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Marine Energy in Canada: Where are we going and how do we get there?

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First points!

- Canada is not (yet) losing ground on the leaders
  - New Energy is poised to be the world supplier of small in-stream systems
  - Clean Current has drawn the giant Alstom into the field
  - Canadian wave monitoring buoys are being used by many wave projects
  - Canadian expertise is being used internationally in resource assessment, planning and enabling studies
  - Public/private research initiatives are poised to advance resource knowledge
  - A collaborative support and promotion culture is emerging
- The apparent leads of others are proving ephemeral
- In fact we may be gaining; we are the envy of some!

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Targets

- National Roundtable – 2050
  - 4,000 MW of tidal – ¾ in British Columbia
  - 10,000 MW of wave
- Nova Scotia Power
  - 10% of capacity from tidal
- BC Hydro
  - Conservative option of 2,000 MW

Freshwater In-stream not on these radars!

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The 2050 challenge?

What might that look like?	
Nova Scotia	1,000 MW
New Brunswick	500 MW
Quebec	Ocean – 500 MW; Rivers – 500 MW
Ontario	500 MW
Manitoba	500 MW
British Columbia	Ocean – 5,000 MW; Rivers – 2,000 MW
Others	3,500 MW

About 20% of new generation!

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The resource is there!

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Distribution of potential tidal sites

Province	Potential Tidal Current Energy (MW)	Number of Sites (-)	Average Size (MW)
Northwest Territories	35	4	9
British Columbia	4,015	89	45
Quebec	4,288	16	268
Nunavut	30,567	34	899
New Brunswick	636	14	45
PEI	33	4	8
Nova Scotia	2,122	15	141
Newfoundland	544	15	36
TOTAL	**42,240**	**191**	**221**

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Wave resource summary

- Wave energy resources are spatially and temporally variable (greatest in deep water during winter)
- Potential Offshore resource:
  - 37,000MW in the Pacific and
  - 145,000MW in the Atlantic (annual mean values)
- Potential Nearshore resource (annual mean values):
  - 35kW/m near the Queen Charlotte Islands (~9,600MW)
  - 25kW/m near Vancouver Island (~9,400 MW)
  - 25kW/m near Sable Island (~1,000 MW)
  - 25kW/m near SE Nfld (~9,000 MW)

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What will it take?

