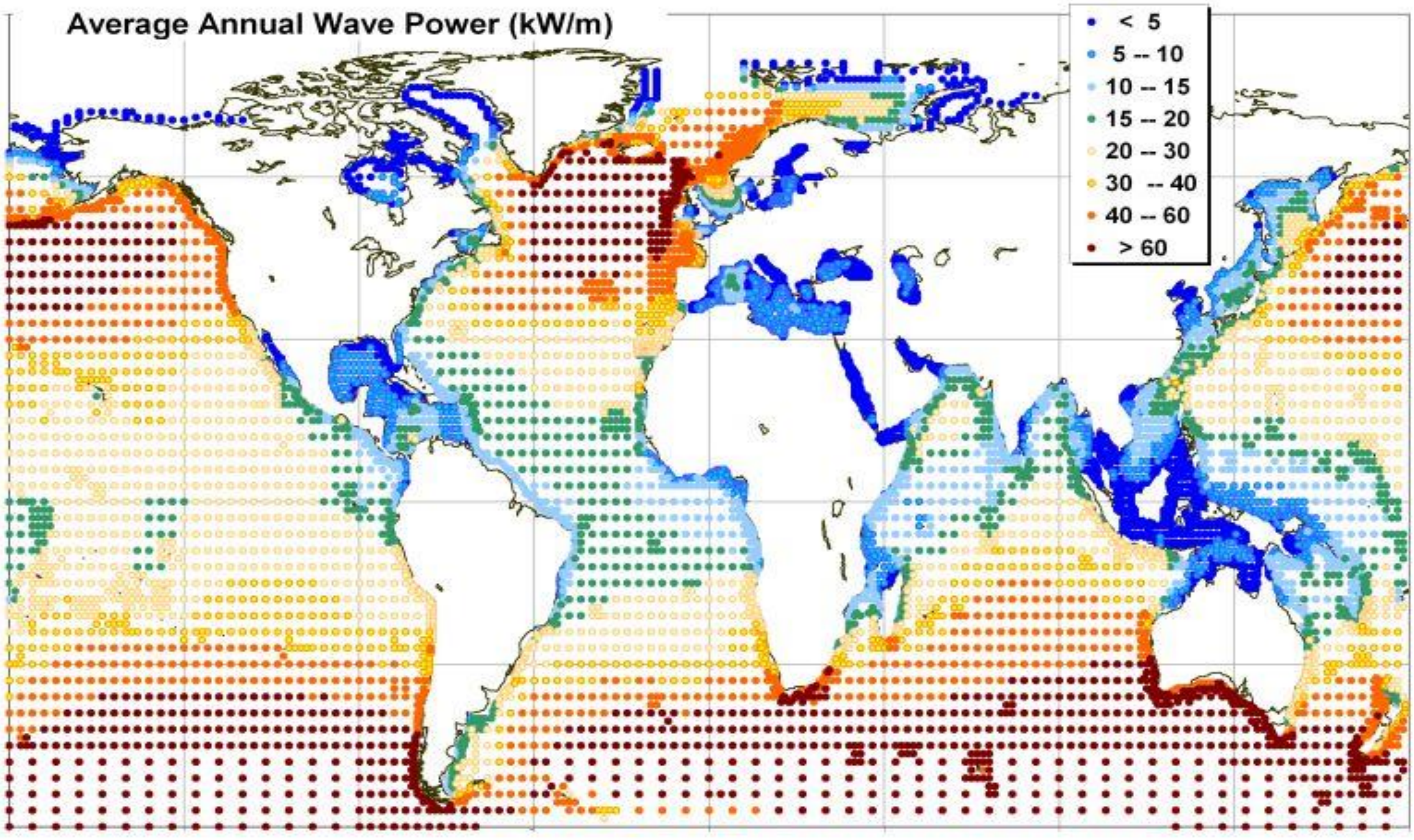
Overview

- 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

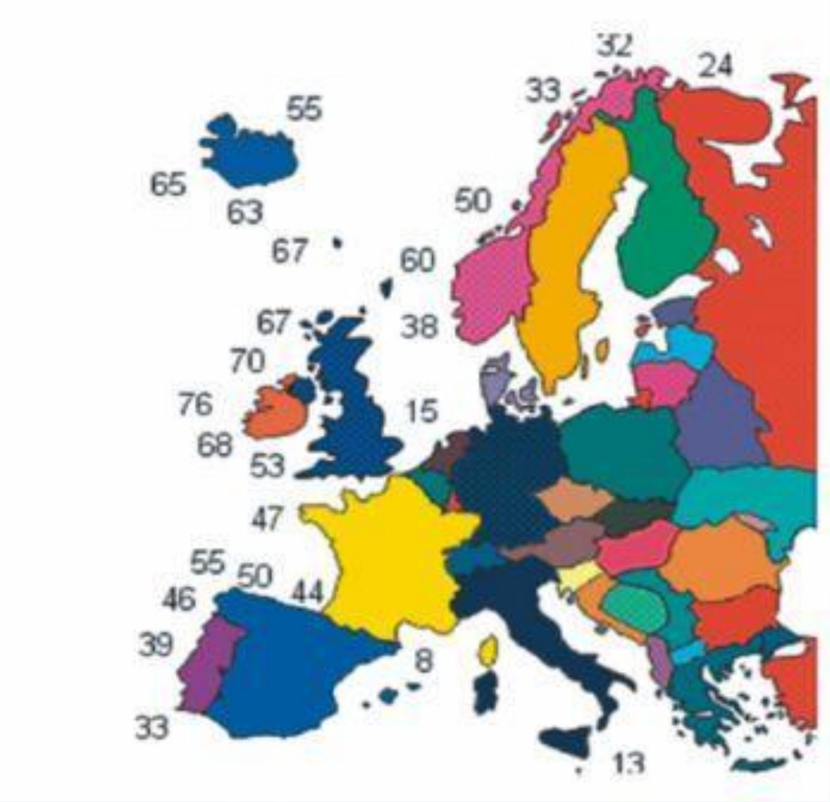
Marine Renewable Energy Sources

