Marine Renewable Energy Legislation for Nova Scotia

Policy Background Paper

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EXECUTIVE SUMMARY

Marine renewable energy resources in the form of tidal, wind, and waves have been identified as a clean, green source of energy for Nova Scotia. Harnessing this energy could provide and contribute to many positive opportunities and benefits for the province and long-term interests of the public. These include a non-carbon emitting power source, reduction of greenhouse gases, energy security, and economic growth. As marine renewable energy is a public resource, the Province has a responsibility to ensure that development of the resource is carried out in the best interest of the public and the environment. However, unlike other natural resources with established market values, there is currently no specific regulatory scheme for renewable energy in Nova Scotia or anywhere in Canada.

The province has made a commitment in response to the Bay of Fundy Strategic Environmental Assessment (SEA) and in the 2009 *Energy Strategy* to create marine renewable energy legislation before allowing commercial-scale projects. Legislation would serve to provide clear, predictable, and efficient processes that would support the sustainable growth of the sector. It would also help the province to achieve or address the following policy commitments and objectives:

- Renewable Electricity Standard (RES), requiring approximately 1210 gigawatt hours of renewable energy sales by 2013 (*Electricity Act)*
- Legislated target of 10 per cent lower greenhouse gas emissions than 1990 *(Electricity Act, Environmental Goals and Sustainable Prosperity Act)*
- Target of at least 25 per cent renewable electricity by 2015 (*2010 Renewable Electricity Plan*)
- Goal of 40 per cent renewable electricity by 2020 (*2010 Renewable Electricity Plan*)
- Collaboration with New Brunswick on research and regulation of tidal energy in the Bay of Fundy
- Further consideration of royalties for large-scale renewable projects while maintaining a competitive investment climate (2009 *Energy Strategy*)

The development and operation of a marine renewable energy sector poses several challenges from regulatory, environmental, and socio-economic perspectives. There are multiple jurisdictions involved. The marine ecosystem is unique supports multiple users/uses. Legislation would serve to address these challenges and ensure suitable licensing processes, environmental protection, worker/public safety, resource conservation, recognition of other users, community benefits, and appropriate provincial revenue.

This discussion paper is intended to describe the following challenges and relevant subject areas that should be considered when creating marine renewable energy legislation and policy:

Policy Approach to Development

In light of challenges facing marine renewable energy development and the infancy of the sector, the province has recognized the importance of adopting an adaptive approach to development. A development framework is intended to support marine renewable energy technologies that are in their infancy as well as technologies that are developmental or commercially available. It covers several development phases that define required steps and milestones for progression of the industry.

Multiple Jurisdictions
Jurisdiction of Nova Scotia's marine environment and natural resources is not clear-cut. Provincial and federal governments may both have responsibilities and accountabilities depending on a particular area of interest. In order to regulate the industry effectively and efficiently, and provide potential developers with predictable processes, it will be important that jurisdictional responsibilities are coordinated.

Aboriginal
Activities related to development and operation of the marine renewable energy industry could potentially impact the Mi'kmaq of Nova Scotia's Aboriginal and/or Treaty rights, including fishing. The creation of legislation and relevant future marine renewable energy projects will be part of ongoing discussions between the Mi'kmaq and the province at the Energy Consultation Table. Proponents will also be encouraged to engage directly with the Mi'kmaq according to established best practices.

Planning
The public, Aboriginal communities, municipalities, and other users/uses of the marine environment could potentially be affected by the development of marine renewable energy. Effective and strategic planning should ensure that activities associated with marine renewable energy projects are in the public's interest and that potential spatial conflicts are mitigated. Potential planning mechanisms include public involvement/engagement, integrated management, possible compensation for affected industries (e.g. fisheries), and establishment of safety zone criteria.

Economic
Development of marine renewable energy has the potential to render economic opportunities such as regional and community benefits, knowledge and job creation, exporting of surplus electricity, environmental credits, and revenue (e.g. royalties) from commercial projects. However, before some of the opportunities can become a reality, electricity generated will need to be cost effective for securing long-term power purchase agreements and a stronger grid with capacity for variable energy sources will be needed.

The creation of new legislation could facilitate a strategic licensing and leasing (tenure) system. Proponents would have the ability to acquire rights and access to the resource allowing them to obtain a sense of project security. Licensing and leasing could also enable the application of appropriate economic instruments such as incentives and royalties that could support the growth of the industry and provide benefit to the public.

Environmental
Marine renewable energy is a new and emerging sector, and presents uncertainties that could potentially impact the marine environment. Before projects proceed to commercialization more information will need to be gathered regarding energy extraction limitations and possible cumulative effects from the addition of multiple marine renewable energy devices. Future research and strategic planning, as well as coordinated regulatory activities will serve to ensure that potential negative environmental impacts are addressed and mitigated effectively.

Occupational and Operational Safety
The uniqueness of the marine environment and the uncertainties associated with the development of marine renewable energy make it vital that all stakeholders—developers, government/regulators, marine industries, and the public—understand potential health and safety risks. Guidance, monitoring, and regular inspections and audits would contribute to effective risk mitigation.

Allocation of Rights
Currently, there is not a straightforward, generally applicable route for developers to obtain rights, approvals, and permits required to develop marine renewable energy projects. Although there are permitting and approvals processes under both provincial and federal legislation, a strategic and systematic approach to allocating rights at different project stages would give confidence to developers, investors, and the public.

Design of a rights allocation system would include aspects such as project application requirements, design of competitive processes, site location options, and decommissioning criteria. This would ensure that growth and development of the marine renewable energy was sustainable and managed by fair and equitable processes.

Regulatory Issues and Model
The legislative and regulatory framework for marine renewable energy should be consistent, clear, and robust. The current regulatory environment, consisting of both provincial and federal regulators and accountabilities is complex and may not be efficient and effective if the volume of projects grows. For example, environmental and safety regulation are two key areas where both governments' regulatory responsibilities and activities in the marine environment could lead to duplication of efforts, conflicting decision-making outcomes, and regulatory uncertainty for industry.

The creation of a regulatory model developed under new marine renewable energy legislation could ensure a cohesive approach to regulation. There are three types of regulatory models that are applicable to the marine renewable energy industry—cooperation, collaboration, and integration. Each addresses different approaches to jurisdictional responsibility and arrangements between relevant provincial and federal authorities. Essentially, a coordinated or integrated model that could set aside jurisdictional issues and administer the tasks on behalf of both governments would be best equipped to ensure the public interest and enforceability of legislation affecting the marine renewable energy industry.

PART ONE:

MARINE RENEWABLE ENERGY BACKGROUND & CHALLENGES

1.0 INTRODUCTION

Marine renewable energy sources have the potential to provide Nova Scotia with a significant supply of sustainable, non-carbon emitting electricity. The Bay of Fundy has one of the largest tidal ranges in the world, containing energy potential in the form of wind, waves and tidal.

In 2008 the Offshore Energy Environmental Research Association (OEER) published a strategic environmental assessment (SEA) report on Fundy's potential marine renewable energy. The SEA report provided an assessment of the social, economic, and environmental effects and factors associated with potential development of renewable energy sources in the Bay of Fundy. It provided twenty-nine recommendations including the creation of marine renewable energy legislation incorporating sustainability principles.

As part of Nova Scotia's response to the SEA recommendations, a commitment was made to create marine renewable energy legislation, covering all of Nova Scotia's waters, before allowing commercial-scale projects. This commitment was also affirmed in the 2009 *Energy Strategy*.

If the marine renewable resource is going to be developed with the potential of providing commercial electricity generation, a coordinated legislative framework should be established. Use of the ocean for renewable energy production will require a commitment to marine energy development that promotes clean, renewable energy, ensures protection of living resources, and takes into account existing marine users and the concerns of coastal communities.

1.1 Policy Drivers and Opportunities

Harnessing Nova Scotia's abundant marine renewable resource has the potential of providing many positive opportunities and benefits for the Province and the long-term interests of the public including:

- *Sustainability*—Marine renewable energy is natural and potentially inexhaustible if energy extracted is within pre-determined limits (EPRI, 2006). Harnessing the resource efficiently could provide a sustainable and clean source of power for generations to come.
- *Energy Security*—Use of marine renewable energy around Nova Scotia's coastline will improve the diversity of energy supply, reducing our dependence on imported fossil fuels and also has the possibility of making Nova Scotia less vulnerable to fluctuations in world energy prices.
- *Industry building*—Development of marine renewable energy will engage industries and skills that already exist in Nova Scotia and may be exported throughout the world.

The investment in and development of a marine renewable energy sector in Nova Scotia would allow the Province to potentially achieve multiple objectives and commitments as outlined in the *Renewable Electricity Plan,* 2009 *Energy Strategy*, the response to the

Bay of Fundy SEA, the *Electricity* Act, and the *Environmental Goals and Sustainable Prosperity Act* (EGSPA).

Commitments and policy objectives addressed:

- Nova Scotia's Renewable Electricity Standard (RES) which requires approximately 1210 gigawatt hours of renewable energy sales by 2013
- Legislated target of 10 per cent lower greenhouse gas emissions than 1990
- Target of at least 25 per cent renewable electricity by 2015 (*Renewable Electricity Plan*)
- Goal of 40 per cent renewable electricity by 2020 (*Renewable Electricity Plan*)
- Collaboration with New Brunswick on research and regulation of tidal energy in the Bay of Fundy
- Creation of marine renewable energy legislation before considering commercial tidal projects
- Further consideration of the idea of royalties for large-scale renewable projects while maintaining a competitive investment climate

1.2 Sustainable Development of the Marine Renewable Energy Resource

Marine renewable energy is a public resource. The province has a responsibility to ensure that development of this resource is carried out in the best interest of the public and the environment. If developed commercially, marine renewable resources must be managed in a safe, orderly manner, similar to other natural resources. Due to the physical and regulatory complexities presented by the marine environment, the need for guiding legislation in other marine industries (e.g. aggregates extraction, oil and gas exploration and production, the laying of telecommunication cables, etc.) has been recognized (DTI, 2002). The exploitation of marine renewable energy presents some comparable regulatory issues that should be addressed by a legal framework.

Marine renewable energy legislation would ensure that projects and development take place with appropriate licensing, environmental protection (including disclosure of environmental data and other information), community benefits, and appropriate provincial revenue. Legislation will help Nova Scotia to fulfill the objective to reduce greenhouse gases. It is also considered by stakeholders to be a means for the Province to ensure benefits from marine renewable energy development accrue to the Province in general, and local communities directly affected by marine renewable energy development.

In order for the marine renewable energy industry to progress and grow in Nova Scotia, legislation and regulatory frameworks need to provide predictable, effective, and efficient processes that promote resource conservation, environmental, health and safety protection, advancement of environmental goals, and economic development. Legislation should place a high value on the long-term public interest while maintaining the overall integrity of internationally recognized habitats and species.

2.0 CHALLENGES OF MARINE RENEWABLE ENERGY

The development of the marine renewable energy industry poses several challenges from regulatory, socio-economic, environmental, and safety perspectives. These challenges include consideration of multiple jurisdictions in the development of marine renewable energy, the complexity of the marine ecosystem and the fact that this environment supports multiple users and uses. Determining how these challenges will be addressed and managed is one of the major tasks encompassing the creation of marine renewable energy legislation.

2.1 The Multi-Jurisdictional Challenge

Similar to the experiences of the offshore oil and gas industry in Nova Scotia, marine renewable energy is also subject to certain aspects of federal and provincial control. Various activities that represent multiple interests and accountabilities of both governments and individual departments and agencies take place in Nova Scotia's waters. In order to harness the marine resource effectively and provide developers with predictable processes, it is important that jurisdictional responsibilities are coordinated to guide future development and management of the marine renewable energy sector.

2.1.1 Jurisdictional Boundaries

One of the main issues regarding multi-jurisdictional challenges is determining what and how different levels of government will regulate. Jurisdiction over offshore renewable resources has two aspects according to constitutional law: Nova Scotia ownership and related proprietary jurisdiction over areas of the seabed[1], and federal legislative jurisdiction with respect to interference with fishing and navigation rights.[2]

In terms of jurisdiction for renewable and non-renewable energy offshore, there is no convenient technical description of Nova Scotia's boundary as established by the Constitution in 1867. With respect to any given location, Nova Scotia and the federal government may have different views on the interpretation of the pre-confederation historical record that defines the boundary, and therefore on the location of the Province's offshore geographical limits. The current evidence and federal and provincial viewpoints regarding Nova Scotia's boundary placement may also vary depending on the particular location under discussion.

The federal government does recognize inclusion of areas 'between the jaws of the land' such as the Bay of Fundy, as being within provincial boundaries. It is also understood by Nova Scotia that the Bay of Fundy is divided at the mid-line between Nova Scotia and New Brunswick.[3]

The concrete limits of the Offshore Accord area negotiated between the federal and provincial governments and adopted in their laws for the petroleum sector are not definitive of either government's claim, but give some indication of the areas addressed by historical record on which Nova Scotia relies.

