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# Tidal Energy in Canada

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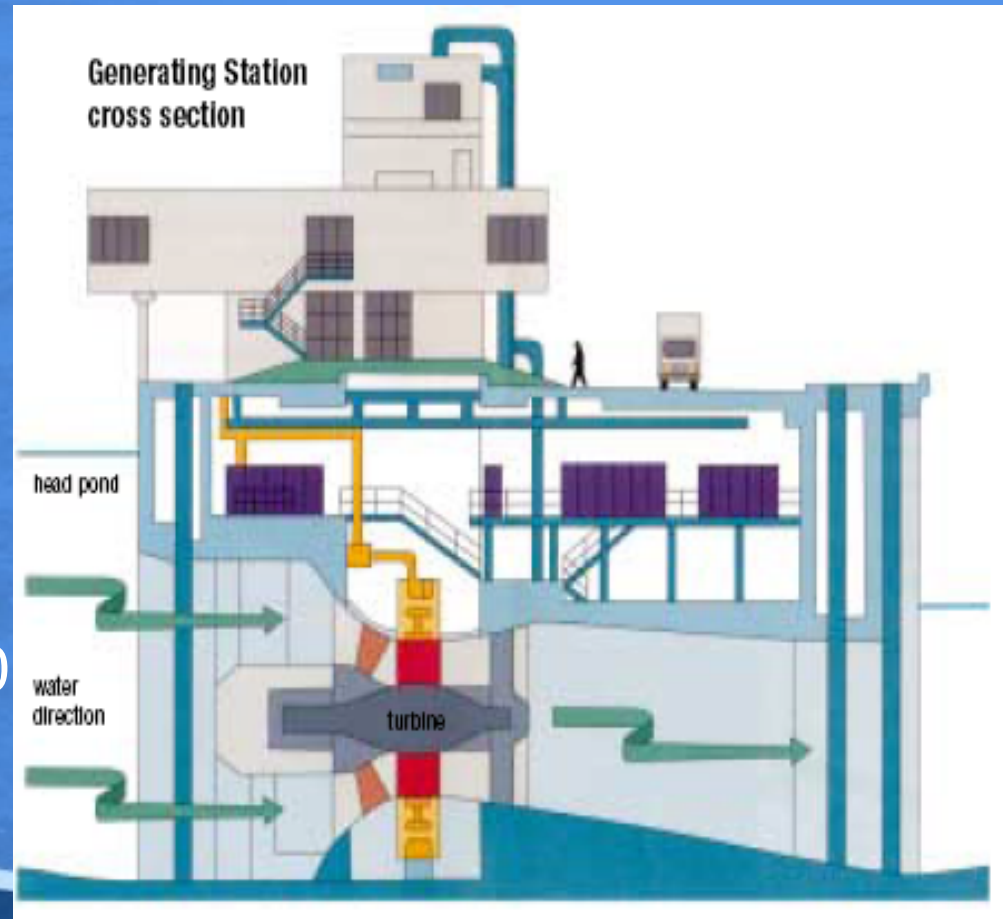
# Outline

- **Canada's History**
- **The Energy Resource**
- **Technology Activities**
- **Project Activities**
- **Provincial Activities**
- **Opportunities**

# Tidal Energy History

## Annapolis Tidal Generating Station

- Commissioned in 1980
- Completed in 1984
- Only tidal plant in NA
- Provincial/Federal initiative
- Draws more than 40,000 tourists a year





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# Tidal Energy History

- **Annapolis Tidal Generating Station**
  - Bay of Fundy: Annapolis river between Granville Ferry and Annapolis River
  - Capacity of 20 MW
  - Length of 46.5 m, depth of 30.5 m
  - 2 sluices
  - 408 m<sup>3</sup>/s water flow





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# Tidal Energy History

- **Davis Hydro Turbine**
  - 10 year R&D program with the NRC late 70's early 80's
  - Vertical axis turbine based on Darrieus windmill
  - Two experimental test units and three prototypes
  - Independent technology assessments

# Tidal Energy History

- **Davis Turbine**
  - Nova Energy Ltd. early development work
  - Became Blue Energy
  - Government felt technology was sufficiently proven, next step should be market driven
  - Blue Energy and New Energy working to commercialise



