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The Ocean Renewable Energy Group

Meeting the technical, operational and financial risk facing the ocean energy sector

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Moving thinking beyond technology and project development

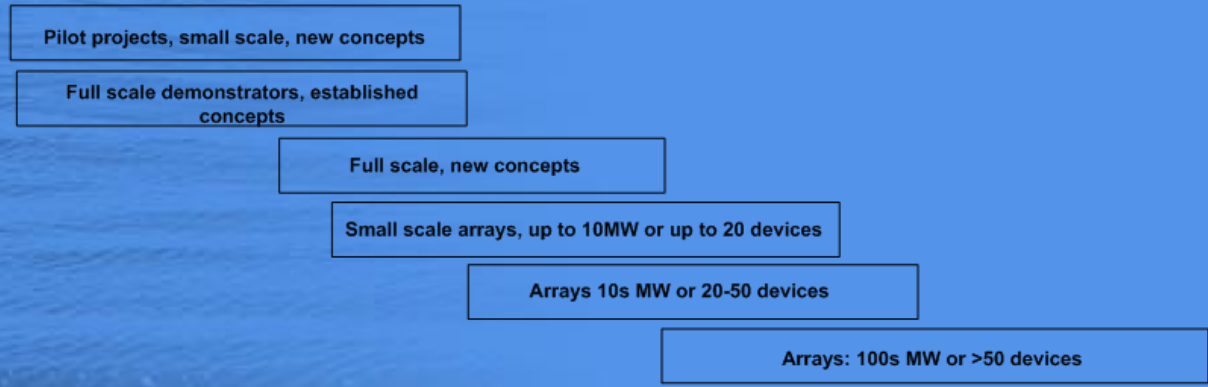
- Looking along the UK Roadmap
- Thinking about the technical, financial and operational landscape
- Focusing on where experience gets integrated to reduce risk
- Discussing the likely critical points
- Moving from demonstration to development
- Canadian perspectives



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The Technical Landscape



2000	2003	2004	2006	2007	2008	2010	2015	2020
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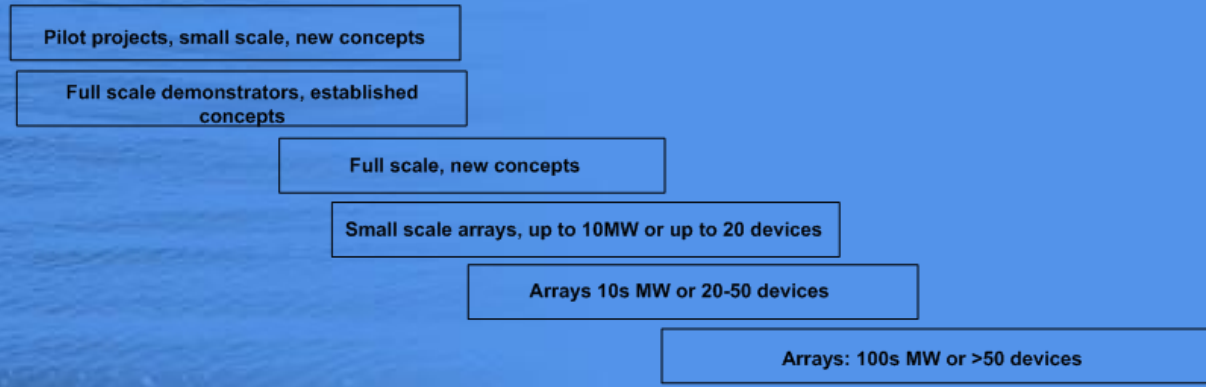
Does it work	→	→	→	→									
Can it be manufactured				→	→	→	→	→					
Can it be maintained affordably					→	→	→	→	→				
Can it be installed affordably							→	→	→	→			
Is it reliable and productive							→	→	→	→	→	→	
Can we achieve economies of scale							→	→	→	→	→	→	
Can it be afforded							→	→	→	→			
Permitting challenge			↑	↑	→	↗	↑	↗	→	→	↘	↘	↘