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[1] S. 92, *Constitution Act, 1867*.
[2] S. 91, *Constitution Act, 1867*.
[3] See *R. v. Burt* (1932), 5 M.P.R. 112, the NBCA, p117, as addressed in the SCC *References re Offshore Mineral Rights of British Columbia,* [1967] S.C.R. 792, at p.809.

Recognizing the implications and public sensitivities, the two governments have been able to accommodate their differing constitutional views through collaborative law-making and administration in other aspects of marine energy resources. The essential feature of these coordinated regimes is that both governments have ensured identical legal results in their relevant legislation, and have jointly empowered common regulatory staff who then act under the authority from both governments. The laws establishing the Canada-Nova Scotia Offshore Petroleum Board and the federal-provincial regulatory regime for Donkin Coal mine are two examples.

2.1.2 Complex Regulatory Environment

The development of marine renewable energy resources is subject to a number of regulatory authorities as both provincial and federal governments have certain jurisdictional roles regarding matters related to marine resources. Therefore, it is important that marine renewable energy legislation recognizes all accountabilities and regulatory responsibilities accordingly. Consideration of governance options will have to take into account the existing, overlapping interests of federal and provincial departments and agencies. It is important that an integrated approach is adopted for both the strategic planning of the potential industry, as well as for the consideration of development applications through the permitting process (DTI, 2002).

Provincial Regulatory Framework

- Nova Scotia Environment Act
- Environmental Goals and Sustainable Prosperity Act
- Fisheries and Coastal Resources Act
- Endangered Species Act
- Energy Resources Conservation Act
- Crown Lands Act
- Beaches Act
- Special Places Protection Legislation Act
- Electricity Act
- Public Utilities Act
- Social legislation
- Assessment Act
- Municipal Government Act

Federal Regulatory Framework

- Fisheries Act
- Canadian Environmental Assessment Act
- Species at Risk Act
- Migratory Birds Convention Act
- Navigable Waters Protection Act
- National Energy Board Act
- Oceans Act
- Canada Environmental Protection Act
- Shipping Act
- Canada Labour Code

2.2 Complexity of the Marine Environment

Nova Scotia's existing offshore waters present a unique and complex ecosystem. In particular, the Bay of Fundy, Gulf of Maine and Georges Bank constitute one of the world's most biologically productive ecosystems. The rich marine waters and shoreline habitat are supported from a deepwater conduit that brings dense, high-salinity, nutrient-rich deep water from the North Atlantic (Jacques Whitford, 2008). Tides in the Gulf of Maine and Bay of Fundy are forced by the tides in the North Atlantic Ocean rather than from the direct influence of the sun and moon (Jacques Whitford, 2008). These characteristics create a unique environment and warrant consideration from regulators, developers, and other users of this particular marine ecosystem. Other parts of the Nova Scotia offshore area that may be suitable for tidal, wave, or offshore wind development may coincide with rich inshore fisheries with high commercial value as well.

Although human activities are not new to the ocean environment, there is currently little practical knowledge of how the marine ecosystem could be affected by marine renewable energy technology. This lack of information makes it difficult to assess the potential effects of devices used for generating electricity. Given the newness and progression of wave, and tidal energy conversion technologies in particular, there are limited national or international examples to draw from.

The unique characteristics of Nova Scotia's marine environment and the unknown possible impacts of marine renewable energy technology make it essential to proceed using a staged development approach. This approach addresses issues such as environmental effects, cumulative effects, resource extraction, monitoring, evaluation, inspection, and compliance and enforcement. Research programs and projects are also underway that address the potential effects of renewable energy projects on the marine environment. (*See section 8.1.4, p.45*)

2.3 Multiple Users and Uses

Marine areas that could potentially be used for the development of marine renewable energy are currently used by multiple users and uses including various government, Aboriginal, commercial, and recreational users. Governing marine space and mitigating conflicts between users/uses can be further complicated by the possibility of future proposals for marine protected areas that may also reduce the amount of space available for commercial and recreational users. The following biophysical and socioeconomic aspects of Nova Scotia's marine environment have the potential to interact or be affected by marine energy development:

• Fish and fish habitat	• Aquaculture
• Marine benthic habitat and communities	• Conservation
• Pelagic communities	• Marine transportation and navigation
• Marine mammals	• Tourism and recreation
• Marine birds	• Archaeological and heritage resources
• Species at risk	• Economic development
• Fisheries (commercial and recreational)	• Civil aviation and defense
• Aboriginal Traditional and Current Use	• Oil and gas development

Uncoordinated management can result in negative environmental and socioeconomic impacts. In order to reduce potential conflicts, it will be important for integrated management and economic interests related to Nova Scotia's marine environment to be addressed by formal legislation. A strategic approach to managing marine activities would allow for better protection of resources, conservation of biodiversity and preparation of a changing energy future. Integrated use implies that multiple uses of the ocean space and resources are managed in a coordinated manner so that no single activity is seen outside the context of other users (Walmsley 2005). This concept encompasses the balanced consideration of the full range of interests and environmental, social, cultural, economic, and institutional objectives for the management of the offshore area (DFO, 2008).

3.0 MARINE RENEWABLE ENERGY DEVELOPMENT IN OTHER SELECTED JURISDICTIONS

The development of marine renewable energy is in its very early stages not only in Nova Scotia, but also globally. While it seems that offshore wind energy has made the most advancement in terms of technology and feasibility, there are still many uncertainties surrounding the new sector. The initial development of the industry is presenting new challenges that are being met with innovative approaches to problem-solving and strategic planning. As the industry progresses in different areas of the world new information and data regarding technological, socioeconomic, environmental, and regulatory impacts are being acquired. The exchange of this information and sharing of preferred practices will continue to advance the industry, benefiting all stakeholders involved.

Pointing to "model legislation" from other jurisdictions on how to encourage and control future marine renewable energy developments is not possible in light of the fledgling nature of the industry (Doelle et al., 2006). However, a number of regional and international approaches to addressing offshore renewable energy stand out. While it is true that other jurisdictions are presented with different regulatory frameworks, geographical characteristics and political climates, they are also grappling with comparable challenges to Nova Scotia. Therefore, their experiences, lessons learned, and strategies are relevant to Nova Scotia and worthy of consideration.

United Kingdom
The United Kingdom (UK) has been identified as possibly being the most relevant jurisdiction to Nova Scotia in terms of marine renewable energy and specifically tidal energy (Doelle et al., 2006, p.25). Similar to Nova Scotia, the UK employs a quota-based mechanism in their renewable energy regime.[4] Building on their success in the offshore wind sector, the UK's marine energy development is proceeding via two phases of activity: the demonstration/pre-commercial phase and the commercial generation phase.

Unlike some jurisdictions involved in marine renewable energy development, the UK has created specific legislation to regulate the industry's activities. Many other jurisdictions have been focusing on using current legislation to permit and regulate marine renewable energy projects and have noted challenges inherent to complexities presented by marine renewable energy.[5] The *Offshore Production of Energy*, part of the UK's *Energy Act* 2004 includes provisions regarding licensing, permits and approvals, navigation and aviation, decommissioning offshore projects, safety zones, civil and criminal law applicable to renewable energy installations, and authority to declare "Renewable Energy Zones" (REZ) outside the UK territorial sea.[6]

Marine renewable energy development is regulated by national authorities through a coordinated environmental review and permitting process. Currently, the UK's regulatory model involves several government entities: the Crown Estate (licensing/leasing of land), Department for Environment, Food and Rural Affairs (DEFRA) (environmental issues) and the Department for Business, Enterprise and Regulatory Reform (BERR). BERR

[4] The UK target is for 10% of electricity generation to come from renewable energy by 2010 and 20% by 2020. (DTI, *Our Energy Future—Creating a Low Carbon Economy*, 2003, p.59)
[5] US – FERC uses energy act and licensing process for hydro-dams; New Zealand RMZ;
[6] *Energy Act 2004* c. 20 (UK)

serves as the focal point for the permitting process, promoting a coordinated and streamlined approach to administering the package of permits required of developers.

Under the UK's current regulatory approach two rounds for commercial offshore wind development have occurred and more recently, a competitive tender process was held for wave and tidal energy leases covering small- to large-scale projects. Despite the UK's success, the creation of new legislation—the draft *Marine Bill*—was proposed in 2005 as an effort to improve the framework for managing and protecting marine resources while also addressing other users and uses of the ocean resource. Key features of the bill include creation of a Marine Management Organization (MMO) which will oversee licensing and environmental enforcement and introduction of a UK wide planning system for development and designation of marine conservation zones ("marine spatial planning").

The draft bill shed light on jurisdictional issues between the UK government and devolved administrations. The UK's regulatory regime for marine renewable energy has been somewhat simplified as multi-jurisdictional issues in terms of seabed ownership have been determined the responsibility of a sole authority—the Crown Estate—in all UK territorial waters, including those of Wales, Northern Ireland, and Scotland.[7] However, with the proposal of new legislation, devolved administrations, in particular Scotland, recognized a critical need to ensure that the new legislation clearly recognized the split powers of involved governments. As a result, agreements on additional devolution and similar legislation were made between the UK government and devolved administrations in 2008 including:

- Scotland's creation of a similar draft *Marine Bill* and Marine Scotland (similar to MMO) to ensure that split powers between the UK and Scotland were clear
- Creation of a Welsh Zone for fisheries to enable the Welsh Assembly Government to exercise its responsibilities for fisheries management in a more coherent way (Welsh Assembly Government, 2008)

These arrangements between governments have been viewed as mechanisms to facilitate formal coordination and working arrangements in order to ensure that the marine environment and marine resources are properly managed.

United States

The US faces many similar challenges to Nova Scotia. Their experience provides a useful example of the key regulatory challenges that must be addressed and the important role legislation can play (Doelle et al., 2006, p. 25).

The US has been entertaining marine renewable energy proposals, as well as permitting and licensing multiple projects using existing legislation and processes[8]. The Federal Energy Regulatory Commission (FERC) uses the process for hydro-power licensing under the authority of the *Federal Power Act*, while the Department of Interior's Mineral Management Service (MMS) is authorized under the *Energy Policy Act* of 2005 and uses processes similar to offshore petroleum and minerals' permitting . Prior to recent

[7] The Westminster Body, the Crown Estate Commission, has handled administration of rights and revenues for the territorial seabed of Scotland, Wales and Northern Ireland. Despite Scotland's devolution and rights held by the Crown in Scotland, the Crown Estate is responsible for administration of the seabed as a legacy of a 19th century transfer of responsibility from Edinburgh to London (The Highland Council, 2008).

agreements between the governing bodies, project progression leading to commercial development was limited by the lack of a coordinated planning process, lack of authority to grant leases and exclusive use and occupancy rights of offshore areas, and inability to assess resource rent for the space occupied or a fee or royalties for energy generated[9] (Doelle et al., 2006, 32). Although both FERC and MMS had permitting processes in place to issue rights for marine renewable energy projects, regulatory barriers and jurisdictional dilemmas had been preventing the industry from developing in an effective, efficient and sustainable manner.

The marine renewable energy industry in the US was challenged by multi-jurisdictional issues regarding which federal regulatory agency— FERC or MMS—had primary permitting authority for projects in Outer Continental Shelf (OCS) waters. Individual states have also challenged FERC for jurisdictional rights to the seabed and some such as Oregon,[10] addressed this through a Memorandum of Understanding (MOU) with FERC. This gives the state more individual power in the permitting process, but it does not address operational regulatory responsibilities of the governments and respective departments.

To address regulatory issues recommendations were made for one federal office to lead an interagency, federal-state process to create a coordinated environmental review and permitting system for marine renewable energy projects. In 2004, the US Commission on Ocean Policy urged federal legislation that would: streamline the process for leasing and permitting renewable energy facilities in US waters, ensure the public receives a fair economic return for use of the resource and put in place an open and transparent allocation process fully considering state, local and public concerns[11] (Doelle et al., 2006, p. 33).

Consequently, FERC and MMS announced in March 2009 that the agencies would work together to facilitate the permitting of marine renewable energy. An MOU was signed on April 9, 2009 with the agreement that FERC will issue licenses and MMS will issue leases, easements, and other rights-of-way for tidal hydrokinetic project development in OCS waters. MMS will have jurisdiction over offshore wind and solar energy, while FERC will be responsible for tidal and wave current projects (FERC & MMS, 2009).

New Zealand

New Zealand's experience with enabling the development of marine renewable energy projects provides another example of the challenges presented by using existing legislation to guide regulatory processes. Currently, a resource allocation regime for renewable energy projects is not in place in New Zealand. Project developers are required to secure permits under the *Resource Management Act* 1991 (RMA) for space occupation, erection of structures, extraction of energy and, possibly, discharges (PPL, 2008).