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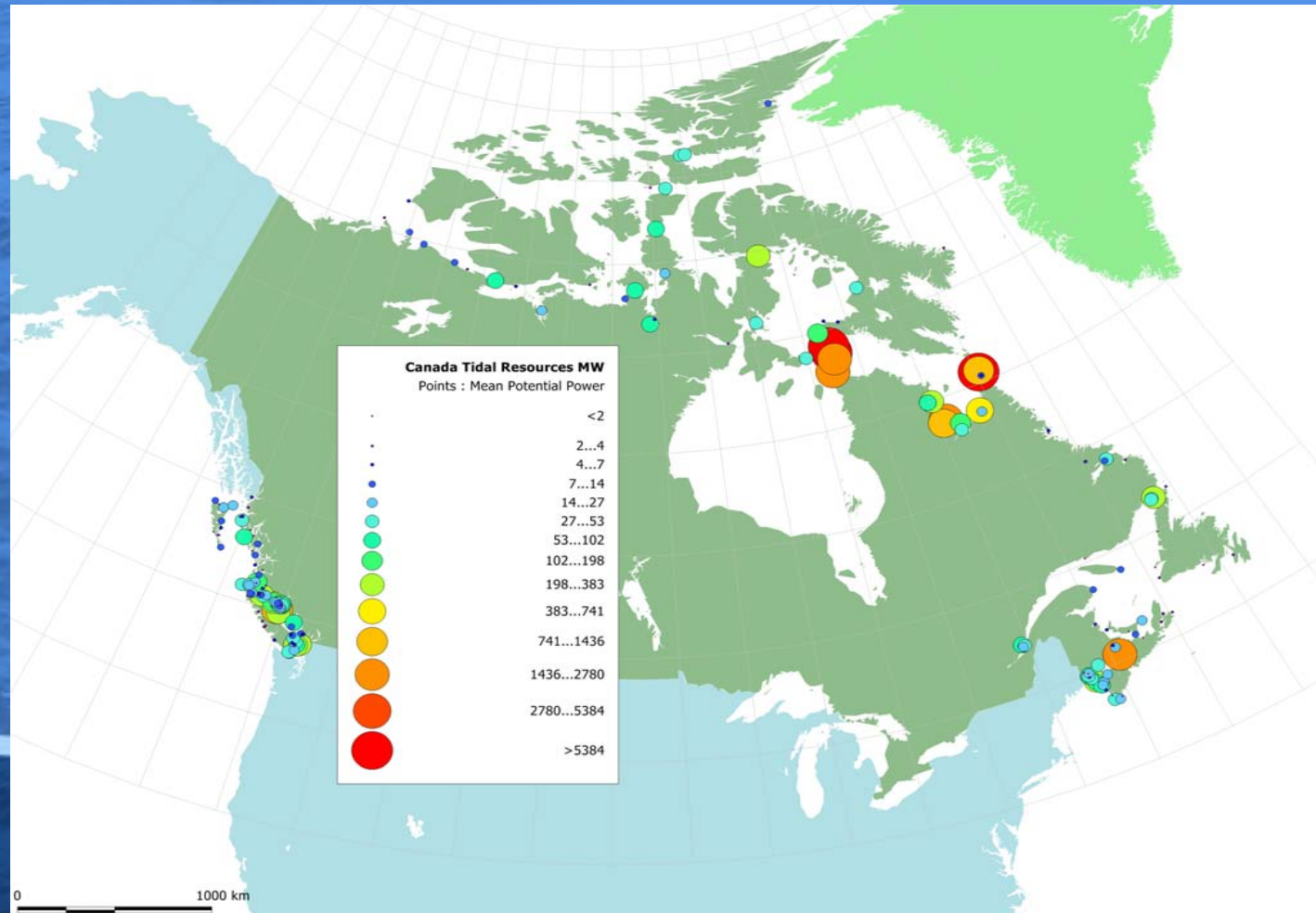
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# The Energy Resource

Canada Potential Tidal Current Resource Sites

Tidal

Mean  
potential  
power  
(MW)