- **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

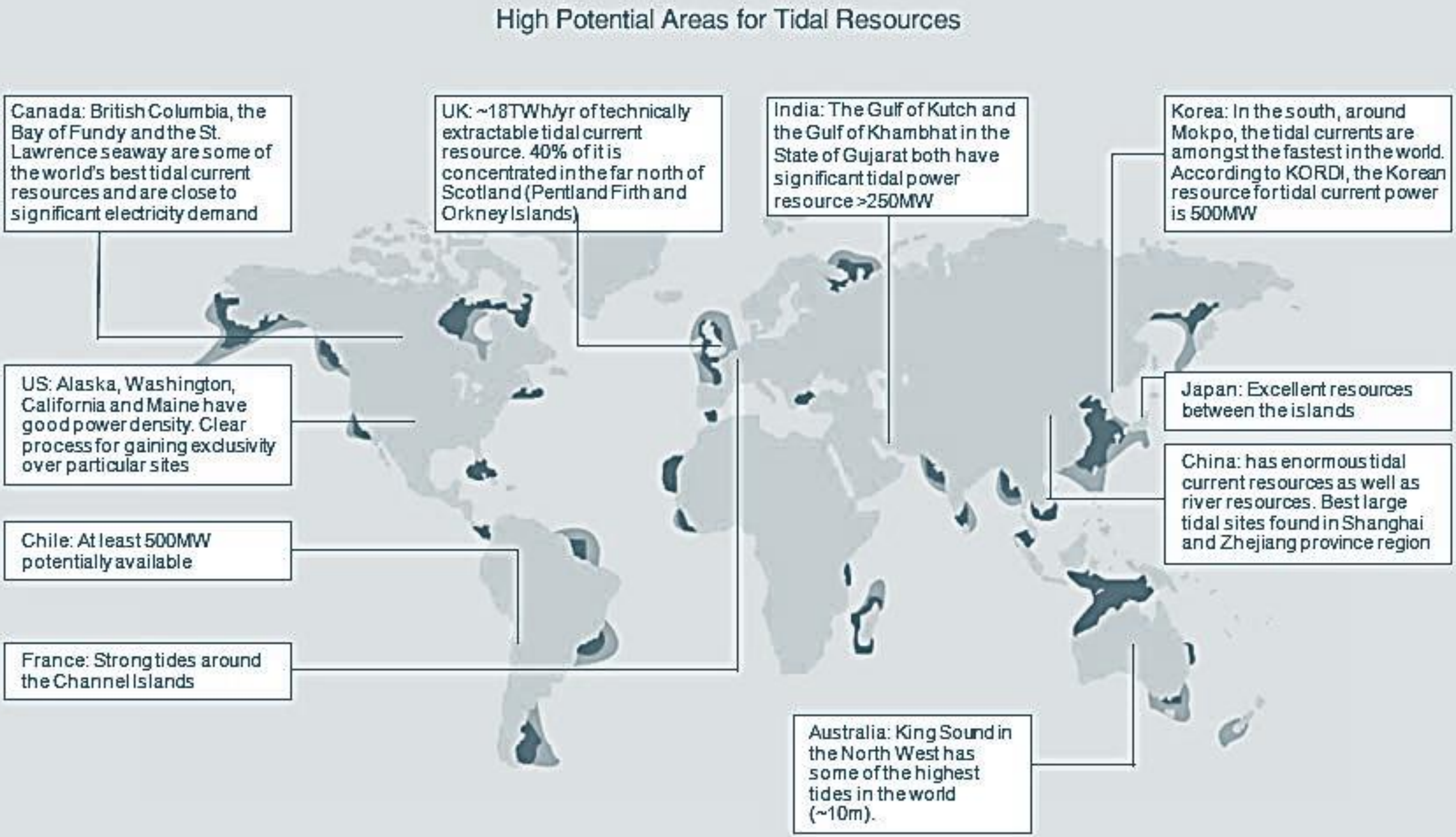


Source: wrsc.org



Europe: Average Annual Wave Power (kW/m)