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The Financial Landscape



2000	2003	2004	2006	2007	2008	2010	2015	2020
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Inventor financed	→			→	→	→								
Strategic VC financed	→			→	→	→								
Strategic investor financed					→	→	→							
Utility financed						→	→	→	→	→				
Project developer financed							→	→	→	→	→	→	→	
Technology push			→	→	→	→	?	?	←	←	←	←	←	Market pull
Equity			→	→	→	?	?	?	?	←	←	←	←	Debt
Grants			→	→	→	→	Supported market	→	→				Competitive renewable	

The experience curve

	R&D – 1 ofs	Pilots – 3-20 ofs	Scale up – 50s and more
Difficulty	No small marine projects	<< 3-20x Increased operational and financial challenges	Experience and expertise <i>Simplifies</i>
Cost	5-10x commercial	3-5x commercial	Establishing commercial
Permitting	All the challenges of being first	May not be any more difficult	More appropriate to scale
Financing	Love money	Buying experience	Exploiting early market price
Strategic partners	Hesitant	Buying experience	In sales mode



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The needed experience

- Large industrials – materials, components, manufacturability, reliability, credibility, insurability, financability – warranties!
- Other industries – oil and gas experience is too costly – but can we afford not to use it?
- Utilities – interconnection/integration expertise, project development and finance, market for electricity, influence to secure supported market
- Finance and insurance – transformation to a customer led development

Critical points

- Between technology developer and system refiner/manufacturer
- Between technologies that need to consolidate, not appear to compete
- Between large industrials playing to be *in the game* and having them create winners
- Between utilities being project sponsors and being project developers and customers
- Attracting specialist support while the sector market is still too small to offer serious business
- Attracting project developers preoccupied by established renewables

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When the room is full of lawyers, financiers and insurers, we know we have made it!

From demonstration to development – from one-offs to sustained activity

- To demonstrate that ocean energy is a power solution (CC, energy and coastal economy)
- To build the manufacturing, supply and service chain
- To build a market and financial development pathway
- To support the pathway for the disruptive and refining technologies that are still coming



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These may be the riskiest 5 years for the sector

External risks

- The pathway needs political support
 - Ignored – another *solution* like hydrogen!
 - Lost opportunity – all renewables are created equal!
 - Let someone else prove it!
- The big fix is tempting
 - Nuclear
 - Clean coal
- Split-personality *green* society
 - NIMBY
 - NAME
 - NIMLT

Canadian progress?

“Let’s get something in the water”

- Scaled trials - Clean Current – 2006; New Energy – 2006; Wave Energy Technologies - 2007
- Full scale – *Fundy* Standard - Minas basin 3 generator demo – 2011/12
- Sustainable Development Technologies Canada – 5 projects - \$20m
- BC Innovative Clean Energy Fund – 3 projects - \$6m
- 3-6 Projects - \$100m to \$200 Clean Energy Fund demo

Canadian progress?

“In this for the long-term”

- New Brunswick and Nova Scotia Strategic EA + environmental research
- Nova Scotia Power/Emera project and investment commitments
- Federal regulatory initiative – timing?
- National technology roadmap – 2011
- Commitment to international standards – 2010+
- Initial Clean Current generator licensed to Alstom
- EcoLogo certification – 2010
- Fiscal investment incentives = other renewables
- Nova Scotia Ocean Energy Act & BC licensing rules – 2011?
- Inclusion in BC electricity resource/transmission plan to 2040 – 2010
- Ontario Feed in Tariff for “waterpower”
- 2 projects – \$80m – to Clean Energy Fund RFP
 - Moving to array scale large tidal
 - Supporting a pioneer market
- Strong sector association and growing visibility
 - An assumption that wave, tidal and in-stream will be part of the clean energy future

Are we there yet?

- To demonstrate a power solution –
 - technically YES,
 - business and financially NO
- To build the supply chain – NO
- To build a market and financial pathway - NO
- To support refining technologies - MAYBE

Things to watch

- Results of Clean Energy Fund RFP
- Move to tidal array development in Fundy
- Leadership in small-scale tidal and in-stream
 - Widespread in-stream - 4 Provinces/Territories
 - Nova Scotia and BC
- Launch of Pacific Coast wave in BC
- Ongoing technology development
- Evolving utility interest
- International partnerships



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OREG Bi-Weekly News

October 19, British Columbia event, Victoria BC

October 28/29, Fall Symposium, Ottawa Ont