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# The Energy Resource

- 190 sites identified
- Total mean potential exceeds 42,000 MW
- Nunavut has largest potential
- BC has most sites
- Peak flow of 2 m/s or more





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# The Energy Resource

- Rivers, estuaries, man-made channels are other low/zero head hydro applications
- Developers pursuing include New Energy Corp, Coastal Hydropower and Verdant Power



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# The Energy Resource

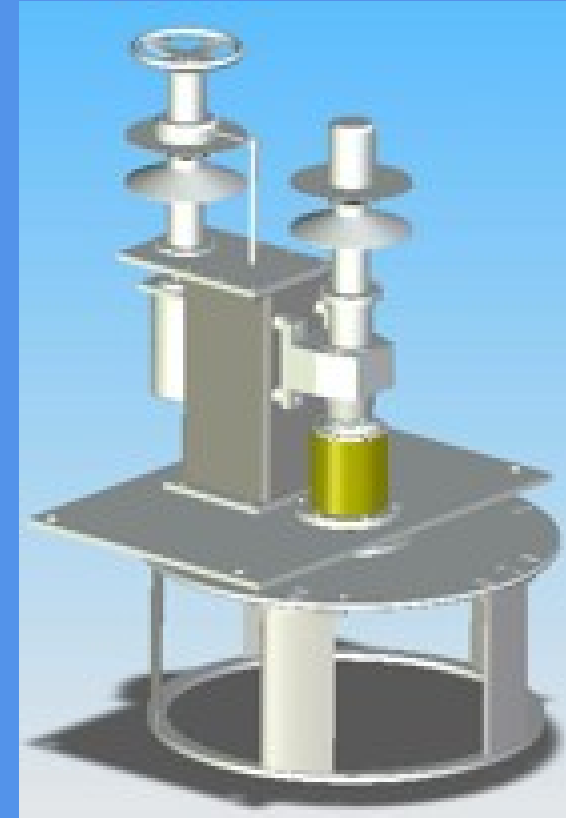
## Canada: Main Rivers and Lakes



# Technology Activities

## Canadian tidal device developers: New Energy Corp.

- Vertical axis “EnCurrent” turbine based on Davis hydro turbine research
- Tested 3 kW unit in still water using a barge
- 5 kW ducted turbine in wastewater canal
- 2<sup>nd</sup> generation in irrigation canal



# Technology Activities

## Canadian tidal device developers:

### Clean Current

- Bi-directional ducted horizontal axis turbine
- Direct drive variable speed permanent magnet generator
- Tested at NRC IOT
- Race Rocks demo project



ARTIST'S  
CONCEPT OF  
THE PROJECT

# Technology Activities

## Canadian tidal device developers:

### Blue Energy Canada

- Took on commercialisation activities after early Davis hydro turbine testing
- Recent prototype testing in UBC tow tank as part of WD agreement