Courtesy of Sustainable Energy Authority of Ireland



Courtesy of Atlantis Resources Corporation

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

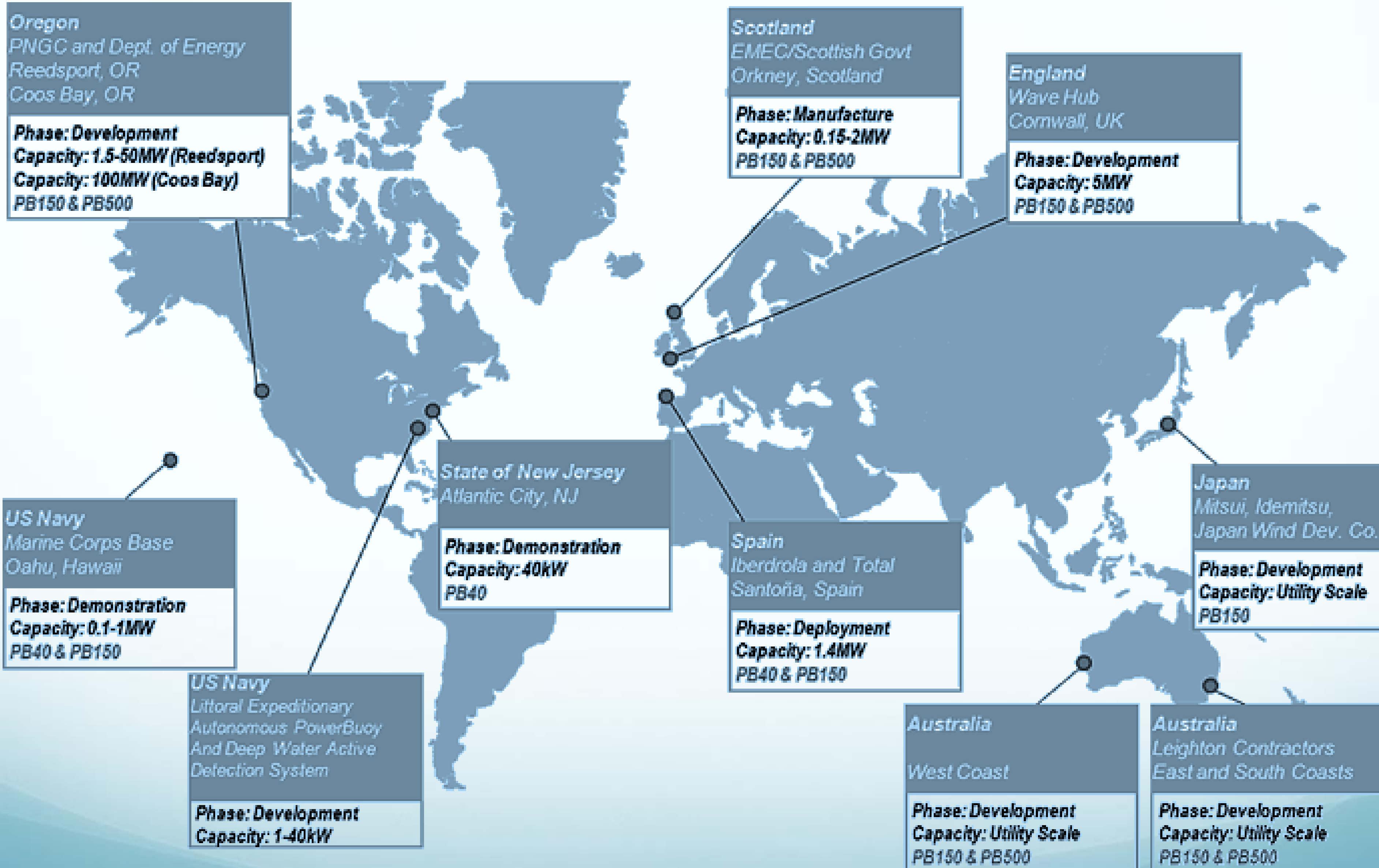
DoE, Mapping and Assessment of the United States Ocean Wave Energy Resource, 2012

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
Press Release, *Frost & Sullivan*. “Hydro, Wave and Tidal Power Outlook Bright.” July 14, 2010