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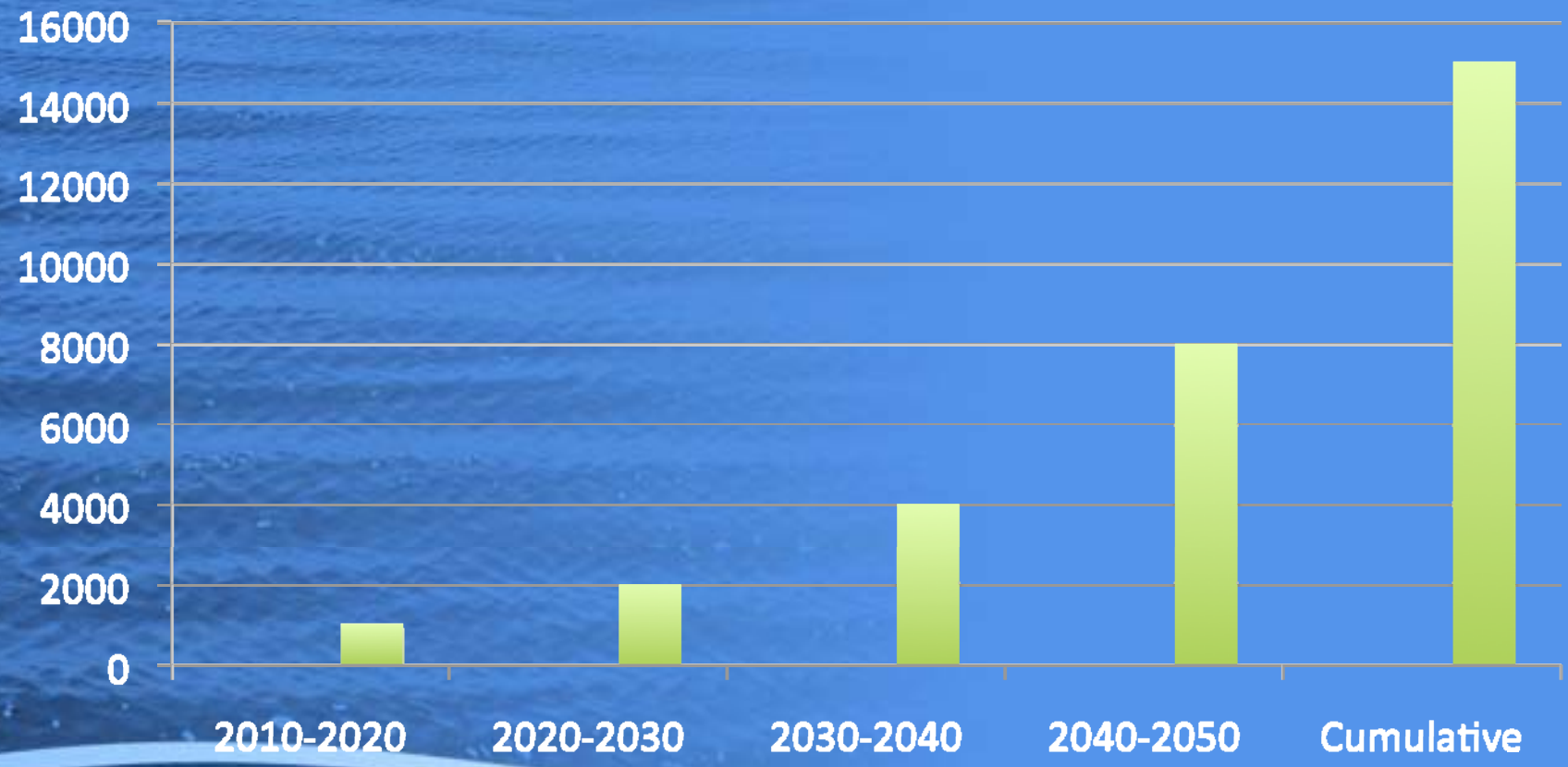
Installed capacity



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Generator installation activity level

- 2010
  - <10 per year
- 2020
  - >250 per year
- 2030
  - 2 per day
- 2040
  - 5 per day

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What is at stake?

- 5 generators per day
  = $10-15 million per day, $2-3 billion per year
  – Leakage?
    - Canadian technology?
    - Canadian manufacture?
    - Canadian supply and installation chain?
- Example of the UK leakage in offshore wind
  – 90% of capital goes to European suppliers and installers

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Building an industry, being part of the solution

- failure to start implementing the technologies … greatly impede Canada's ability… in the long run
- significant opportunities to sell this type of technology in international markets … these technologies should continue to be tested domestically through technology platforms to demonstrate commercial success and export viability