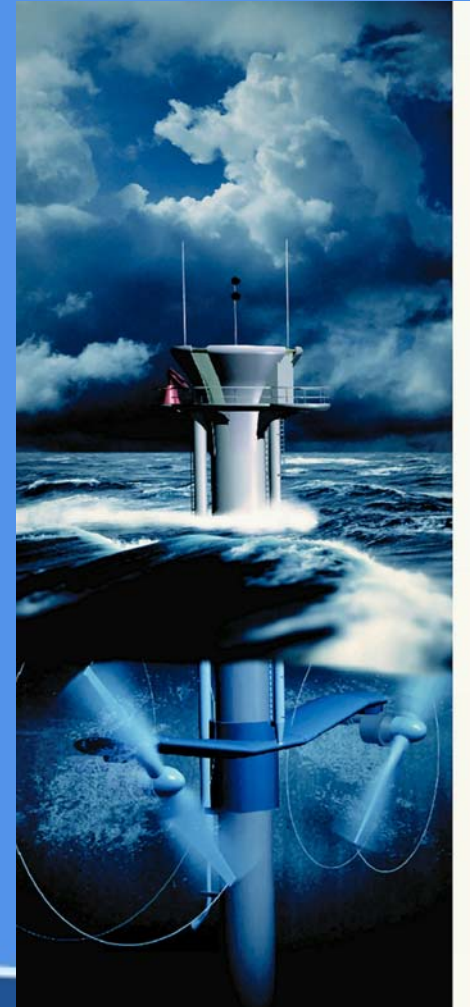
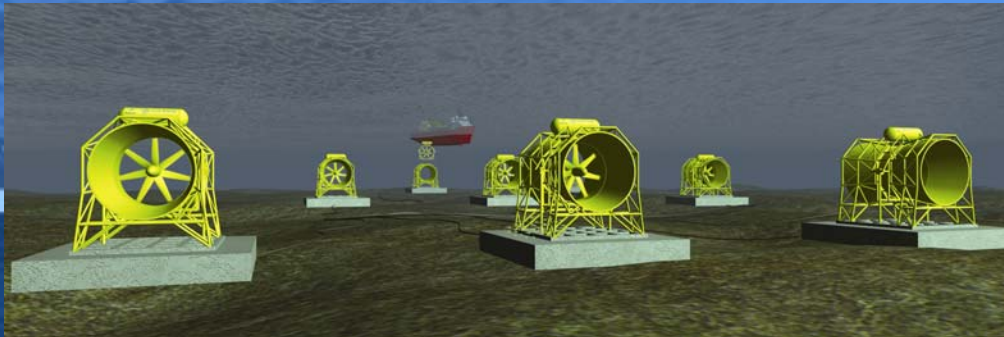
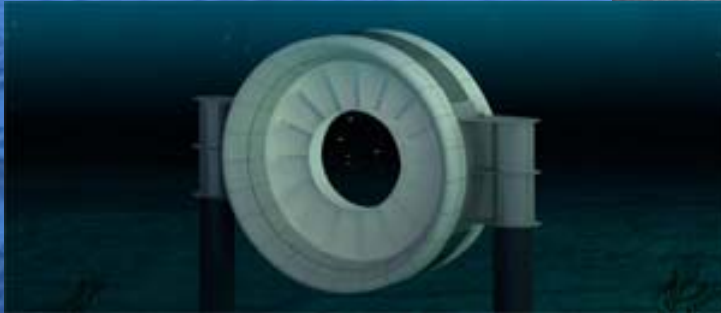
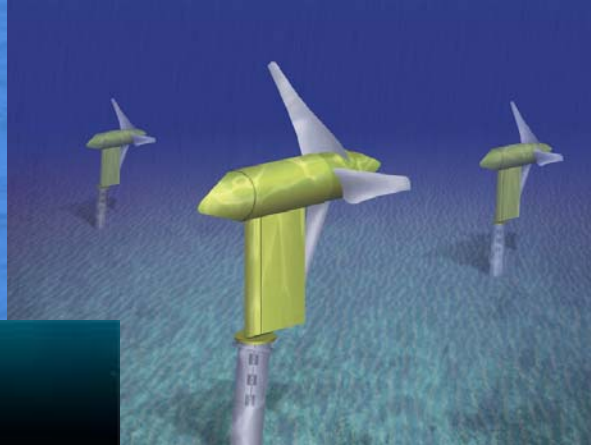


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# Technology Activities

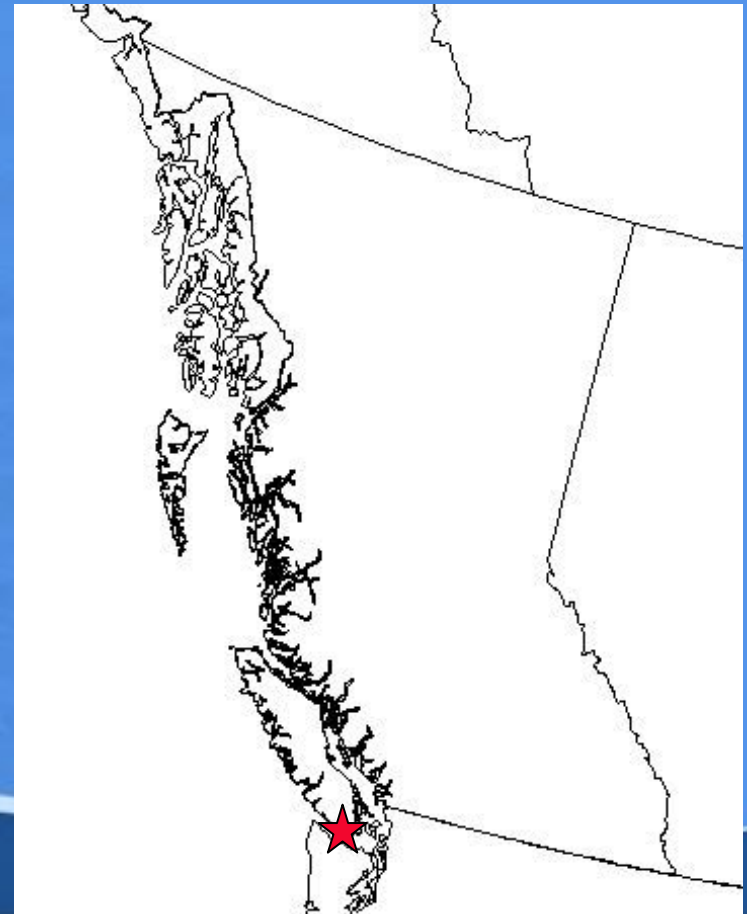
International  
tidal device  
developers