Courtesy of Ocean Power Technologies Australasia

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

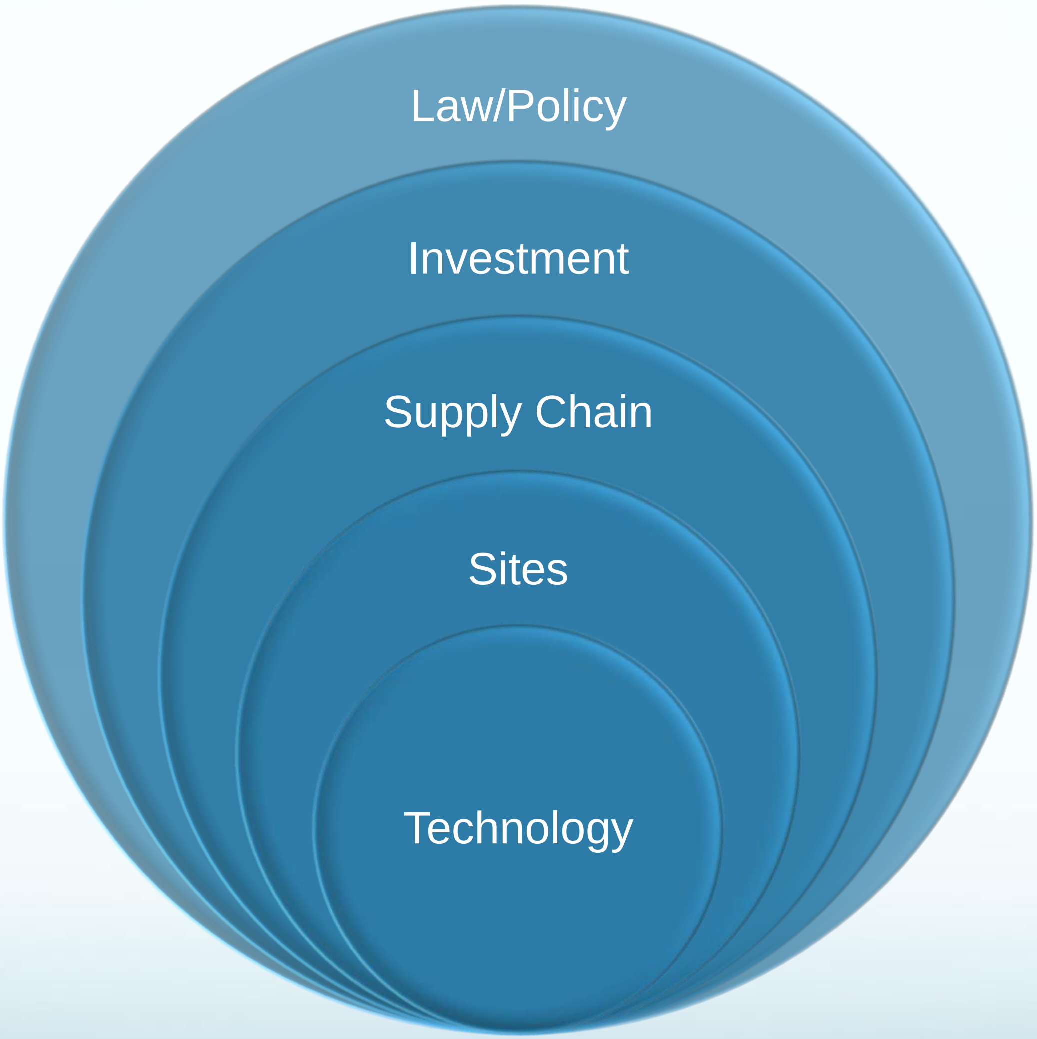
Courtesy of Open Hydro

- 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…"*

Clean Energy Council, Marine Energy Sector Report, 2011.

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

Campbell, H., 2009. Emerging from the Deep: Pacific Coast Wave Energy. *Journal of Environmental Law and Litigation*, 24

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 a investment decisions without certainty that seabed is secured for sole use