The RMA permitting process is essentially an environmental management regime, operating on a first-come-first-served basis (PPL, 2008). When granting permits under

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[9] U.S. Commission on Ocean Policy, *An Ocean Blueprint for the 21st Century*, Final Report. (Washington DC, 2004). 366.

[10] FERC and the state of Oregon signed an MOU in March 2008 to coordinate procedures and schedules for review of wave energy projects located in state and federal waters.

[11] Ibid, 368.

RMA, authorities cannot consider trade competition aspects of proposals, nor can they consider the financial and technical capabilities of project developers unless there are related environmental implications (PPL, 2008). Overall, the RMA serves to promote sustainable management of natural and physical resources, but is not broad enough to cover economic and social interests. As such, stakeholders have been urging the government to consider whether the RMA is the best mechanism for allocation of space and marine resources for marine energy projects (AWATEA, 2006).

While the RMA is the main legislation used for marine renewable energy permits, there is a range of legislation, regulations and regulatory bodies involved in the permitting process. This has been identified as a barrier to development and consistency. The next layers in the hierarchy are the *New Zealand Coastal Policy Statement* (NZCPS) prepared by the Minister of Conservation and various regional policy statements and plans (PPL, 2008). Developers are required to gain consents of regional and local authorities whom may have different requirements depending on developers' operative plans. As there is not a straightforward permitting process, specific issues and requirements may arise with which any project developer will have to comply (PPL, 2008).

Although New Zealand is reported to have eighteen demonstration and test projects underway (six wave, twelve tidal), uncoordinated and fragmented permitting processes have been flagged as a challenge to the growth of the industry (AWATEA, 2006). In order to overcome resource permitting issues, there has been a recent recommendation to set aside an area for the creation of an energy park to be used for tidal energy development. This could possibly reduce the number of assessment and scoping processes by covering more than one project at a time.

Norway

In an effort to support and control the development of marine renewable energy, Norway has proposed an act addressing offshore renewable energy production. The proposal also includes a national strategy on offshore renewable energy.

The proposed legislation is modeled on the method for managing the country's petroleum resources. It is based on public administration and control of the management of the energy resources offshore. Other areas covered by the proposed act are regulations regarding security and working environment, infrastructure, area tax, electricity system operation, export and import of electricity, a process of applying for concessions, and fisheries compensation. The primary aim of Norway's legislation will be to ensure coordinated development of marine renewable energy plants and electricity infrastructure offshore and onshore, in addition to other issues including the environment, fisheries, and sea transport (Ministry of Petroleum and Energy, 2009).

The strategy focuses on the challenges related to future development of marine renewable energy and establishes the principle that the development of renewable energy only can take place within specific zones defined by the Norwegian Government. A governmental decision on opening of zones for development of renewable energy has to be based on an impact analysis (Ministry of Petroleum and Energy, 2009).

4.0 FRAMEWORK FOR DEVELOPMENT OF NOVA SCOTIA'S MARINE RENEWABLE ENERGY INDUSTRY

The growth of the marine renewable energy industry in Nova Scotia requires a strategic approach to development. The findings of the SEA report noted the importance of a cautious, incremental approach to development due to the uncertainties encompassing marine renewable energy. In order to assess the feasibility of technologies, environmental effects, and economic viability the industry will be developed using a staged, adaptive approach. This method provides a vehicle for continuous learning, gathering of data regarding environmental, technological, and socio-economic impacts. It also allows the industry to develop and grow in a sustainable manner, ensuring the health and safety of the public, protection of the environment, and conservation of natural resources.

The framework is intended to support marine renewable energy technologies that are in their infancy as well as technologies that are developmental or commercially available. It covers several development phases that define required steps and milestones for progression of the industry.

1. **Strategic Environmental Assessment (SEA)**

   A strategic environmental assessment (SEA) is a process that takes place before specific projects are considered. It assesses the environmental and social impacts of potential marine renewable energy projects and provides stakeholders with the opportunity to influence decisions related to planning, policies, regulation, and management early in the process.

   The SEA process has been one of the first steps in Nova Scotia towards developing marine renewable energy. The 2008 SEA provided an assessment of the social, economic, and environmental effects and factors associated with potential development of renewable energy sources in the Bay of Fundy.

2. **Regulatory and Planning Phase**

   All marine renewable energy projects will be required to obtain specific regulatory approvals and permits before development can commence. As each project will be unique in terms of technology, location, and scope, regulatory requirements may be different.

   As the first step in the project planning process, proponents would need to engage in technical and environmental studies and activities that would help inform project design and provide details necessary for determining applicable regulatory requirements. Proponents could potentially obtain a conditional permit that reserves the site for the collection of baseline data and to gather information necessary for final regulatory approvals and to gather information for an environmental assessment (EA) (if required).

   Once a final project application is submitted by a proponent and reviewed by regulatory authorities, final permits/approvals would be granted as well as a Crown land lease upon review and approval of the EA.

3. Research and Development (R&D) Phase

Many marine renewable energy technologies (particularly for wave and in-stream tidal) are in their infancy and require further refinement through demonstration, research, and development. The R&D phase provides an opportunity to build expertise in the adaptation of technologies for marine renewable energy under Nova Scotian conditions,

At this phase, demonstration and developmental (pre-commercial) technologies are tested for survivability, environmental information, and if possible, certification. This phase of industry development has been supported by the province through their agreement to provide funding for an in-stream tidal testing facility—Fundy Ocean Resource Centre for Energy (FORCE)—in the Bay of Fundy. Devices tested at FORCE will be monitored for wear, environmental impacts, and performance that will lead to further technological developments. Information gathered and experience acquired will also help regulatory bodies determine how best to assess, approve, and manage the emerging industry.

Once a device is proven, a small array of devices can be tested for technical and commercial viability. Data gathering, surveying, monitoring, and evaluating will continue to build understanding of possible impacts, environmental effects, risks, and technology success or failure.

4. Commercial Phase

Commercial marine renewable energy projects could only begin once technologies are shown to be viable and economic. Success will depend on normal commercial factors—including an acceptable level of risk, a competitive price for delivered electricity, and a market for that electricity. Commercial viability will also be influenced by regulatory requirements and environmental advantages associated with marine renewable electricity including emerging policy with respect to the cost of carbon.

At the commercial phase, the industry would continue to be regulated and monitored to protect people and the environment.

4.1 A Staged Project Development Approach

(*Please note that the following description of staged project development is most relevant to in-stream tidal and wave technologies.)*

A staged approach to development would involve three project stages—micro-scale/demonstration, pre-commercial/small array, and commercial. During the first stage, single prototype devices would be tested in the ocean covering survivability, reliability, performance, and if possible, certification and environmental information.

The next stage is likely to be deployment of a small array of devices during which the technical and commercial viability can be demonstrated and interaction between devices assessed. Once viability is proven and interaction between devices understood, deployment of larger arrays becomes a possibility before commercial projects are developed.

This staged development will allow for a life-cycle approach to individual projects consisting of site investigation, permitting, environmental assessment[12], monitoring, evaluation and eventually, decommissioning. Data gathering, surveying, monitoring, and evaluating will be critical steps at each stage to understand possible impacts, environmental effects, risks, and technology success or failure.

Proponents would not necessarily be required to engage in all stages of development before applying to commence commercial development, once specific technologies have reached a certain level of maturity. However, it is prudent to use an incremental, adaptive approach given the infancy of the industry in Nova Scotia and elsewhere.

A staged development approach to marine renewable energy projects has been adopted by other jurisdictions. British Columbia, the United Kingdom, the United States, Ireland, and Denmark have either been developing or have implemented strategies focused on marine renewable energy development using similar staged approaches.

Marine renewable energy projects are currently categorized under project stages that include different amounts of energy produced, grid-connection, and number of devices deployed. Although there are not consistent standards (i.e. aggregate capacity, length of time, number of devices) among all jurisdictions for marine renewable energy development in each stage, countries currently involved in the industry are incorporating similar methodologies and criteria as illustrated in Table 1 below:

JURISDICTION	**PROJECT DEVELOPMENT STAGES**		
United Kingdom	**Investigative** • Length varies by site/project	**Demonstration/ Pre-commercial** • Includes demonstration and small array • 1 MW – 10 MW • max. 20 devices • Grid connected • 1 – 7 years	**Commercial** • 4 levels of aggregate capacity**:** 10MW-50MW 50MW-100MW 100MW-200MW 200MW – 300MW • max. 20 devices • SEA requirement
United States (FERC)	**Demonstration** • Less than 5 MW • 5 years • Grid connected	**Pre-commercial** • Varies, but some project approvals have been for up to 100 MW • 3 years	**Commercial** • 30-50 years
Ireland[13]	**Prototype** • 2 MW • 2 devices	**Pre-Commercial Single** • 2 MW • Up to 2 devices • grid connected • PPA • 2 years **Pre-Commercial Small Array** • 10 MW • up to 10 devices • grid connected • PPA	**Commercial** • Up to 485 MW • 60 years

[12] The size and scope of individual projects will determine whether an environmental assessment requirement is triggered under current legislation.
[13] Department of Communications, Marine and Natural Resources. (2005). Ocean Energy in Ireland. Retrieved from http://www.marine.ie/NR/rdonlyres/86491414-3E7E-48E5-A0E1-287CA9191C61/0/OceanEnergyStrategy.pdf

JURISDICTION	PROJECT DEVELOPMENT STAGES		
		• 5 years	
British Columbia	**Investigative** • 2 years • Information gathering only	**Demonstration/Pre-commercial** • 3-10 years	**Commercial** • Criteria not yet determined
Denmark	**Demonstration** • 3 years • Grid connected	**Pre-Commercial** • Less than 10 MW	**Commercial** (offshore wind) • 25 years
NOTE: The information in this table is representative of licensing processes established up to April 2009.			

TABLE 1

4.1.1 Investigative Stage

The investigative stage is a preliminary stage that a proponent would engage in (prior to any of the development stages if the proponent does not already have a project in that area) before construction, development, or operations can commence. This stage would provide for the collection of baseline data and field work to support the approval and installation of a project (OEER, 2008). Some jurisdictions such as British Columbia and the United States require a permit for this stage.

Objectives:

- Research resource attributes
- Data gathering
- Site planning
- Facility design
- Perform due diligence

4.1.2 Demonstration – Impact of Environment on Technology

The purpose of the demonstration stage is to ensure that marine renewable developers have the opportunity to test technology against unique environmental conditions. It plays a key role in producing efficient designs and significant learning of how to operate and maintain the technology.

The demonstration stage provides an opportunity for monitoring and adaptive feedback to inform decisions for developmental/commercial scale generation. Other jurisdictions[14] have cited demonstration programs/phases as being successful in moving the industry forward (Doelle et al., 2006, 59).

Objectives:

- Development and validation of engineering and technical aspects of devices and demonstration of their commercial potential

[14] UK, Germany, Denmark

- Development of understanding of the environmental impacts of devices and their potential impacts on other uses or users of the marine area, through monitoring and research
- Encourage the optimization of technologies in terms of efficiency, life-cycle cost, and environmental effects management
- Evolution and refinement of the regulatory process and adaptation as appropriate to new technologies and their impacts
- Build public support and knowledge
- Perform due diligence

Potential project criteria:

- Testing of prototype devices that can be easily removed
- Aggregate capacity ranging from 1MW – 5MW
- Length of project stage typically 2-4 years
- Possible use of public funding for some projects (i.e demonstration program)

- **Micro-scale Projects**

Small-scale or "micro-scale" projects may necessitate a different permitting and approval process than other projects. While a micro-scale project may still require various municipal, provincial or federal approvals, it may not be necessary or efficient to require developers to undergo the same regulatory process established for demonstration or developmental/pre-commercial projects.

At this project level, regulatory provisions will need to be created that limit energy resource extraction to a certain amount, technology is proven or will require monitoring and reporting of results, and environmental aspects of the project are disclosed before deployment.

A modified regulatory process for micro-scale projects is present in some jurisdictions. For example, the UK has determined that marine renewable projects generating under 1 MW that can be constructed and removed easily will not require permission under their *Electricity Act 1989*. However, all operators are required to prepare an environmental statement outlining perceived risks that is subject to review and approval by relevant authorities.

Objectives:

- Development and validation of engineering and technical aspects of devices and demonstration of their commercial potential
- Development of understanding of the environmental impacts of devices and their potential impacts on other uses or users of the marine area, through monitoring and research
- Encourage the optimization of technologies in terms of efficiency, life-cycle cost, and environmental effects management
- Possibility for net-metering or feed-in tariff (FIT)

Potential criteria:

- Aggregate or individual device limits on capacity to under ??? MW
- Testing of prototype devices that can be easily removed
- Permitting of a single device or up to aggregate capacity limit for micro-scale projects

4.1.3 Developmental /Small Array– Impact of Technology on Environment

The developmental/ stage is similar to the demonstration stage, as technology is still being tested and proven, but the devices are expected to be grid-connected and the size of the project will likely differ in terms of aggregate capacity and number of devices. This stage also enables commercial-scale units to be tested and deployed in “pilot arrays” before full build-out. The primary objective at this stage is to test the impact of technology on the environment to determine environmental and technical feasibility.