# Project Activities

## Pearson College – EnCana – Clean Current Tidal Power Demonstration Project at Race Rocks

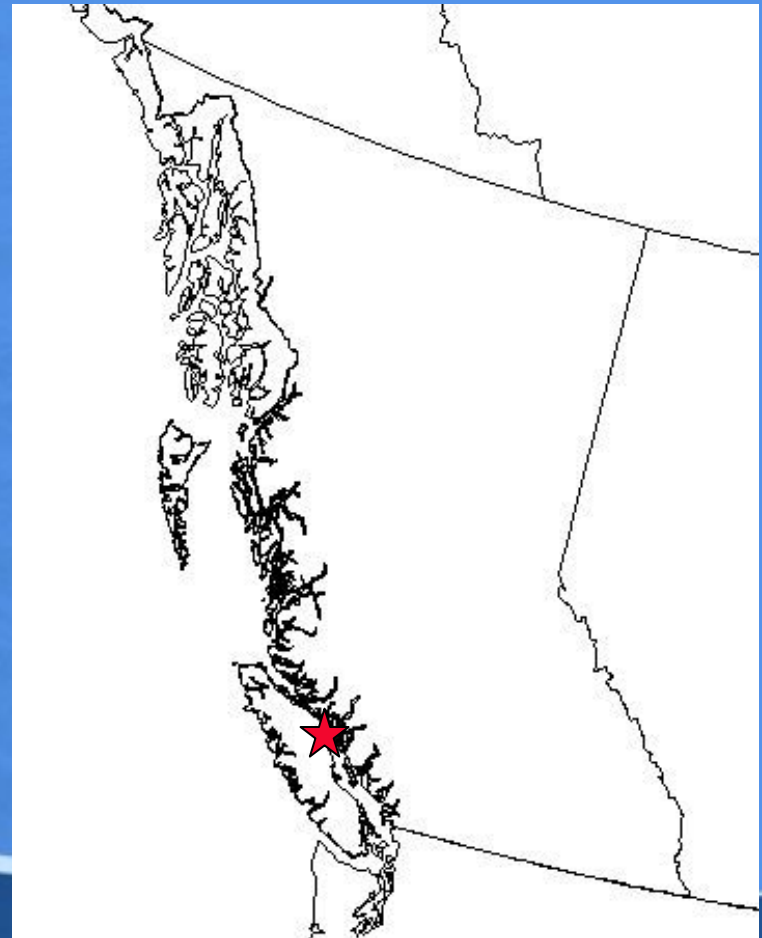
- 10 nautical miles SW of Victoria
- Ecological reserve – college are volunteer wardens
- Funding from SDTC and EnCana Environmental Innovation Fund
- Activities began in March 2005, turbine installed in Sept 2006



# Project Activities

## Canoe Pass Tidal Demonstration Project

- Channel btwn Maude and Quadra Islands, near Campbell River
- 500 kW capacity, New Energy EnCurrent turbine
- Looking for final funding
- Proposal to turn site into a “plug and play” testing area