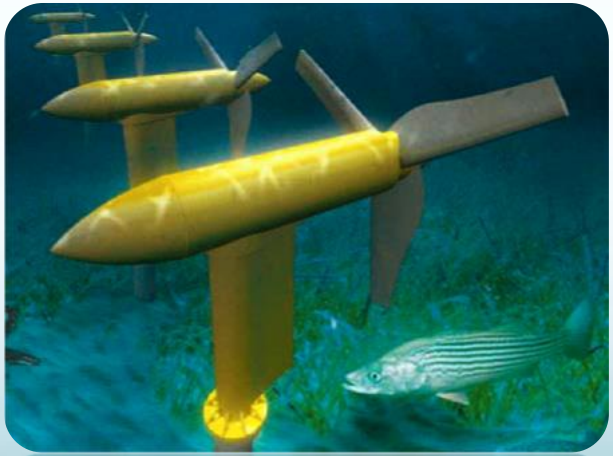


Image: smartplanet.com

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

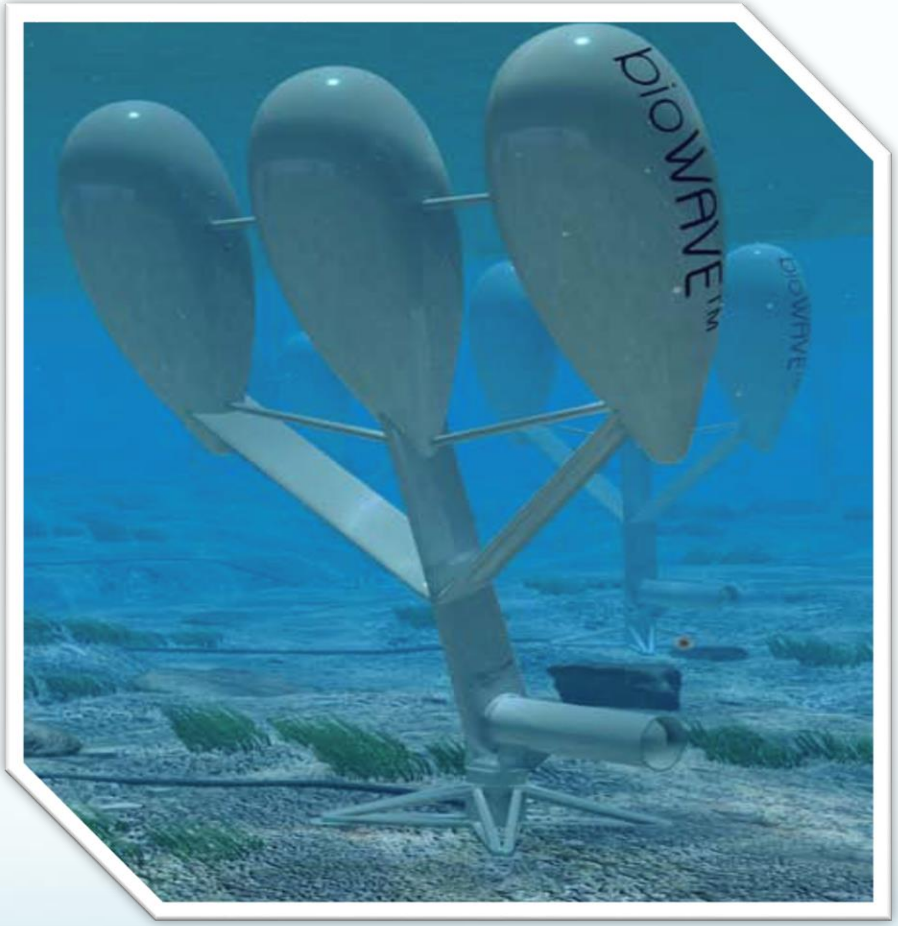
- Marine renewable energy could potentially interfere with:
  - Marine habitats
  - Marine mammals
  - Navigation
  - Fisheries/fishing
  - Recreation