Objectives

- Development of understanding of the environmental impacts of devices and their potential impacts on other uses or users of the marine area, through monitoring and research
- Prove technology and develop grid-connected prototypes
- To gather information on interaction of devices in close proximity
- To capture key data on the resource, costs (construction, installation, commissioning, operational and maintenance) and energy performance and revenue
- Development and validation of engineering and technical aspects of devices and demonstration of their commercial potential
- Evolution and refinement of the regulatory process and adaptation as appropriate to new technologies and their impacts

Potential project criteria:

- Grid-connection
- Removable devices
- Aggregate capacity ranging from 1MW – ???
- Length of project (for monitoring and evaluation purposes) 1-10 years
- Single device or small array

4.1.4 Commercial

The commercial phase could commence once the industry reaches commercial viability in Nova Scotia. This will depend on factors such as the reduction of financial risk associated with making marine renewable energy commercial, government fiscal and financial support, and a competitive price for delivering the electricity generated. Commercial viability will also be influenced by regulatory requirements and environmental advantages associated with marine renewable electricity including emerging policy with respect to the cost of carbon. At the commercial phase, the industry would continue to be regulated and monitored to protect people and the environment. Once technologies have been proven and the tidal and wave industry has matured, a three-stage development process may not be a requirement for all commercial project applicants or all renewable technologies. A staged approach to development will be required, however, while the tidal and wave industries are still in their infancy.

Commercial projects would consist of a long-term lease, production of electricity for commercial use, and a power purchase agreement (PPA) or a self-generation option.

Objectives

- Develop projects and industry that have reached commercial viability

Potential criteria:

- Higher levels of aggregate capacity, possibly designated by different levels (similar to the UK)
- Grid-connected
- Power purchase agreement (PPA)
- Deployment of multiple devices to create an array
- Removability
- Length of project 30-60 years (long-term or renewable lease)

Technologies that take advantage of tidal range such as tidal lagoons and barrages are built to produce electricity at a commercial scale. Some scaling of the plant size and capacity, up or down, to accommodate the site conditions, environmental considerations, economic realities, transmission grid capacity or other factors would be possible, but this type of technology does not lend itself to construction and operation at a small, demonstration scale.

However, a project like this still fits into the framework for development of Nova Scotia's marine renewable energy industry (see section 4.0 above). This type of project would be required to go through a standard permitting and approval process designed for all types of marine renewable energy projects.

(*See Appendix C for a draft potential Project Development and Approvals Process)*

* ***For more detail regarding types of tenures and the permitting process for transitioning between each project stage see Sections 7.0 and 10.0***

PART TWO:

MARINE RENEWABLE ENERGY LEGISLATION & POLICY CONSIDERATIONS

The following sections will examine challenges and issues presented by the development of the marine renewable energy industry in Nova Scotia. Discussion will focus on the following: Social Interests, Economic Interests, Environmental Interests, Occupational and Operational Safety and the Regulatory Model.

5.0 ABORIGINAL INTERESTS

The activities of the marine renewable energy industry may impact the Mi'kmaq of Nova Scotia's Aboriginal and/or Treaty rights, including fishing. Section 35 of the *Constitution Act, 1982* recognizes existing Aboriginal and Treaty rights, including First Nations priority over the marine resource for food, social, and ceremonial purposes (second only to conservation).

The Bay of Fundy region encompasses two provinces: Nova Scotia and New Brunswick. Within this area there are 17 First Nation communities that have fishery access to the Bay of Fundy and its approaches (Atlantic Policy Congress, 2007). In addition to the First Nations who are adjacent to the Bay of Fundy, there are also bands from as far away as Cape Breton Island and northwestern New Brunswick who have fishery access in the Bay. All five First Nation communities in Cape Breton either have fishing access to scallops in the Bay and/or groundfish.

The Province has been consulting with the Mi'kmaq on all major energy projects through the "Energy Consultation Table" under the Mi'kmaq-Nova Scotia-Canada Consultation Terms of Reference (Nova Scotia Department of Energy, 2008b). Discussions at this table are focused on understanding and addressing, where appropriate, potential infringements on Aboriginal and/or Treaty rights. Building a positive relationship with the Mi'kmaq is a key priority for the Province and discussions are ongoing with respect to tidal energy developments in the Bay of Fundy, including the new marine renewable energy legislation.

The Province plans to undertake a Mi'kmaq Ecological Knowledge Study (MEKS) of the entire Bay of Fundy, beginning this year with Phase I, the inner portion of the Bay of Fundy, where current projects are being proposed. The MEKS will provide a clearer picture of historical and current Mi'kmaq use of the area.

The Mi'kmaq have expressed an interest in working collaboratively on the development of Nova Scotia's renewable energy sector. The Government of Nova Scotia is currently undertaking consultations with the Mi'kmaq under these terms and is working with the Assembly of Nova Scotia Mi'kmaq Chiefs on their development of a specific Mi'kmaq Renewable Energy Strategy. It will include an examination of tidal energy among other renewable energy opportunities.

As interest in marine renewable energy projects develops, the Province recommends that proponents engage directly with the Mi'kmaq during the early stages of the project. Best practices for engagement and steps for proponents to follow when engaging with the Mi'kmaq are included in the *Proponents' Guide: Engagement with the Mi'kmaq of Nova Scotia* issued by Nova Scotia Office of Aboriginal Affairs (NSOAA). The guide also recommends proponents to undertake a MEKS, particularly for projects of a larger scope, and identify strategies to avoid, minimize, mitigate or address potential impacts (NSOAA, 2009).The Crown will also carry out its duty to consult on specific projects once they are known.

6.0 PLANNING INTERESTS

The development of marine renewable energy has a range of various social implications as the resource is a public resource and development will affect other marine users and uses. Planning and consideration should be focused on how to sustainably develop the industry while engaging the public and ensuring that an integrated approach to management is established.

6.1 Public Involvement

Public involvement, including engagement will be important aspects of marine renewable energy development. All 'stakeholders' – those who could be affected, onshore or offshore – need to know what is proposed and the consequences, positive and negative, for them, their communities, and for the local environment and economy. Obtaining early broad support and a general understanding from stakeholders eliminates risk for developers, making potential projects more attractive for potential investors. During the development of marine renewable energy projects it will be necessary for government and proponents to consult appropriate stakeholders. Environmental assessments and some permitting processes will already likely require some level of public engagement.

A wide range of tools and techniques could be used for stakeholder involvement. The approach to public involvement should be consistent with the characteristics of specific projects and level of planning required. Selection of relevant stakeholders will also be a part of this process. Approaches to public involvement could include the following levels (ranging from low to high involvement):

- Communications—inform or educate
- Listening—gathering information
- Discuss—consulting
- Engage
- Partner

Engagement policies and procedures will likely be determined by how the permitting process is established through existing and new legislation. For example, currently public engagement requirements differ under federal and provincial environmental assessment legislation. Some federal EAs may not require public engagement as a necessary component of the review process, while the provincial regulatory process includes a mandatory public notification period. Proponents are expected to consult with stakeholders in preparing their environmental assessments (EA). Concerns of the public are considered by the Provincial Minister(s) and federal agencies (in the case of a joint-review being conducted) when making a decision on an environmental assessment.

6.2 Municipalities

The activities of the marine renewable energy industry could have impacts on the local community with respect to land based associated energy facilities or transportation/servicing infrastructure that fall under the jurisdiction of municipalities for appropriate zoning and property taxation. As such, it will be important that municipalities are kept informed regarding new projects or developments in the emerging sector.

Engagement will be an important aspect of municipalities' involvement. The provincial government has recognized this and municipalities that could be potentially impacted by the demonstration facility in the Minas Basin were invited to engage in dialogue during the site development process. In addition, Service Nova Scotia and Municipal Relations will continue to provide advice and will be informed of future projects and developments in the sector that could require municipal involvement.

6.3 Integrated Management

The development and operation of marine renewable energy should take into consideration all users and uses of the marine area. The Government of Nova Scotia recognizes a need to manage and conduct planning practices related to the marine environment that are proactive, adaptive, and collaborative. An approach to integrated management in relation to marine renewable energy should be strategic, providing a sustainable approach to development while addressing competing demands.

Wind, wave, and tidal devices may have impacts on tourism, landscapes, seascapes, habitats and ecosystems, possibly affecting the public and other industries. The implementation of mitigation measures, when necessary, would serve to prevent impacts from affecting areas in which marine renewable energy projects are sited. Many impacts can be minimized through careful site selection. Planning of new installations should consider other coastal functions so as to avoid conflict, preserve tourism, and protect biodiversity, and natural values.

A variety of regulatory mechanisms may be used, tailored to the different uses made of the marine environment. Spatial planning can play a strong role in securing integrated management objectives. During planning exercises, it should be recognized that some marine activities can co-exist in the same areas as marine renewable energy projects. Communication, planning, and management with other departments, Aboriginal groups, stakeholders and the public can also serve to mitigate user conflicts. Without the use of integrated management mechanisms, uncoordinated policies of different government departments and agencies could conflict or work at cross-purposes.

6.3.1 Current Approaches

Under the 1997 *Oceans Act*, Fisheries and Oceans Canada (DFO) has the lead role in the management and stewardship of Canadian marine waters. The Department has responsibility for integrated management activities, marine environmental quality, and marine protected areas. Five large ocean management areas[15] (LOMAs) have been established by DFO with the purpose of implementing integrated management plans. In regards to Nova Scotia, the Eastern Scotian Shelf LOMA has been established and management is guided by the Eastern Scotian Shelf Integrated Management (ESSIM) Initiative. The Eastern Scotian Shelf LOMA does not include the Bay of Fundy and therefore projects in this area are not presided over by ESSIM.

[15] Large Ocean Management Areas (LOMAs) are characterized by: important living and non-living marine resources; high biological diversity and productivity; many stakeholders competing for ocean space and resources (DFO, 2008).

The province has a role in ensuring the sustainability and integrated management of the marine environment and has some initiatives and processes in place that would likely encompass aspects of marine renewable energy. In terms of Crown land usage, the Department of Natural Resources has adopted an Integrated Resource Management (IRM) planning process that considers all potential uses and users (DNR, 2007). Through this process, the department strives to achieve an appropriate balance, recognizing that while many uses can be carried out simultaneously, there are cases where one resource interest may dominate (DNR, 2007).

In 2008, the Government of Nova Scotia adopted the Coastal Management Framework (CMF) which defines a common vision, mission, goals, and strategic thrusts for the government in regard to coastal management. The CMF was developed by the Provincial Oceans Network[16] (PON) to build upon existing provincial and departmental commitments, mandates and capacities, while recognizing the fundamental importance of collaboration with other levels of government, Aboriginal people, stakeholders and interest groups.

6.3.2 Potential Spatial Conflicts

The rise of new uses and potential future uses of marine resources (such as liquid natural gas terminals, aquaculture, wind farms, and wave and tidal generators), together with a rapid growth of shipping and exploitation of non-living resources, could increase conflict among different uses as well as the cumulative impacts of human actions on complex ecosystems.

6.3.2.1 Fisheries Issues

The compatibility of fishing activity with marine renewable energy projects could vary depending on the types of fishing techniques and activities undertaken, and the project size and layout. For example, tidal or wind farms can be an individual or small number of stand alone turbines arranged as an array in lines and columns. The latter will cover relatively large areas and are therefore likely to have the most significant effect upon fishing activity

Vessel anchoring and the use of bottom gear is likely to have the most scope for conflict as power cables and gear present a mutual hazard in terms of damage to gear and cables, and in some cases the safety of fishing vessels. One possible mitigation measure could be to bury cables in the seabed and/or develop cable lanes.

Currently, several organizations including OEER, DFO, and universities are working on research efforts regarding marine renewable energy and fisheries (*see sections 8.1.2 and 8.1.5 for information on other research initiatives*). Information gathered will contribute to the province's approach to strategic and adaptive planning. This will help to ensure that neither industry is negatively impacted by the other. Possible options to mitigate negative impacts on the fishing industry follow:

- **Dialogue and Engagement**
  Before a marine renewable energy project is sited and prior to activities commencing in a given area, potentially affected fishers (Mi'kmaq or non-Native)

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[16] The Provincial Oceans Network (PON) consists of fifteen departments and agencies with a mandate or interest in coastal management.

should be engaged. An early, proactive approach will serve to 1) benefit from industry knowledge and 2) ensure that concerns of fishers are heard and considered. Regulators in the UK recommend that contact between the developer and the local fishing industry be established from the earliest possible time in the planning process (BERR, 2008, 6).

FORCE's in-stream tidal projects in the Minas Basin involved early dialogue between the developer and the fishing community. This has been encouraged during the permitting process.