# Project Activities

## Queen Charlotte Islands Demonstration Tidal Power Plant Feasibility Study

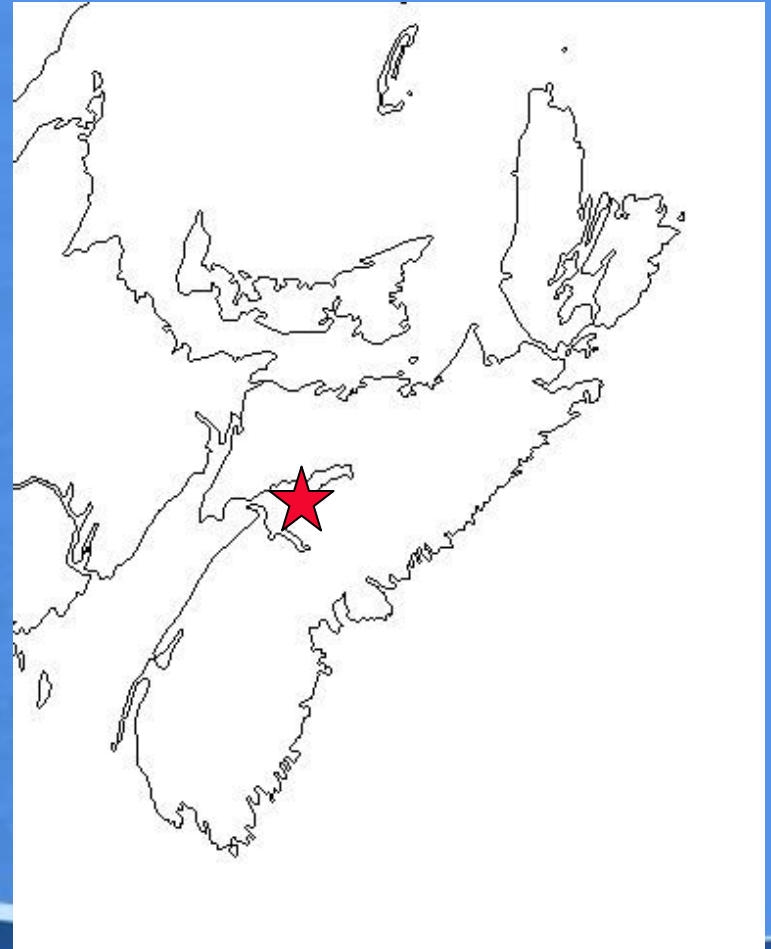
- UVic Mechanical Engineering integration project
- Federal interest; coordinated with BC Hydro, WD and Province for RFP
- Objectives: determine site, capacity, technology; gather data; ensure community involvement; development plan



# Project Activities

## Nova Scotia Power

- Operators of Annapolis
- Engaged in EPRI Tidal Stream Energy project
- SDTC accepted Statement of Interest, proposal being submitted Jan 2007
- Announced choice of Open Hydro as technology partner in \$12m project



# Project Activities

## Coastal Hydropower

- Operating rights for Gorlov turbine and Davidson & Hill ducted turbine for use as Combined Technology
- Plans/agreements for deployment in Campbell River area, Sonora Island, and Columbia River
- Other sites identified on BC coast, rivers in BC, Yukon, Alberta, ON, WA and Alaska



# Provincial Activities

## East Coast

- EPRI report spurred interest
- NS and NB working on application process and policy
- NS Department of Energy UK mission
- February workshop on research issues and funding and support required
- NB Power and NB Department of Energy pursuing similar path