- Marine renewables enter an already congested marine environment, traditionally regulated in a single-sector manner:




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

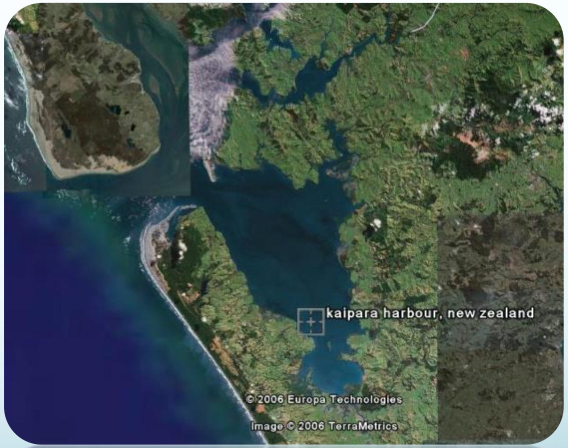
Deploy and monitor

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

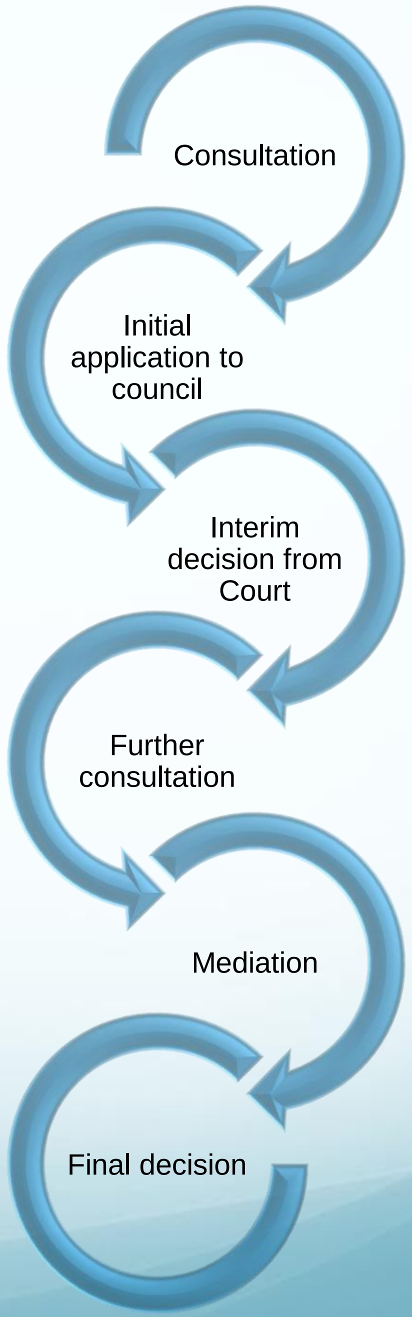
Openhydro turbine
Courtesy of Crest Energy