Other jurisdictions have also acknowledged the importance of dialogue and engagement, creating formal programs and policies. For example, for the construction and operation of offshore wind farms in the UK, BERR has established the Fishing Liaison with Offshore Wind and Wet renewables group (FLOWW)[17] with the purpose of discussing issues arising form the interaction of fishing and offshore activities, share best practices, and develop a common set of standards for marine renewable energy projects (BERR, 2008, p.5).

- **Compensation**

  In cases where fisheries are disrupted, displaced or fishing gear is damaged by a marine renewable energy project, remedies including compensation should be explored. However, given the variation of fishing techniques, no single formula or regional approach is likely to be suitable for all sites (FLOWW, 2008). A wide range of issues may need to be considered in determining value and whether fishing interests have been affected.

  Alternatives to compensation may include mitigation measures such as working with fishermen on the timing of activities and following a well-devised environmental protection plan that prevents incidents or mitigates such occurrences. In the case of displacement, alternative comparable fishing opportunities may also be explored.

  Currently, in Nova Scotia's offshore, the petroleum industry in cooperation with the fishing industry voluntarily established a fisheries compensation scheme for fishing gear or vessel damage resulting from seafloor debris (CNSOPB & CNOPB, 2002). While it is possible that some marine renewable energy projects could present hazards for fishing gear or vessels, the creation of safety zones could mitigate this issue.

  Arrangements for any compensation are generally undertaken between individual fishermen, fisheries organizations, and developers. Determining the appropriate levels of compensation for fishing grounds exclusion issues may be more achievable than trying to define and quantify compensation associated with adverse environmental impacts on fisheries. The complexity of this issue may involve the challenge of addressing the tradeoff between negative and positive impacts of development .

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[17] BERR (2008) has published the *Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW) Recommendations for Fisheries Liaison* which provides best practice guidelines for offshore renewables developers.

6.3.3 Managing Spatial Conflicts

An effective management approach supported by legislation could mitigate possible effects of increased users and uses of the marine environment such as overuse, resource depletion, and spatial conflicts (*see section 2.3 for list of users and overlap*). Determining a clear authority and management procedures to resolve conflicts across sectors and deal with cumulative effects will help to ensure the sustainability of the marine environment.

Governance systems in such settings should pay particular attention to avoiding spatial and temporal mismatches. They should be responsive to local conditions but also pay attention to large-scale processes. Given the various users of the marine environment, a mechanism for deciding whether certain users/uses have priority over certain areas is necessary. *(see Appendix A, p.66 "Priority Rights" for more information).*

6.3.3.1 Safety Zones

The physical presence of marine renewable energy devices may necessitate the need for safety zones (Rodmell & Johnson; OEER 2008). These zones would serve to exclude different types of vessels and activities from entering an area temporarily or permanently during any of the project phases (construction, operations, major maintenance, decommissioning) of a single device or a small array. The creation of a safety zone could limit commercial and recreational fishing, navigation, and other marine activities within the determined area. The impact of a safety zone depends on how large the zone must be to mitigate potential safety hazards.

Although there are currently no standards for determining the need or size of a safety zone, a safety zone has been deemed necessary for the Fundy Ocean Research Centre for Energy (FORCE) demonstration facility in the Minas Basin. In order to mitigate the possibility for project related collisions with other vessels during construction, operation, and decommissioning, a 300 meter radius exclusion area for fishing has been proposed. The proposed exclusion area was intended to address lobster fishing in particular, prohibiting traps from being set within 300 meters of the in-stream tidal devices. The ultimate safety zone will still require further consultation from fishers.

The disruption or displacement of fishing activities due to safety zones is recognized as a significant issue that will need to be addressed. The practicality of undertaking specific fishing activities, as well as navigation and safety issues will influence decisions on whether restrictions or safety zones will be applied to new developments, and if so, the type and extent of the restrictions.

Some marine renewable energy technologies could be compatible with particular types of fishing techniques and activities. Further research, however, is required to determine the appropriate implementation of safety zones and planning mechanisms. Reconciling the interests of fisheries and marine renewable energy development will depend on a range of issues including:

- Determination of impacts from site location and those occurring at each stage of development
- Subsequent determination of fishing exclusion levels
- How fisheries and other stakeholder interests are addressed within the planning and permitting process
  (Rodmell & Johnson)

6.3.3.2 Safety Zone Conditions

In the offshore, it is common practice for oil production platforms to have a 500m safety zone, while commercial offshore wind turbines in the UK are expected to be given a 50m safety zone (Maritime and Coastguard Agency, 2008). However, due to the infancy of many marine renewable energy technologies, data and information is necessary to assess what kind of safety zone is needed, including its size and duration. This may vary by technology and local factors.

The creation and size of a safety zone could be determined on a case-by-case basis by means of legislation. For example, the UK *Energy Act* 2004 provides the legislative basis for establishing safety zones based on an assessment of offshore renewable energy projects' possible impacts on other marine users and uses[18]. The size, timing, and duration of safety zones could also be pre-determined, but as each marine renewable energy project will be unique in terms of location, technology, size, environmental and navigation aspects, and socio-economic issues, a case-by-case method may be the most effective.

Specific provisions for these types of zones would need to be legislated and subject to relevant authorities' approval. Size of the area and duration of the zoning mechanism would need to be determined.

- **Compulsory Safety Zone**
  Legislation would require that safety zones be implemented for all marine renewable energy projects. In this case, the safety zone would be permanent, preventing other activities from entering the area in order to mitigate adverse effects and possible impacts. This approach to safety zones is typically employed in the oil and gas industry.

- **Rolling Basis Safety Zone**
  A safety zone could be established on an as-needed, 'rolling' basis, covering only those areas of the total site in which activities (construction, major maintenance, decommissioning, etc.) are taking place. Once an activity has been completed in a specific location, the safety zone would 'roll on' if necessary to cover the next location within the site in which activity is taking place (UK HSE). Depending on the scope of the safety zone application, the area in which work has been completed would then either revert to an operational safety zone or have unrestricted access for navigation (BERR, 2007, 8).

[18] S. 95 Energy Act 2004. United Kingdom.

Option 1 *Compulsory* safety *zone*	**Option 2** *Rolling basis safety zone through case-by-case assessment*
Pro(s) • Ensures that marine renewable energy project installations are treated in a precautionary manner • Initially, may be less administratively burdensome because developers will not need to apply for a safety zone Con(s) • May not be necessary depending on current activities conducted, impacts on other users and/or project development stage • An established safety zone will likely require monitoring and a compulsory requirement for safety zones could mean that more safety zones are put in place, requiring more monitoring	Pro(s) • Does not prevent activities of other users unless fully necessary • Provides for an effective and efficient use of the mechanism Con(s) • May be more resource intensive to review applications and provide permits • Some areas or activities that should require a safety zone may be overlooked, therefore putting all potential marine users at risk

7.0 ECONOMIC INTERESTS

The development of marine renewable energy in Nova Scotia presents various opportunities for economic benefits for communities and the region. Although benefits arising from the commercial viability of projects are still some time away, there is still the possibility of some economic opportunities during the early, experimental stages of development. It is important that development of the renewable resource is done in a strategic manner to ensure public benefits in the form of greenhouse gas reductions, a clean energy supply, and economic opportunities.

In terms of economic development and interests, growth in the marine renewable energy sector could allow the province to address government priorities and commitments including those detailed in the *Renewable Electricity Plan*. As the sector develops and grows, economic benefits could become viable, but achievement of benefits will present challenges that will need to be addressed. Potential economic benefits include:

- *Positive impact on local communities*—Coastal communities adjacent to marine renewable energy development could potentially benefit through direct access to the resource through municipally or community owned entities or investment funds and/or encouragement of community-scale technology development if a strategy for these types of mechanisms is implemented. The recently established *Renewable Electricity Plan* provides several policy tools to support community-based renewable electricity projects and could help to accelerate the development of projects in coastal areas.

- *Knowledge and job creation*—Construction, operation and maintenance of marine renewable energy projects will require skilled labor. A diverse range of expertise will be required for all jobs involved with the marine renewable energy industry directly or indirectly.

- *Trade/export potential and environmental credit*— From an energy policy/strategy perspective, the renewable electricity needs of Nova Scotia should be met before offering public supplies for export. However, Nova Scotia's demand for electricity varies widely with much less energy required in summer months. This may lead to opportunities to export surplus marine renewable energy to the regional grid when prices are attractive and Nova Scotia's renewable-source electricity needs are met. Exporting also may be necessary in order to maximize the economic viability of all forms electricity, including marine renewable energy. Additionally, if greenhouse gas emission credits have more tangible value in the future, environmental credits that may accrue from electricity generated from these facilities could become economically valuable.

- *Taxes and Royalties (Municipal, Provincial and Federal)*—Collection of royalties or taxes from generation facilities could benefit the public. Royalty levels would need to be such that development remains commercially viable throughout its lifetime, bearing in mind that the risk in such arrangements remains with the developer/operator (Enterprise and Culture Committee Scotland, 2004).

- *Eco-Tourism*—There is an increasing interest in new technologies and these new marine renewable energy devices and arrays could become tourist attractions.

In order to allow some of these potential economic benefits to become a reality, regulatory processes could be created to ensure that benefits from commercial-scale marine renewable energy development accrue to the public of Nova Scotia. Furthermore, strategic leasing, licensing, and permitting processes of the province's natural resources would ensure that development is sustainable and does not adversely affect other marine industries or uses.

7.1 Electricity Issues

Before economic benefits can begin to be achieved strategic planning and actions will need to be taken to address transmission and market access challenges. While the creation of marine renewable energy legislation may not directly address these issues, it should be recognized that an adaptive approach to developing a renewable electricity market may be required.

7.1.1 Long-term Power Purchase Agreements

Long-term power purchase agreements (PPA) for marine renewable energy projects are viewed as one of the most critical, and often most complicated component of any type of renewable energy project. For developers, PPAs will likely be a necessary part of securing equity and debt-financing, as they secure a long-term revenue stream for projects.

Currently in Nova Scotia markets, developers have three options for selling electricity generated from marine renewable resources—Nova Scotia Power Inc. (NSPI), municipal electric utilities, or export. During the early stages of the industry when projects/technology are being demonstrated, electricity generated from marine renewable energy resources may be more costly than electricity produced from traditional fossil fuels like coal and oil. However, to achieve important policy goals that protect Nova Scotians from the volatility of fossil fuel prices, electricity from these projects could be purchased by NSPI, contributing to the legislated Renewable Electricity Standard (RES) target. As the sector matures it could play an even larger role towards meeting the RES.

Until marine renewable energy becomes more cost effective, it is unlikely that the six municipal electric utilities would purchase significant amounts of it for their electricity supply. Additionally, municipalities would only represent small markets (< 40MW). In regards to the current price of energy, a higher price per kilowatt hour for a PPA would likely be required. Therefore, exporting provides a potentially more attractive option as the electricity costs in the US are significantly higher. However, this option also presents challenges in terms of transmission costs and existing grid capacity.

7.1.2 Transmission and Grid Capacity

The transmission and use of marine renewable energy is currently challenged by the existing transmission system. As marine renewable energy resources are intermittent, backup energy sources are needed if the renewable energy supply is unavailable. The need for backup power limits the ability to add new intermittent renewable energy (Nova Scotia, 2009).

A stronger grid in Nova Scotia would increase the capacity for variable sources like wind and tidal energy. The 2009 *Energy Strategy* and *2010 Renewable Electricity Plan* recommended that a transmission system operator study be conducted to help enhance renewable energy opportunities in Nova Scotia.

In order to use marine renewable and other renewable energy resources within the province to meet the 2013 and 2015 Renewable Electricity Standard (RES) requirement[19], a modest investment in transmission capacity and additional load management techniques may be required. To move beyond the 2013 standard large investments in Nova Scotia's transmission system will be required. New lines will be necessary to serve remote locations. More capacity is also required to move electricity throughout the province.

New and strengthened ties also mean that clean energy from marine renewable resources could be sold into the regional grid when there was a surplus. As it stands now, Nova Scotia's grid only has a 350 MW connection with New Brunswick which is currently not enough capacity to support the exporting of electricity. A robust interconnection with our neighboring provinces is critical (Nova Scotia, 2009).

This issue has been identified and addressed in the *2009 Energy Strategy*, "Green Grid Initiative" *and 2010 Renewable Electricity Plan*. It will take significant planning, resources and commitments before the grid will be ready for exporting marine renewable energy.

7.2 Regional and Community Opportunities

Marine renewable energy development has the potential to produce significant financial, environmental, and social benefits to local communities and the province as a whole (more significantly once reaching commercial viability). It is also possible that adjacent coastal communities will be impacted by development (i.e. construction, changes in landscape, etc.). Compared with many other forms of development (like new housing or commercial buildings), the benefits of marine renewable energy tend to be much less concentrated in the area around the development (BERR, 2007). For example, the benefits of reduced greenhouse gas and the contribution of renewable energy to improving the security of energy supplies are nation- and province-wide (BERR, 2007).

