



Research Needs to Support an Efficient Regulatory Framework for Ocean Renewable Energy

A Presentation to Nova Scotia Energy
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Overview

Marine Renewable Energy in Canada

- **Background**
- **DFO's CEF project**
- **Pathway of Effects – CSAS review**
- **Follow up workshop**
- **Regulatory concerns – Gaps in knowledge**
- **Proposed Science priorities**



Context

For this exercise Marine Renewable Energy (MRE) includes

- Offshore wind
- Offshore wave
- Tidal in-stream Energy Conversion (TISEC)
- In-river Hydrokinetic (no head)

This exercise does not include:

- Traditional Hydro-electric and/or Tidal Power Projects – Dam / Impoundments / High Head



MRE Projects in Canada

- Tidal In-stream (TISEC), in-river hydrokinetic, offshore wind projects have been deployed or are under consideration in many of the provinces / territories, including:
- British Columbia - Race Rocks, Canoe Pass tidal power,
Naikun Offshore wind proposal,
significant potential for offshore wave
- Central & Arctic – demo scale hydrokinetic deployments in NWT, Yukon, Alberta, Manitoba and Ontario,
3 offshore wind proposals in the Great Lakes
University of Manitoba – hydrokinetic test facility
- Quebec – 2 hydrokinetic projects in St Lawrence River
Plan Nord includes 200MW of renewables
- Maritimes – Nova Scotia Power Annapolis project - 20MW tidal power barrage
FORCE test site
ComFit proposals
NS Marine Renewable Energy Strategy



Regulatory framework

- Canadian Environmental Assessment Act – CEAA required for MRE projects where federal decisions are required respecting – land, money, specific regulations (Law List Regs), and potential trans-boundary effects.
 - CEAA also has provisions regarding the depth and scope of the assessment.
- DFO regulatory involvement initiated for authorizations under the Fisheries Act
 - Destruction of fish by means other than fishing and
 - Harmful Alteration, Disruption or Destruction of Fish Habitat.
 - Other provisions and/or other Statutes
- The majority of MRE projects have been small – short term deployments, considered relatively low risk and CEAA has been addressed as a screening.
- Commercial scale MRE development may be considered high risk. We need a coherent and strategic approach to ensure the necessary science is provided to support future regulatory decisions.



Experience with MRE

- Direct experience with MRE projects in Canada has been limited to small, short term deployments.
- We have borrowed from experience / assumptions with traditional hydro-electric, tidal barrages and other undertakings.
- In the context of Environmental Assessments, predicted effects have not been confirmed / validated.
- Monitoring results limited, inconclusive and lessons learned not necessarily transferable to scale up to commercial developments.
- Other jurisdictions – technologies and fish may vary but the type of interaction and/or the niche occupied will be similar.



DFO's CEF Project

- In anticipation of commercial scale MRE developments, DFO received funding from NRCan through the Clean Energy Fund – CEF.
- Objective - develop a strategic science and research plan to address future regulatory information needs related to the granting of project approvals for offshore renewable energy (wind, wave, tidal and in-river) devices in Canadian marine and aquatic ecosystems.
- Results from this work will help identify priority areas for environmental and socio-economic research, as well as potential research partners (domestic and international) for future collaborations.



CEF Project Stages / Deliverables

1. Pathways of effects for each major form of offshore renewable energy technology
2. Identification of major regulatory decision points and development of environmental regulatory guidance document
3. Completion of a gap analysis between regulatory decision points and existing knowledge / science
4. Ranking of research priorities in the form of a strategic research plan



Deliverable #1

Pathways of Effects/ Understanding Risks

- DFO has developed Pathways of Effects (PoEs) to assess the risks associated with all aspects of the MRE projects and the potential impacts on the environment.
- PoEs are a visual presentation to demonstrate cause and effect relationships - document also includes a supporting narrative - Assumptions / Strength of Evidence.
- The PoE models followed the International Driving Forces - Pressures-State-Impact-Responses (DPSIR) framework adopted by the Organization of Economic Co-operation and Development and originally developed by the United Nations Environment Program.