Achieving 2050 – NRTEE 2009

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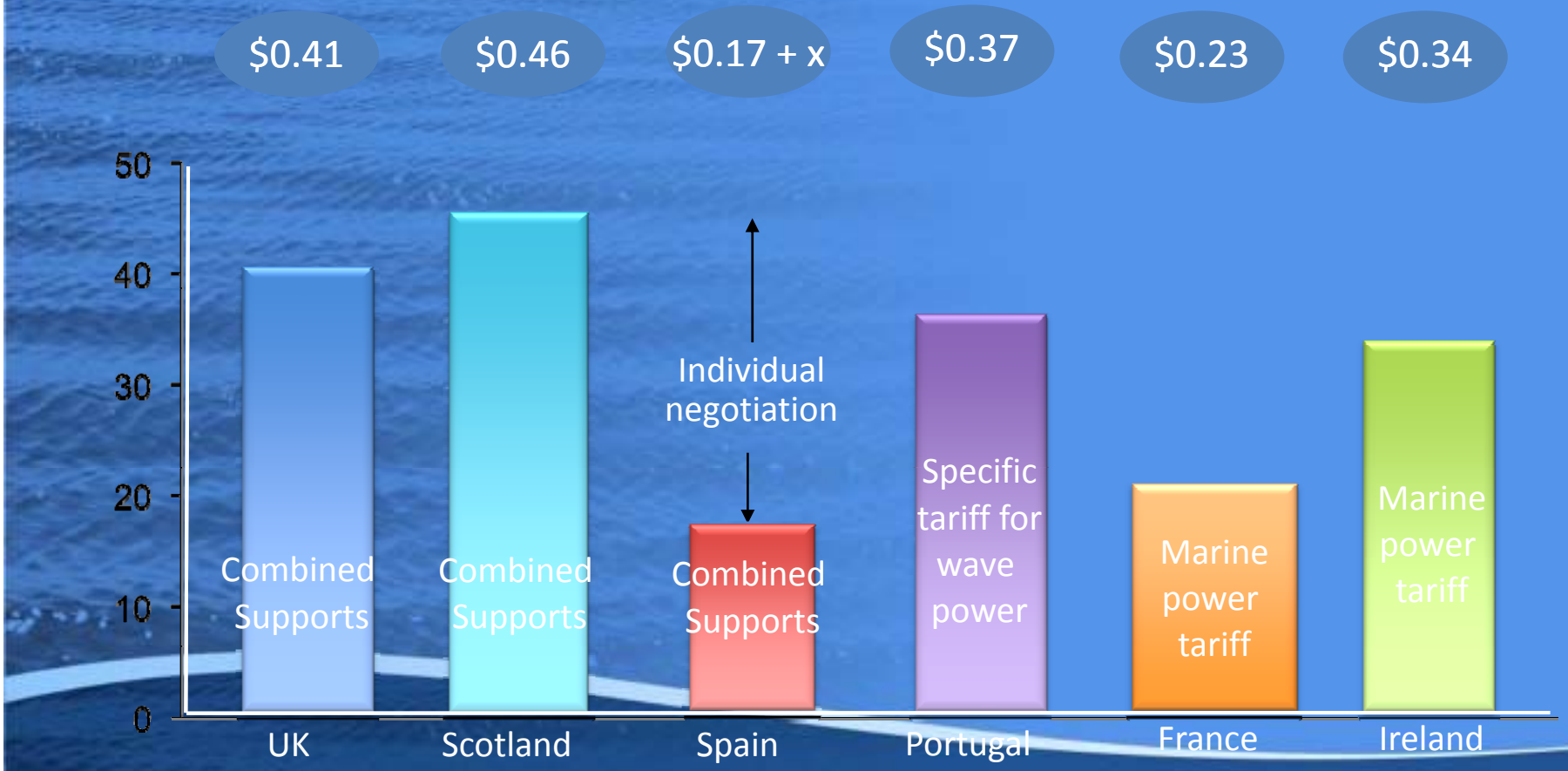
Driving forward – the competing environments



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Status summary

- Canada - #3 in technology development
  - A tidal technology adopted by Alstom
  - An in-stream becoming the first manufacturer

But, transition to a power industry?

- Several utilities looking to marine to reduce use of coal, oil or imports
- Several utilities looking to marine for community and off-grid
- Ontario Feed in Tariff for water power
- Experience in, and experience in building E Coast offshore service industry
- Growing clean energy interests Canadian power project industry

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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

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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 & 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

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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

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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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What we need?

- A strategy for the economic and energy win
  - A focus on having marine energy play its part in climate change and low-carbon economic strategies
  - Federal, provincial, utilities supporting the early stage market, Feed in Tariff, Marine Supply Obligation
  - A learn by doing adaptive management approach by regulators
  - Early deployments to drive innovation, refinement and technology consolidation
- Engagement by financial and supply chain capacity
- Engagement of industrials like the EU (Alstom, Rolls Royce and Voith Siemens)

The big sort-out starts in 2011 or 2012!

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