As the people of Nova Scotia and specific coastal communities will be affected by marine renewable energy development, it is important that options for routine and systematic benefits are considered. This will not only be important for providing opportunities to communities, but also for the growth of the industry. In other renewable energy sectors, such as wind, jurisdictions that have made provisions for communities to accrue benefits have demonstrated higher rates of deployment than places that do not have benefit systems in place (DTI, 2005).

[19] The Province's 2011 RES requires an additional 5 per cent of total supply of post 2001 to come from renewable energy sources. The 2013 RES requires an additional 5 per cent of total supply post 2001, for a total of 10 per cent of energy coming from renewable energy sources. The new RES target requires 25% renewable electricity by 2015.

The benefits from marine renewable energy development in Nova Scotia that could potentially be considered or may arise within local communities include:

- The use of locally manufactured content
- The use of local contractors during construction
- Buying shares or other investment opportunities for local residents and businesses
- Potential involvement in the development process by local landowners, groups, or individuals
- Land rental to the local landowners (for onshore facilities/operations)
- Local community facility improvements
- Lump sum or regular payments into a fund for the benefit of local residents
- System of royalties or financial incentives
- Employment of local people in the operation and maintenance of projects
- Improvements to local environment and wildlife habitats
- Visitor centers and tourist facilities
- Education visits and school support

An approach to regional and community benefits will need to balance the economic viability of the industry with its impacts on coastal communities and the region. Overall, legislation will need to address benefit options that are suitable within the Nova Scotia context and provide for the well-being of communities.

Many of these benefits can not be realized until marine renewable energy reaches commercial viability. During the early stages of the marine renewable energy industry, it may not be economically viable to implement a community benefits system. However, the Department of Energy recognizes the value in addressing and establishing community and economic benefits for marine renewable energy in the 2009 *Energy Strategy,* the formal response to OEER's SEA, and the *2010 Renewable Electricity Plan*.

The Province has been committed to ensuring regional and community benefits from energy projects as demonstrated by voluntary offshore energy agreements (OSEA) for large-scale offshore projects. OSEA's can include features such as employment commitments, industrial benefits, royalties, and research and development funding. They are strategic as they take into account the circumstances of each project and the stage of the industry at that time. A similar approach could be implemented for large-scale marine renewable energy. The creation of a voluntary contract agreement for "locally-sourced" benefits would not likely violate trade agreements that include Nova Scotia. In the more immediate term, the *Renewable Electricity Plan* provides for a feed-in-tariff price-regime for small-scale tidal arrays for community-based projects. This will help ensure benefits from local projects accrue directly to communities.

7.3 Project Development—Licensing and Leasing

Marine renewable energy is a public resource. Currently, there is not a system in place to license/permit energy extraction or ensure that the public receives benefits from its exploitation. The development of legislation could support land and energy resource tenure systems. Licensing of the marine renewable energy resource and leasing of the land would provide the proponent with rights and access to the resources. The granting and administration of tenure would enable proponents to progress from exploration to production following identification of suitable marine renewable resources. The tenure framework for licensing of the energy resource and leasing of the land could also enable incentive and compensation mechanisms such as royalties to be established. Economic instruments such as incentives, royalties and rentals could be applied according to a projects stage of development and productivity.

7.3.1 Licensing and Permitting for Energy Extraction

Although marine renewable energy is viewed as a sustainable resource, extraction of large amounts of energy could potentially impact the marine environment. A licensing and permitting system would serve to put limits on the amount of energy that can be safely extracted from marine renewable resources. It would also establish the precedent for the possibility of a royalty scheme to be considered in the future when projects reach commercial viability and are receiving profits.

The granting of resource tenure would provide the industry with certainty as to the rights and obligations granted by the administering body (e.g. department, agency). Project developers would be required to apply for a license according to the proposed project scale (including amount of energy they plan to generate with a tidal, wind, or wave project). A license would allow for provisions making it possible to suspend energy extraction if the amount of energy generated was producing cumulative effects *(See section 8.1.2 for more information on resource extraction and limitations).*

7.3.2 Leasing of Crown Land

Submerged lands (the sea bed) along the Province’s 9,000 km of coastline are considered Crown Land and are currently under the administration and control of the Minister of Natural Resources. Exceptions would include federally owned land and privately owned waterlots (NSDNR, 2009). Crown land is a finite asset which we strive to use effectively for the good of all Nova Scotians. As such, new marine renewable energy developments will need to be licensed for a variety of economic purposes to help build and maintain the prosperity of the Province (NSDNR, 2009).

Marine renewable energy developers have approached the province with their interests to examine the potential for marine renewable energy development (tidal lagoon, in-stream tidal) on submerged Crown land. Securing rights to Crown land plays a significant role in the growth of the marine renewable energy industry as uncertainties about resource values at various sites and the use of new technologies present investment risk.

7.3.2.1 Land Issuance Issues

The type of permit, lease or license required for a developer to establish and operate a marine renewable energy project will be dependent on the land use required. Some forms of tenure provide for exclusive, intensive use of the land and would require legal survey. Other tenure forms are non-exclusive, offering lesser rights at lower costs for licensing or permitting (Vold & Sranko, 2006). The term of a lease would also be dependent on land use and the project objectives and goals. Currently, there are several types of land issuance being employed by other marine renewable energy jurisdictions illustrated in the table below:

LAND ISSUANCE OPTIONS					
Issuance Type	**Land Use**	**Project Development Stage**	**Term/ option to renew**	**Rights**	**Jurisdictions currently using approach**
Exemption	Testing of technology only, not intending to proceed to other stages	Prototype/ Demonstration or possibly micro-scale	18 months No option to renew	Non-exclusive	*US*-Verdant Exemption
Exploration permit/ license	Access for inspections, analysis, etc.	Investigation	Max 2 years No option to renew	N/A	*British Columbia* (suggested approach)
Pilot license	Testing new technologies	Demonstration/ Prototype	5 years	Non-exclusive	*US FERC* – Pilot License
License of occupation	Where minimum improvements are required OR As interim tenure during construction or demonstration before moving to lease	Investigation for Pre-commercial Commercial	Ranges from 3 – 10 years	Non-exclusive or Exclusive	*British Columbia* – License of Occupation *US FERC* – Preliminary Permit
Lease option	As interim tenure to obtain relevant statutory consults and meet development milestones leading up to deployment ** may be prerequisite for commercial lease*	Investigation for Pre-commercial Commercial	3-5 years (may also be dependent on milestones declared in development plan)	Exclusive	*US MMS*-Interim/Term Lease *US FERC*-Conditional license *UK* – Lease option agreement *Ireland* – Foreshore Commercial License
Lease	Access and operation rights, but no distribution of electricity for commercial use ** may be prerequisite for commercial lease*	Demonstration Pre-commercial	1-7 years Possibility of renewal	Exclusive	*UK* – Lease *US MMS* – Limited lease
Commercial Lease	Development, access and operation rights to produce electricity for commercial use and sale	Commercial	Ranges from 25-60 years	Exclusive	*Ireland*-Foreshore Commercial Lease *US FERC*-License *US MMS*-Commercial lease *UK* – Commercial lease (proposed)
NOTE: The information in this table is representative of licensing processes established up to April 2009.					

A strategic approach should be taken in designing the land lease and license framework in order to provide balanced promotion and regulation of marine renewable energy projects. As the province has determined that a staged approach to project development will best suit the needs of developers and growth of the industry, the approach to land issuance should support the staged development accordingly. There are a number of issues concerning land issuance that should be addressed, particularly for commercial projects. A summary of these issues and options can be found in *Appendix A.*

7.3.3 Economic Instruments for Efficient Resource Tenure

Linking financial terms and mechanisms to the allocation of resource and land tenures creates legitimacy in the licensing and leasing process and allows a resource agency/department to address the use of public resources (Dhanju & Firestone, 2009).

Monetary instruments such as incentives, royalties, and rents could be applied strategically at different stages of marine renewable energy project development to advance the industry and provide benefits to the public and local communities. For example, incentives such as tax credits or feed-in tariffs (FIT) could be available for demonstration or pre-commercial projects, while a royalty scheme could be applied to eligible commercial projects. A FIT covering marine renewable energy technologies has been established under the province's Renewable Electricity Plan. (*See section 7.3.3.2 for more details*).

7.3.3.1 Royalties

The implementation of royalties is directly related to the future economic success of the marine renewable energy sector. If development of marine renewable energy resources remains at a small scale, incentives/subsidies could be strategically applied to support the industry.

Royalties would serve to 1) recognize the marine renewable energy resource as belonging to the public and 2) acknowledge that the development of the resource could impact the public with loss of opportunity to pursue other enterprises on certain areas of ocean space. (*Land rent could also address loss of opportunity and use of public space. See section 7.3.3 for more detail on this subject.*)

When addressing royalties, the Province should monitor the growth and success of the industry in Nova Scotia to determine whether and when royalties are a viable option. As new technologies and markets grow, the province reserves the right to impose royalties for projects (NS Dept. of Energy, 2009). A royalty regime would be structured to ensure projects receive a fair rate of return that attracts investment allowing the owners of the resource an equitable share of the return based on profitability. As the marine renewable energy industry is in its early stages, royalties at this point would not be a reasonable option and it is difficult to determine at this early stage whether royalties will be an option in the future. However, a royalty framework could be established before the industry reaches commercial viability in Nova Scotia to allow companies to calculate profitability.

Recognizing that marine renewable energy projects will have most of their costs front-loaded, a concession or tiered royalty structure may warrant consideration. Under this scheme, royalties would not become payable until a project gets underway and begins to make significant economic returns. Criteria for defining what constitutes significant economic returns would need to be determined.

Regulatory authority would be necessary to set royalty levels. The Province's 2009 *Energy Strategy* commits Nova Scotia to a regime similar to that for offshore petroleum—a profit sensitive regime that encourages private sector investment and risk.

7.3.3.2 Incentives

The licensing of marine renewable energy through legislation could also support the implementation of incentives. A variety of incentives exist that could be applied to encourage and support development of small- to medium-scale projects including:

- *Feed-in tariff (FIT):* A FIT provides developers with a price guarantee for the production of renewable energy. The price guarantee allows developers to cover their costs and earn a return on their investment. The developer would pay for access to the power grid, and in return the grid operator must provide the FIT.

FITs have proven to be successful in generating significant deployment of renewable energy in other jurisdictions such as Germany and Spain (WFC, 2007). They have been regarded as allowing all stakeholders—the public, business, government, etc. to profit from producing renewable energy. FITs can also be modified or customized to support different types of development needs or types of renewable energy projects.

The province has recognized the significant impact incentives can have in supporting and developing renewable energy industries and has recently established a FIT under the *2010 Renewable Electricity Plan* that will cover micro and small-scale tidal and wave projects at the distribution level and developmental (pre-commercial) tidal arrays at the transmission level.

- *Subsidy or Production tax credit (PTC):* Premiums above the wholesale price of conventional power could be set through the tax system to deliver a subsidy to marine renewable energy power producer. This type of incentive generally has the effect of reducing the cost of producing energy from renewable sources and offsets the tax liability of companies based on the amount of energy produced (USDOE, 2008).

- *Investment tax credit (ITC)*: A tax credit supplied to a developer for the cost of investing could help to cover the costs of installation or the cost of a system, such as a tidal or wind turbine. ITCs can be helpful early in the diffusion of a technology, when costs are still high as they directly reduce the investment cost and reduce the level of risk (Sawin, 2004).

- *Grants or Fund creation*: The opportunity to receive grants or funding for the development or deployment of marine renewable energy projects would allow developers to apply for funding for different aspects of project development. The ultimate intent would be to help reduce the capital cost of devices, increase power capture efficiency, and improve reliability.

- *Environmental credits*: Several types of environmental or “green” credits exist that can incentivize carbon-neutral renewable energy. Renewable Energy Certificates (RECs), Carbon Offset Credits (COCs) and similar “green” credits typically provide a production subsidy to electricity generated from renewable energy sources.

7.3.3.3 Lease Rentals

The existence of quality differences across ocean areas implies that ocean space with the right qualities for marine renewable energy projects may be a scarce natural resource (Hoagland, 2007). Ocean space for projects and development may also have value for other uses such as commercial fishing, aquaculture, environmental conservation, and shipping. Consequently, there may be significant opportunity costs from a decision to allocate ocean space for renewable energy development (Hoagland, 2007).

Therefore, Crown land leased for marine renewable energy production could be subject to various terms and conditions including rental rates (with rate factors to be determined). The amount of a rental rate charged and the method for calculating rental acreage would need to be determined. Typically Crown land lease rental rates are determined by appraisal, current market conditions, projected income, or set based on regulatory objectives. The rental formula would need to take into account factor similar to those considered for royalties—a system that would encourage development while securing a fair rent for the use of Crown land.