Deliverable #1 General Approach to Logic Model

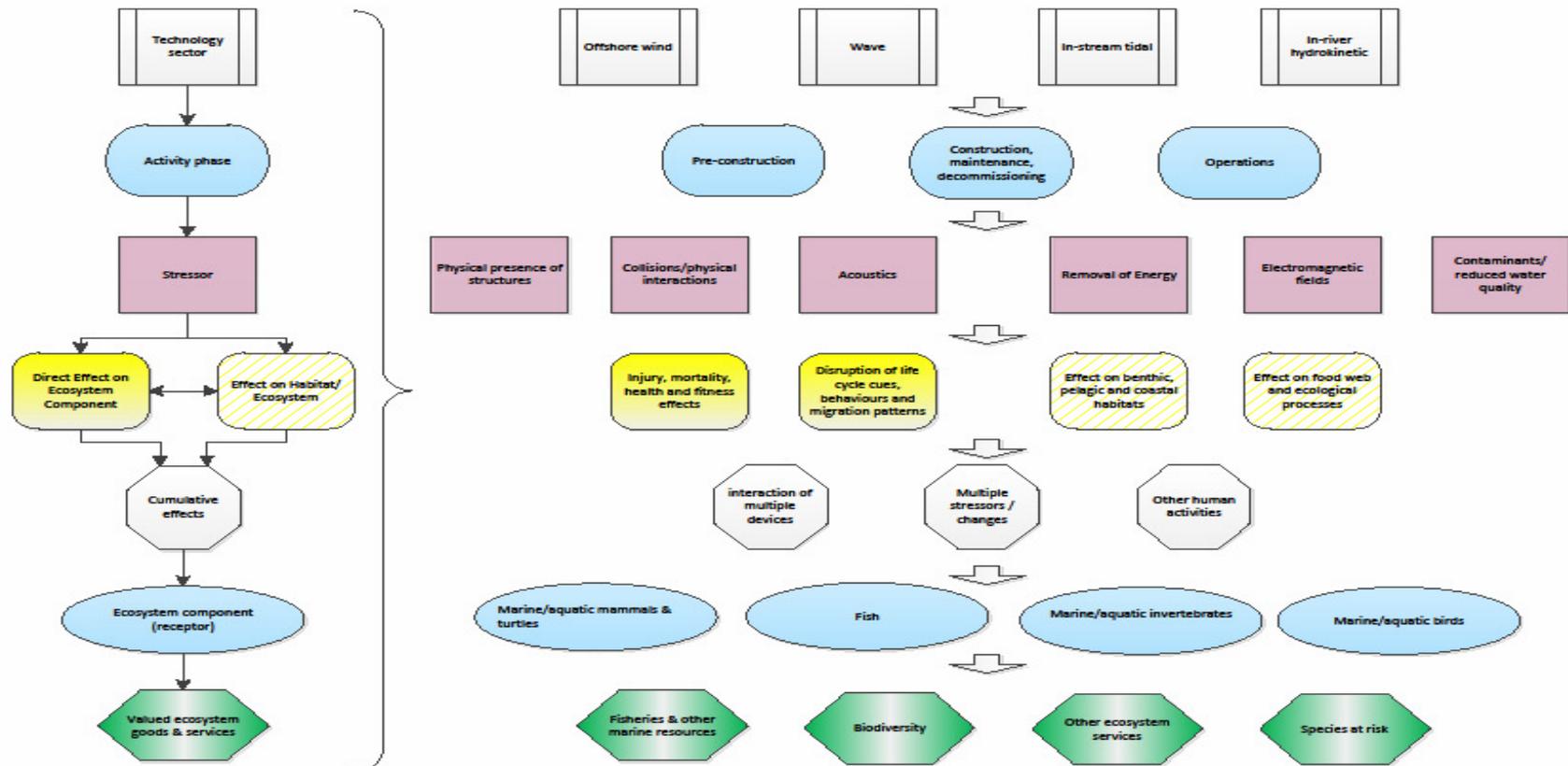
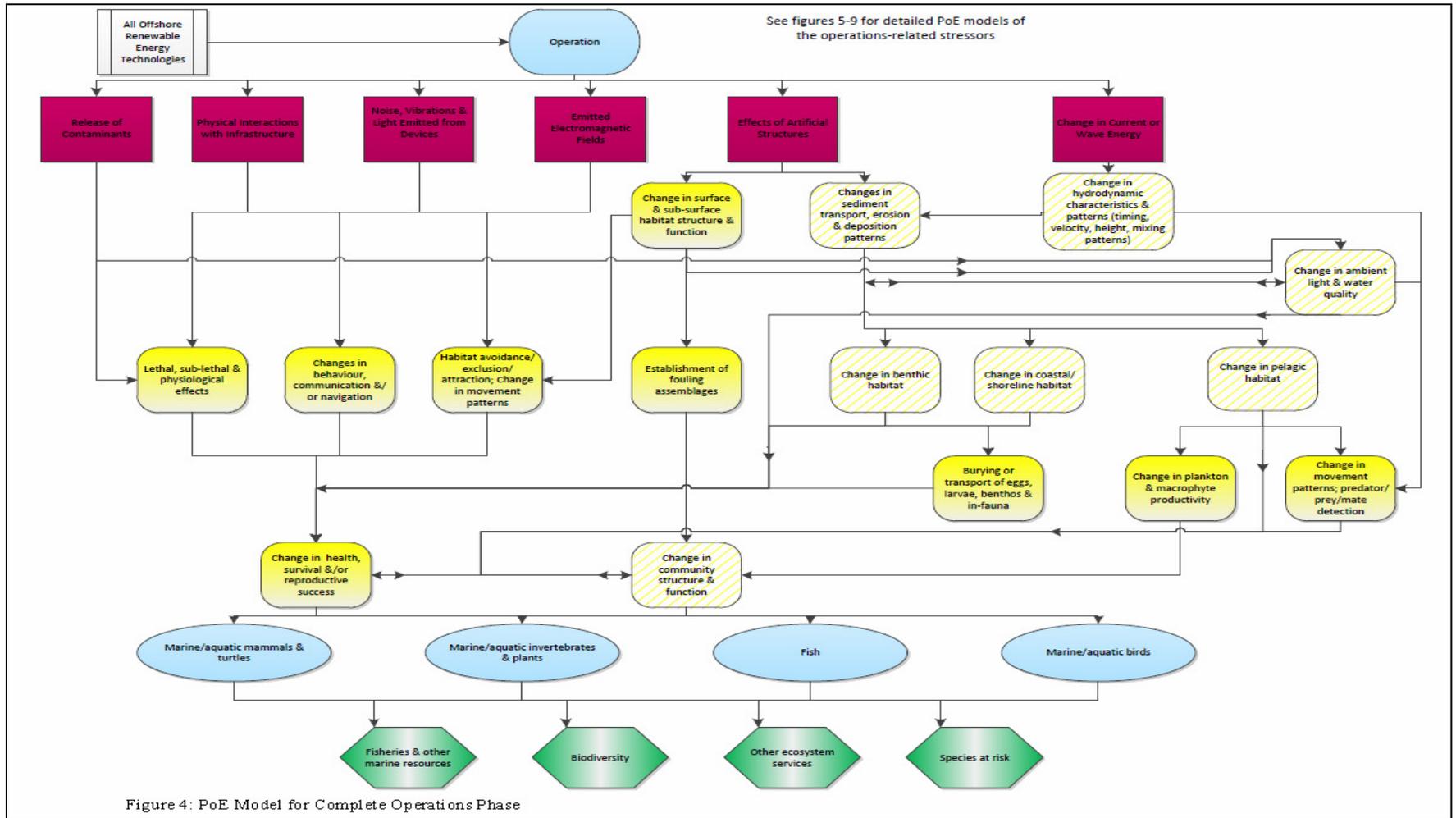