Kaipara Harbour
Courtesy of Crest Energy

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

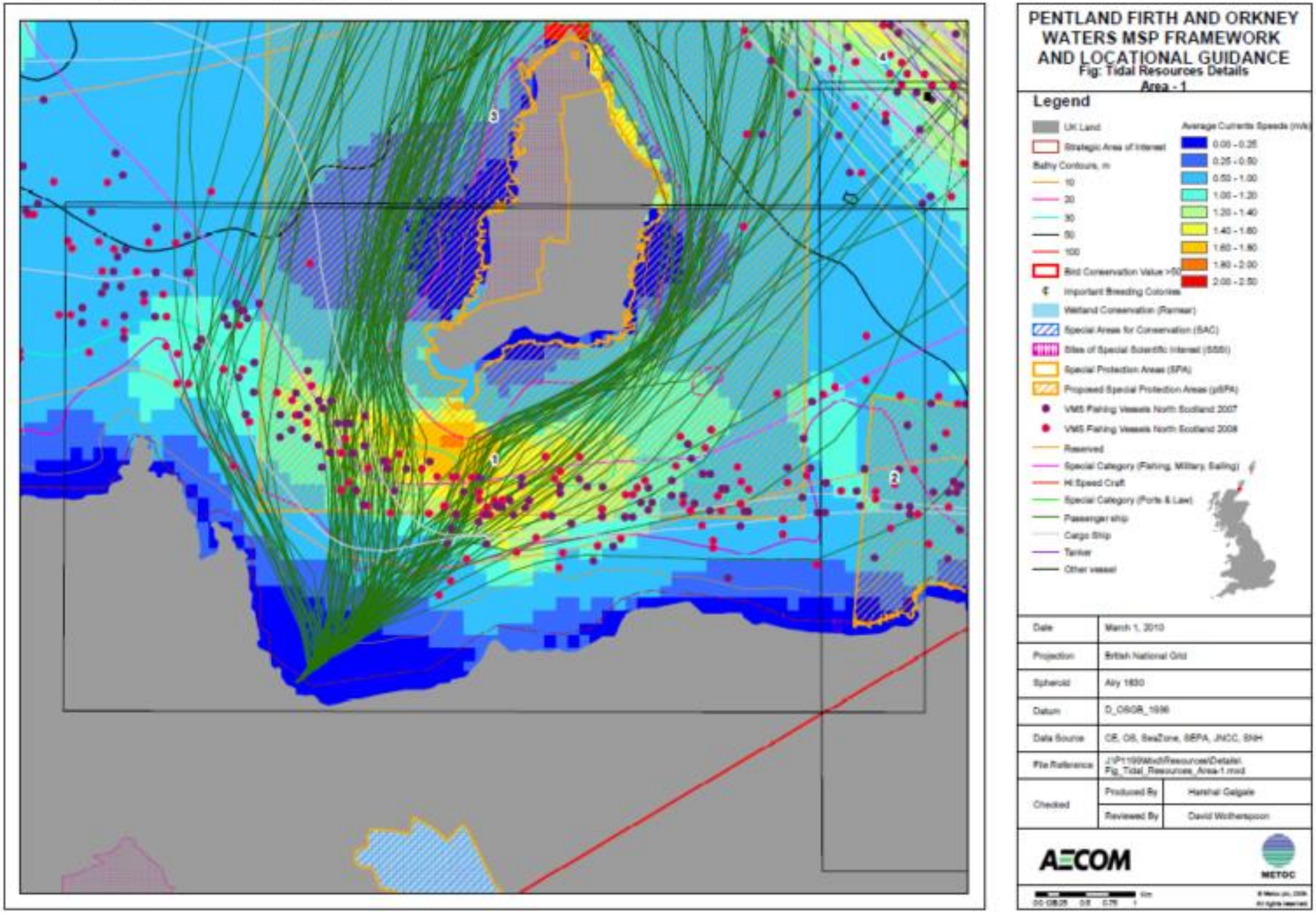


Maui’s Dolphin
Courtesy of Kaitiaki

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?

Figure 6.1b: Tidal Resource Detail Map Area 1