There are several other factors affecting rental rates that should also be considered such as whether buffer zones will be needed and how to financially and spatially account for them, the possibility of single device projects evolving to arrays and therefore needing more space, and overall the appraised value of the site. Options for allocating leases and rental rates include rent based on acreage, a seabed footprint only or a tiered system to account for future project development.

- **Rental rate administered based on acreage**
  Following the offshore oil and gas model, a fixed or variable rental rate (if certain areas of ocean space are appraised to be more valuable) could be charged per acre of the lease. In the US, the MMS proposed that rental rates of $3 to $5 USD per acre be charged for commercial leases. This is below the current prevailing rates for oil and gas (MMS, 2008, 39380). The underlying value of the project's acreage is thought to be less affected by an alternative energy project than it would be for an oil and gas project.

- **Rental rate administered on seabed footprint only**
  A rental rate including only the seabed footprint of operating devices could be established. However, devices that require buffer zones for effective operation and energy production may need a larger leased area with exclusive use.

- **Rental rate administered based on adaptive approach**
  A tiered, adaptive approach to seabed rentals could be implemented to accommodate the phased project development approach. In this sense, developers who submit development plans that include eventual deployment of arrays could apply for acreage to accommodate future use. Rental rates for current project needs could take effect, while lease land not currently being used may be given a lower rental rate until the project has matured into those areas. The intricacies of this approach would require development and management plans and timelines to be strictly adhered to and complied with by developers.

Option 1 *Rental administration based on acreage*	**Option 2** *Rental rate based on seabed footprint only*	**Option 3** *Rental rate based on adaptive approach*
Pro(s) • Provides assurance in terms of guaranteed space for future project development (if planned for in advance) Con(s) • Could be costly for developers that are intending for their project to grow in size, but begin only using a small area for a demonstration device	Pro(s) • Provides more non-exclusive use area for other marine users Con(s) • May not be the most effective for future project development and planning • Would only be adequate for projects that do not require a buffer zone	Pro(s) • Provides developers with flexibility • Allows for ease of future project development Con(s) • Creating and managing an adaptive rental rate approach could be more administratively challenging for the developer and regulator

7.4 Future Opportunities

The future of energy technology will play a significant role in the growth of the marine renewable energy industry and the benefits accrued to the public. Once marine renewable energy technologies are proven for reliability and survivability and efficient and effective technologies are determined, manufacturing of the technologies may become more cost effective. This could lead to more developers interested in the industry and subsequently, more projects.

The strengthening of the transmission grid and ability to store energy from intermittent sources could allow for increased use of renewable energy sources and technology. The evolution of a smart grid is thought to increase reliability and further develop economic opportunities.

The variable nature of marine renewable energy can be mitigated to some extent by various energy storage technologies, but at an increased cost. However, being able to provide this energy during peak use periods will increase its value. There are emerging technologies, currently subject to high capital costs, such as batteries, compressed air storage systems[20], and high-speed flywheels[21] that may help some intermittent power producers store energy for later use. As it becomes easier and more cost-effective to integrate marine renewable energy with the current energy mix in Nova Scotia, regional and community benefits will grow in value.

[20] Compressed air energy storage (CAES) systems pump air into underground formations, such as depleted gas wells or salt caverns, using a natural gas-powered machine. The pressured air is released later to drive a turbine to make electricity. CAES can be used to store energy at low demand periods for used in meeting periods of high or peak demand.

[21] A high-speed flywheel works by accelerating a rotor (flywheel) to a very high speed and maintaining the energy in the system as rotational energy. The energy is converted back by slowing down the flywheel.

8.0 ENVIRONMENTAL INTERESTS

The development of marine renewable energy projects will require us to ensure that there are no adverse environmental effects. It will be important that provincial and federal governments have processes, mechanisms, and personnel in place to conduct environmental reviews in a coordinated and cohesive manner. This would ensure that any potential impacts are addressed and mitigated effectively, providing the industry with more certainty regarding regulatory processes. Regulatory responsibilities and protocols should be coordinated for providing efficient and effective environmental assessment, monitoring, and compliance and enforcement systems.

8.1 Environmental Benefits and Impacts

The range of benefits and impacts created by the generation of marine renewable energy will differ depending on project location. As such, it is not possible at this stage in the development of the industry to determine exactly what the benefits and impacts will be. Following are a range of selected environmental benefits and impacts that could result from marine renewable energy projects:

Possible Environmental Benefits

- Contribution to reducing greenhouse gases
- Production of clean, green energy (commercial development has potential to displace over 1 million tons of greenhouse gas per year in Nova Scotia[22])
- Emission and pollutant free during operation of devices and energy generation
- Increase in available three-dimensional habitat for benthic species
- Refuges for fish (Scottish Environment Link, 2008; MBA UK, 2007)

Possible Environmental Impacts

- Disruption of currents, waves, substrates and sediments
- Habitat alteration (marine, terrestrial and avian)
- Impediment to animal movement and migration
- Landscape and seascape obstruction (aesthetic)
- Electric and magnetic fields
- Noise (airborne and underwater)
- Navigation
- Collision and strikes
- Changes in water quality

Some of these impacts also have the potential of affecting other users of the marine environment such as the oil and gas industry, fisheries, shipping and tourism. Mitigation of some of these impacts could be achieved through research and planning. Environmental impacts at various stages of project development (planning, construction, operation and maintenance, decommissioning) should also be considered and

[22] Nova Scotia emits approximately 24 million tons of greenhouse gas per year (Environment Canada, 2004).

addressed through environmental assessment, monitoring and compliance and enforcement mechanisms.

8.1.1 Resource Extraction and Limitations

It will be necessary to establish appropriate limits on the amount of energy extracted to ensure there are no adverse environmental effects on the area surrounding – or at distance – from the facility. Extracting substantial quantities of energy from the ocean could have far reaching effects on the area surrounding an energy facility. Potential impacts include a reduction in water velocity, wave height, and water surface elevation (USDOE, 2008).The magnitude of these impacts will depend on the chosen technology and the number of devices (USDOE, 2008). Changes in current velocity could affect water temperature, marine life, weather, transportation, and deposition of sediment, estuaries, inlets and bays.

The Jacques Whitford background report prepared for the Bay of Fundy SEA suggested that in-stream tidaldemonstration projects in the Minas Passage will have limited effect on current velocity. However, a commercial scale project that reduces the kinetic energy by more than a few per cent could have significantly larger effects (2008).

Several research initiatives are underway to address the effects of marine renewable energy extraction and will help to inform future development and policy-making. Recently, OEER held a "Workshop on Hydrodynamic Modeling in the Bay of Fundy." High priority areas for research were identified including resource assessment (optimizing energy extraction and definition of available power), far-field effects, and sedimentation. Following this workshop, OEER intends to award funding specifically for hydrodynamic modeling in these three targeted priority areas. (*See Section 8.1.4 for more detail on current research).*

As some uncertainty exists regarding the acceptable level of energy extraction, it is important to recognize that set limits and quantifiable targets cannot be firmly set to guide developers' use of the ocean resource (Jacques Whitford, 2008). However, an incremental approach to development would allow for careful monitoring and evaluation of marine renewable energy extraction.

8.1.2 Cumulative Effects

The concept of cumulative environmental effects recognizes that the environmental effects of individual human activities can combine and interact with each other. This can cause aggregate effects that may be different in nature or extent from the effects of the individual activities. Ecosystems cannot always cope with the combined effects of human activities without fundamental functional or structural changes (CEAA, 2004). Identification and management of cumulative effects is important in the aquatic environment, where developments may have off-site implications that need to be mitigated before projects proceed.

Cumulative effects assessment is now a required component of many regulatory environmental assessment regimes such as the *Canadian Environmental Assessment Act* (CEAA). Under current legislation, a cumulative impact assessment has to identify, describe, and evaluate the cumulative effects that are likely to result from a project in combination with other projects and activities that have been or will be carried out in the foreseeable future. It will also need to address potential impact of plans and projects in all sectors not just marine renewable energy. Cumulative effects assessment requires developers to consider the following type of information:

- Existing completed projects
- Approved but uncompleted projects
- Ongoing activities (i.e. discharge permits, fisheries)—these may or may not require formal consent
- Plans or projects for which an application has been made and are under consideration by the permitting authorities
- Plans or projects which are "reasonably foreseeable" (i.e. future developments that are being planned).

It is important to recognize that in the early stages of project development where only a few small devices are being tested, adverse effects and environmental impact will likely be low. However, as the industry develops and more devices are employed, there is a risk of adverse effects increasing (SDC, 43).

Assessing cumulative environmental effects will be a critical aspect of ensuring that marine renewable energy development does not adversely affect the marine ecosystem. At present, the province has limited experience with cumulative effects assessment using the current environmental regulatory tools and the federal government has conveyed the possibility of capacity issues presented by future industry growth. In order to address cumulative effects assessment and mitigation measures effectively and consistently, a process will be required that satisfies the regulatory requirements of both provincial and federal governments. The development of a regulatory model under marine renewable energy legislation could serve to address these resource needs and establish a consistent cumulative effects assessment process.
(See section 11.0, p.55 for more discussion regarding the development of a regulatory model and possible options).

8.1.3 Monitoring

Due to the many unknown effects of marine renewable energy at this time, monitoring of deployed devices and their operations will be very important. A marine environmental monitoring system is a component of an environmental management system comprised of a range of activities to document information on existing conditions. The ultimate goal of a monitoring program will be to protect the natural environment, human health and natural resources. Monitoring will also contribute to determining technology and project viability.

Environmental monitoring should be implemented within the staged approach, assessing the impacts of a project as it moves through each development stage. Developers would conduct audits of their operations and submit results to government for review. As a project progresses, monitoring should be adjusted to reflect the number of devices, the amount of energy being extracted, environmental effects and cumulative effects. Monitoring of marine renewable energy projects at all development stages has the following objectives:

- Determines compliance, ensuring that activities are carried out in accordance with regulations and permit requirements
- Verifies models, checking the validity of assumptions and predictions
- Assesses trends, identifying and quantifying longer-term environmental changes

- Obtains a better understanding or appreciation of environmental health in response to resource use
- Enhances knowledge of ecosystem variability, impacts from human activities, and potential socio-economic impacts

There are a number of issues concerning environmental monitoring that should be addressed:

- **Cost**
  Monitoring costs can become barriers to entry when developing a new industry. The cost of each type of reporting will need to be weighted against its importance in achieving the goal of environmental monitoring.

- **Responsibility**
  Responsibility for developing a monitoring program that can encompass the different stages of marine renewable energy development and provide insight will need to be determined. Deliberation will need to go towards which regulatory bodies—provincially and federally—will have responsibility for analyzing monitoring data.

- **Data**
  Data produced from monitoring efforts will be needed for developers to determine the efficiency and effectiveness of the technology deployed. However, at certain project development stages, particularly the developmental/ small array (pre-commercial) stage, data will be needed to inform regulators and relevant authorities about environmental impacts and cumulative effects. Furthermore, it will serve to aid decision-making concerning whether a commercial development project is feasible and what types of environmental effects might be possible.

  As data is an aspect of monitoring that is critical to everyone's understanding of the industry's feasibility and growth in Nova Scotia, consideration will need to go towards ownership and confidentiality of data. It is imperative that a balance is achieved between the needs of government and the privacy of industry. Deciding levels of confidentiality and ownership rights may be hinged upon agreements and models relating to monitoring costs and responsibilities. For example, Nova Scotia's off-shore petroleum industry has a number of regulations in place to safeguard confidential data.

- **Environmental baseline**
  The interpretation of data gathered by monitoring may be dependent on setting an environmental baseline and baseline needs. This will allow for environmental impacts of marine renewable energy devices to be more accurately determined. Due to the variability and lifecycles of marine ecosystems establishing an environmental baseline could be very challenging. The baseline in the marine environment is continuously changing due to uncontrollable factors like climate change (Scottish Executive 2007). Historical data is often used to determine an environmental baseline however for many areas this data in incomplete or not available.

- **Environmental impact measurement**
  In the event that changes or impacts occur in the marine ecosystem subsequent to the deployment and operation of marine renewable energy devices an assessment methodology will need to be implemented to measure those effects. The methodology will need to determine whether the impact or change is a significant impact initiated by a marine renewable energy device or a natural occurrence. Effective measurement mechanisms will likely require the creation and adoption of indicators.

- **Timing and frequency of monitoring**
  Consideration will need to go towards how often monitoring is conducted in order to produce data and results that will be useful for developing and managing the marine renewable energy industry.

8.1.4 Research

Many of the environmental uncertainties presented by marine renewable energy devices and projects are currently being addressed through local, regional, and national research initiatives.

In Nova Scotia, OEER has a research objective to assess the potential impacts of renewable energy technologies (ocean currents, wind, tides and waves) on the marine environment. OEER will be using $2 million from a recent provincial grant (part of the Crown Share Adjustment payment) for research work.