# Provincial Activities

## West Coast

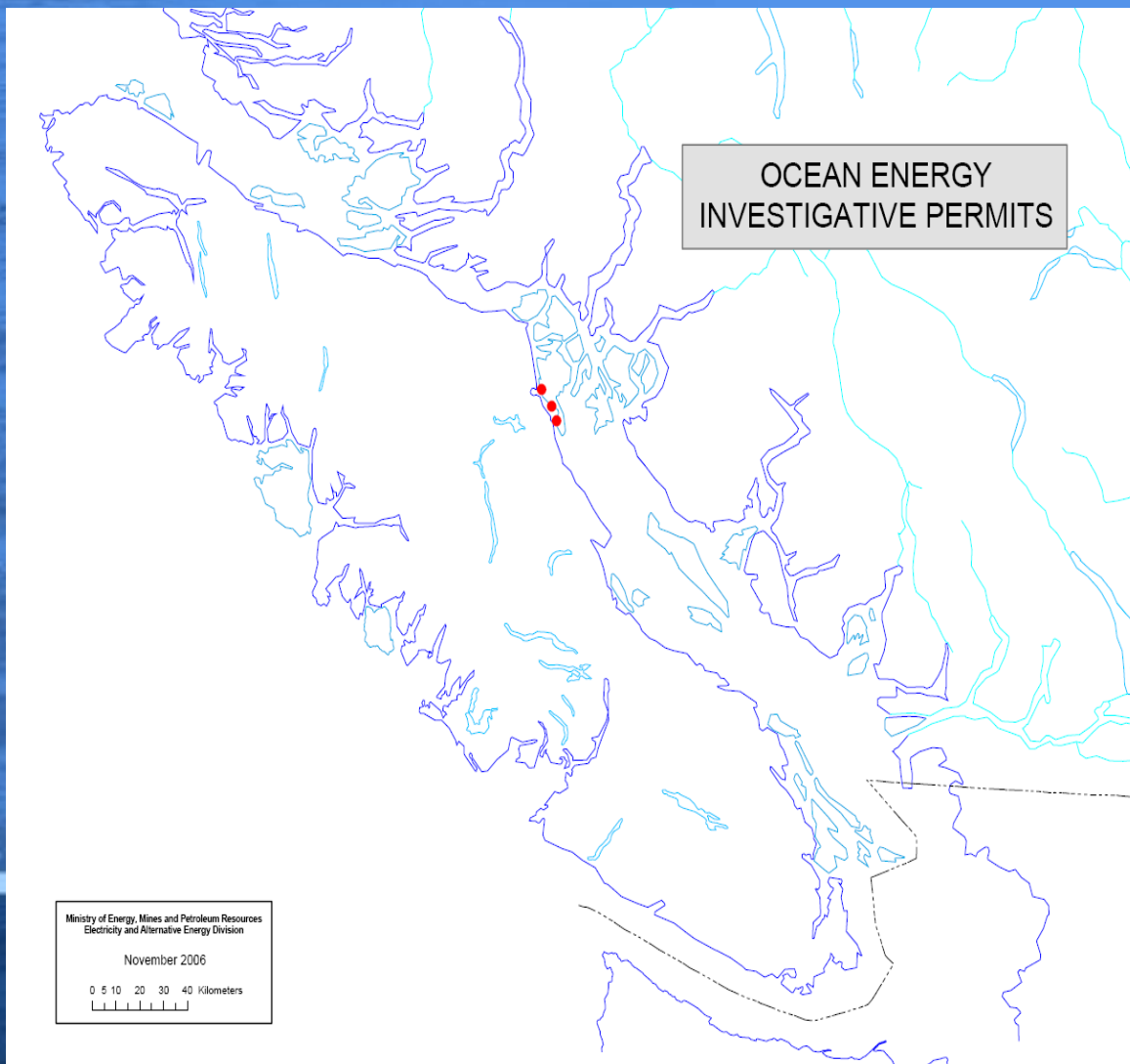
- Project Application Directive
- Queen Charlotte RFP
- New Ocean Policy and new Energy Plan
- Currently 3 investigative permits
- Expecting increase in permitting activity in 2007



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# Provincial Activities





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# Opportunities

- PNW collaborative network through i.e. PNWER, OREG, AEA and NWETC
  - Tidal energy as a component in a larger off-grid community energy independence and non-firm energy integration program
  - R&D collaboration for technology development, integration, power conditioning, etc.
  - Combined efforts for community/stakeholder awareness building



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# Opportunities

- Regional knowledge base development
  - Expedite permitting and licensing
  - Baseline data for environmental assessment
  - Appropriate technologies
  - Service providers, manufacturers, consultants, etc.





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# Conclusions

- Industry progressing rapidly, need to ensure appropriate development and avoid “reinventing the wheel”
- Resource significant – create case for development and look for government support
- Common challenges along coast present opportunities for collaboration



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