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

Scottish Marine Renewables SEA 2007

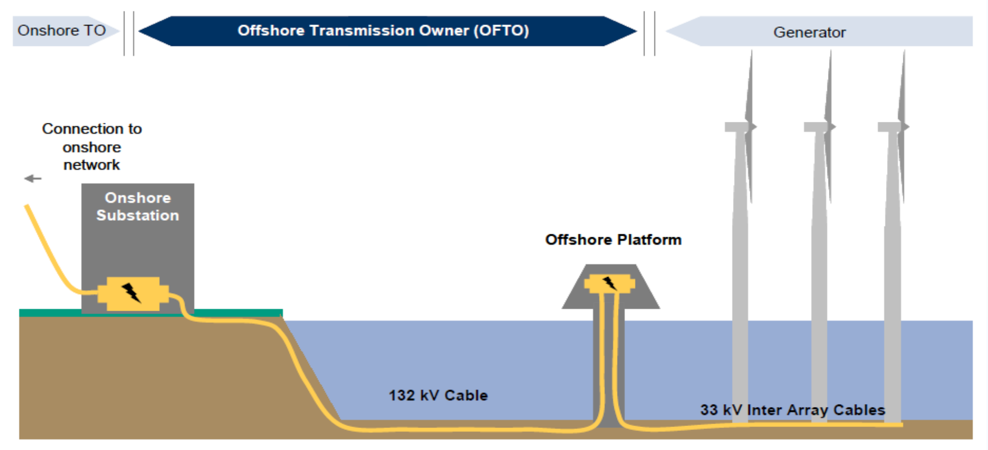
Grid Connection

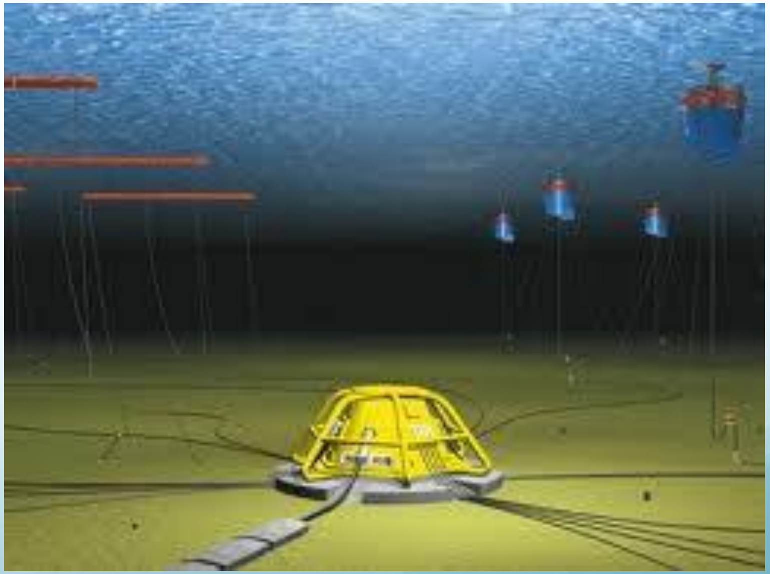
UK

- 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

Glen Wright
glen.w.wright@gmail.com