Figure 1: Framework for pathways of effects logic models for the offshore renewable energy sector



Deliverable #1 Pathway of Effects for MRE





Deliverable #1 Pathway of Effects

- DFO Science review of PoE's Nov 3-4, 2011
- Participation - DFO science, academia, industry, regulators, US reps
- Revisions to the Pathways of Effects completed and the document has been circulated
- CSAS Science Advisory Report in preparation



Deliverable #2 – 3 – Regulatory Decisions / Gaps in Knowledge

- DFO Workshop Jan 31- Feb 1, 2012
- Participation - DFO science, academia, industry, regulators, US reps
- Apply Pathways of Effects to Case Studies commercial scale
- Identify Gaps in Knowledge in relation to Regulatory Decisions
 - focus on Stressors
- Initial Rating of Science priorities
- Workshop Proceedings in preparation



Deliverable #2 – 3 – Regulatory Decisions / Gaps in Knowledge

- Gaps in knowledge regarding many aspects of commercial scale MRE represent regulatory risks for DFO
- Risks include decisions in support of prohibitions or formal Approvals / Authorizations subject to conditions SARA, Fisheries Act and Regulations, Oceans Act, CEAA, others.



Deliverable #2 – 3 – Regulatory Decisions / Gaps in Knowledge

Stressors

- Physical Interactions with Infrastructure 1 - Tidal, In-river, wave
- Effects of artificial structure 2 – Wind, Tidal, In-river, wave
- Change in current or wave energy 3 - Tidal, In-river, wave
- Noise, vibration & Light emitted from Devices 4 - Wind, Tidal, In-river, wave
- Emitted Electro-magnetic Fields 5 - Wind, Tidal, In-river, wave
- Release of Contaminants 6 – N/A



Deliverable #4 Science / Research Priorities

1 - Physical Interactions with Infrastructure

- Desk-top comparative assessment – identify origin of risks to fish traditional hydroelectric, low-head fish friendly turbines, and hydrokinetic devices –vertical – horizontal – helical axes.
- Comprehensive review of the status of Canadian and international projects related to fish interactions
- Modeling to understand the physical changes in water
- Field studies to understand the response behaviour representative species of fish.
- Field studies to understand indirect mortality
- Modeling to estimate overall survival rate for fish populations
- Follow studies in other jurisdictions to understand general fish movements



Deliverable #4 Science / Research Priorities

2 - Effects of artificial structure

- Prepare terms of reference for the future development of technical guidelines for monitoring protocols, strategies and priority indicators for the effects of marine renewable energy on fish and fish habitat.
- Investigate the applicability of different monitoring tools on existing MRE projects in Canada.



Deliverable #4 Science / Research Priorities

3 – Change in Wave or Current

- Prepare terms of reference for the development of technical guidelines for monitoring protocols, strategies and priority indicators for the operational effects of marine renewable energy on fish and fish habitats
- Modeling of physical changes:
 - Far field effects of commercial scale MRE installations on regional tides / wave and the impact on sediment transport and coastal processes (limited to high potential development locations)
 - Validate the monitoring methods / protocols that will be used by developers
 - Modeling to link the small projects to commercial scale arrays



Deliverable #4 Science / Research Priorities

4. Noise, Vibration & Light Emitted from Devices

- Prepare a fact sheet - the state of knowledge on the impacts of noise – vibration, associated hydrokinetics on fish and marine animals in the context of Canadian waters.

5. Emitted Electro-Magnetic Fields

- Prepare a fact sheet - state of knowledge on the magnitude and characteristics of magnetic and induced electric fields associated with hydrokinetics and related infrastructure, on fish and marine animals in the context of Canadian waters.



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Questions?

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