Research activities by several government agencies (DFO, NRCan) and other organizations have been underway and more will be commencing. In order to coordinate research activities, OEER's Research Advisory Committee (RAC) has supported the creation of a research network—the Fundy Marine Energy Research Network (F-MERN). The network will serve to effectively coordinate research and target research funding.

On a national level, the Canadian Marine Energy Research Network (C-MER) has been established to coordinate marine energy research nationally and internationally. It involves participants from Canadian universities, electric utilities, the marine energy industry, federal research labs, and provincial and federal government departments

The result of these research initiatives and future research activities will serve to address current challenges and environmental and technological uncertainties presented by marine renewable energy. They will also provide valuable data that will help to inform regulators and determine whether current and future regulatory processes are effective.

See section 11.0 for more discussion regarding environmental regulation issues and responsibilities.

9.0 OCCUPATIONAL AND OPERATIONAL SAFETY

The complexity and uncertainties of the marine environment pose new challenges for operational and occupational health and safety. It is vital that developers ensure that they place adequate emphasis on understanding and mitigating health and safety risks associated with the uniqueness of Nova Scotia's marine environment. The emerging nature of the marine renewable energy industry means that there is a great variety in devices under development and their installation and maintenance requirements are being determined on a continuous basis. Health and safety guidance should be specific enough to give an adequate level of protection and also flexible enough to allow innovative ideas to be developed (BWEA, 2008, 4).

The occupational hazards associated with marine renewable energy projects include hazards arising from:

- Construction and major repair: installation and mounting of devices, laying of subsea cables, operation of jack-up barges and associated lifting operations during tower and nacelle[23] erection (offshore wind)
- Operation (maintenance and minor repair operations): primary issues are access and egress (frequent personnel transfers between boats/construction vessels/towers), working at height, emergency response, and if some distance from land-helicopter movement
- External hazards such as collisions from marine and aviation activities (Department of Defense, Civil Aviation Authority, Coast Guard, Transportation and Navigation)

Safety issues at the various stages of development will need to be considered, including:

- Site development and planning
- Design, specification, manufacture and assembly
- Construction, commissioning
- Operation and maintenance
- Decommissioning

9.1 Monitoring

The working environment should be monitored for occupational hazards relevant to the specific project. Monitoring should be designed and implemented by accredited professionals as part of an occupational health and safety monitoring program.

In order to check that health and safety standards are being achieved in practice, it will be necessary to measure performance against pre-determined plans, standards. and procedures. The types of systems that can be used to monitor health and safety performance can be categorized into pro-active and reactive systems. Proactive systems monitor specific objectives and report results on a routine basis. Reactive systems can identify where health and safety standards are not being met and report and analyze failures (BWEA, 2008, 11).

Monitoring and inspections of the health and safety aspects of marine renewable energy projects at all development stages has the following abilities:

[23] In a wind turbine, the nacelle refers to the structure that houses all of the generating components, gearbox, drive train, etc.

- Enables developers and regulators to maintain and develop their ability to manage risks effectively
- Identifies inadequate performance and allows for appropriate remedial action
- Identifies whether health and safety systems have deteriorated or have become obsolete and need to be updated (this is very important considering emerging technology and uncertainties regarding the industry)
- Assesses compliance to procedures, rules and risk control
- Identifies the immediate and underlying causes of events

See section 11.0 for more discussion regarding safety regulation issues and responsibilities.

10.0 ALLOCATION OF RIGHTS

As the marine renewable energy industry develops, it is essential that the system of allocating rights in terms of land, approvals, and permits works consistently and in a way that gives confidence to the developers, investors, and the public. Currently, there is not a straightforward, generally applicable route to obtaining rights for marine renewable energy projects at each stage of development. Legislation would provide a basis for ensuring that rights are allocated in a fair and transparent manner, taking public benefit into consideration.

During the early stages of the industry, a fair, equitable, and competitive process to choose proponents is required when public funding is at stake. In future circumstances policy decisions will be necessary to determine the exact process for allocating rights for demonstration and pre-commercial projects. As the industry matures and technology becomes commercially viable, a clear process for awarding valuable commercial public rights will be integral for moving the industry forward.

10.1 Permitting and Approval Requirements

The development of marine renewable energy resources would require a permitting and approvals process that would include leasing or licensing of land, licensing of the energy resource, and permits or licenses from applicable statutory authorities.

10.1.1 Current Permitting and Approval Process

The current process for developers planning to deploy marine renewable energy devices requires that a developer acquire statutory permits and approvals from relevant federal, provincial, and municipal authorities before commencing construction or operation of marine renewable energy projects *(see section 2.1, p. 10 for list of current legislation that may trigger permits or authorizations*). This includes the possibility of an environmental assessment or screening depending on the aggregate capacity of the project (2 MW or more requires a provincial EA) or the triggering of federal legislation. Developers must also get the agreement of the land owner which could be federal or provincial government (or possibly a private landowner) for a site license or lease. A lease agreement allows developers to conduct necessary planning activities and acquire statutory permits. Federal and provincial authorities would need to determine ownership of the land, which could be challenging and resource intensive (see Section 2.1.1).

At this time, proponents interested in developing a project must meet with a One-Window Standing Committee consisting of key federal and provincial regulators and government departments.[24] While this Standing Committee helps to ensure that the regulatory process is coordinated and efficient, proponents are still required to submit an application for project development to each of the regulators (and other applicable regulators not on the Standing Committee if required by project specifications).

[24] The One-Window Standing Committee consists of the following departments: Natural Resources Canada, Environment Canada, Fisheries and Oceans Canada, Canadian Environmental Assessment Agency, Transport Canada, NS Environment, NS Labour, NS Energy, NS Fisheries and Aquaculture, and NS Department of Natural Resources

Therefore, multiple permits and approvals may be required that are subject to different evaluation and decision-making processes depending on the level of government and department. This could result in duplication of efforts and uncoordinated decision-making. As the industry grows, this could lead to inefficiencies in the permitting process.

10.1.2 Future Permitting and Approval Considerations

The creation of new legislation for marine renewable energy presents an opportunity to establish a permitting process that is more consistent and predictable for the proponent. It could also serve to coordinate and integrate the necessary permits and approvals of applicable government departments and agencies.

The scale and location of a project will determine the type of data, permits, and stakeholder engagement required. Statutory permits ensure that development decisions are made on the basis of a comprehensive balanced consideration of impacts, both positive and negative.

A conditional license or lease could be granted to allow a developer to complete studies for project planning and for obtaining permits/approvals. Once all permits are granted, the developer could then receive a full lease (demonstration or pre-commercial project) or commercial lease. This two-step tenure process is administered by the UK, Ireland, and the US and it has been suggested for use in British Columbia. It is also representative of Nova Scotia's *Tidal Policy Framework* for industry initiated test and commercial sites.

10.2 Process for Awarding Rights

Although a process has been established for the permitting of marine renewable energy projects,[25] Nova Scotia currently lacks a strategic system for awarding rights to proponents. A process for awarding development rights at each defined project stage will need to have mechanisms that consider the long-term growth and sustainability of the industry. Initially, for demonstration and developmental/pre-commercial projects, the process may not need to be comprised of a strictly competitive process. However, as projects move towards commercialization, mechanisms should be in place for ensuring a fair and transparent process for awarding developer rights.

At this early stage in the development of the industry, potential issues that may inhibit optimal development are unclear. It is therefore important to consider carefully the design of the process for awarding rights and allocating sites, so as to ensure the best chance of encouraging a pattern of development which allows optimal exploitation of the resource in an environmentally responsible manner (DTI, 2002).

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[25] To address industry initiated test and commercial site marine renewable energy development, the province has established: the *Offshore Renewable Energy Generation Regulatory Flow-Chart for Industry Initiated Test and Commercial Sites* (http://www.gov.ns.ca/energy/resources/EM/tidal/Tidal-Policy-Framework-Nova-Scotia.pdf); and *Guidelines for Permitting of a Pre-Commercial Demonstration Phase for Offshore Renewable Energy Devices (Marine Renewables) in Nova Scotia* (http://www.gov.ns.ca/energy/resources/EM/tidal/Final-Guidelines-for-Permitting-Demonstration-Phase.pdf)

10.2.1 Strategic Development Design

As the industry develops and interest and expertise in marine renewable energy grows, it will become increasingly likely that desirable sites are the subject of competition between developers. Some developers may want to reserve favourable sites for future exploitation, which could inhibit optimal development (DTI, 2003, p.30). Therefore, the province will need to determine what the policy will be in terms of how marine renewable energy project sites are assigned and developed. Development options include allowing developers to nominate any area for a potential marine renewable energy site or setting strategic/priority areas.

- **Open Area Site Choice**
  Under an "open" site choice policy, developers could nominate any site of interest at any time. Depending on the location and scope of the proposed project, an Expression of Interest (EOI) or Request for Proposal (RFP) may be issued to allow other developers to express interest in the same area, possibly leading to a competition.

- **Strategic/Priority Areas**
  Jurisdictions such as the UK, Norway, Denmark, and Germany have established policies for marine renewable energy projects that designate strategic or priority areas for development. The identification of appropriate locations is done through a process of systematic, strategic assessment that advises on the nature, scale and location of development and activities. Government would then decide when certain areas would be available for development and open to applications from proponents. The intention of developing only certain areas at a time is to minimize adverse effects on both the marine and terrestrial environments while ensuring the public interest.

Option 1 *Strategic/priority areas*	**Option 2** *Open area site choice*
Pro(s) • Ensures a rational, comprehensive development of marine renewable energy resources that has been considered well in advance of specific project proposals • Allows for environmental review on a larger scale and aids the environmental impact evaluation process • Could allow for early public participation in the decision-making process and may also expedite development of renewable energy projects Con(s) • Developers that wish to conduct activities beyond the boundaries of these areas may experience delays in the permitting process, as other areas will not have the same amount or readily available data • Will require significant resources in early stages in order to determine strategic areas	Pro(s) • Allows developers flexibility in their choice of project site • May be beneficial during early stages of industry development Con(s) • Site chosen may not be in area explored the SEA and would require further investigation and environmental and socio-economic assessment

10.2.2 Priority of Application Acceptance and Competition Process

A competition process will be necessary to ensure resource conservation, strategic development of desirable development locations, and control resource extraction amounts. Strategic design of the permitting and competition process will ensure the best chance of encouraging a sustainable pattern of development. It is assumed that the application acceptance will differ between short- and long-term rights allocation. Several approaches include a competitive tender or auction process, first-right approach, or a nomination/RFP approach.

- **Competitive Tender Process**
  A competitive tender process for commercial stage projects is an option used currently by the UK, the US, and Northwestern European countries (offshore wind). In the UK, this approach established competitive leasing rounds for strategic areas chosen for commercial exploitation (*See Appendix B for more information on the Leasing Rounds approach*). This approach weighs a set of pre-determined criteria (e.g. community benefits, development plan, etc.) in order to determine the most qualified proponent(s).

- **Competitive Auction Approach**
  Allocating licenses or leases by price or market mechanisms such as an auction, is another method which has been used in other sectors such as the US (MMS). An auction would be based on a single lump-sum payment for the license, or developers could bid the level of annual rental that they would be willing to pay (DTI, 2003, p.39). This approach primarily takes into consideration the lump-sum amount a proponent proposes.

- **Nomination Approach (with EOI or RFP Option)**
  A proponent would have the right to apply based on a first come first served or "first right" basis, but the Province would have the right to publicize an Expression of Interest (EOI) or Request for Proposal (RFP) for the site, to discover whether there is interest in the area. If there are other interested parties, this process could translate to a competitive bid.

- **Non-competitive "First Right" Approach**
  Proponents who have proven their developmental/pre-commercial technology as commercially viable and have successfully demonstrated due diligence under an investigative permit could have the opportunity to apply for long-term commercial leases (Vold & Sranko, 2006, p.26). In this sense, the proponent would have the "first right" to apply.

Option 1 *Competitive tender*	**Option 2** *Competitive auction*	**Option 3** *Nomination approach (with EOI or RFP option)*	**Option 4** *Non-competitive "First Right" approach*
Pro(s) • Granting exclusive rights at an early point reduces investment risk at	Pro(s) • Efficient allocation of sites • Will guarantee largest payments for development	Pro(s) • Maximum flexibility for government • Potential for greater value to	Pro(s) • Provides the proponent with the security they need to make investments given

Option 1 *Competitive tender*	**Option 2** *Competitive auction*	**Option 3** *Nomination approach (with EOI or RFP option)*	**Option 4** *Non-competitive "First Right" approach*
the development stage (therefore making it easier to gain financing and investment support) (Doelle et al., 2006, 58) • May provide the greatest value to the public • Given uncertain technologies it might prevent inferior technology being applied to high value sites Con(s) • Proponent has less security during investigative, demonstration and pre-commercial stages • Provides less security for original investors • More complicated administratively	permits Con(s) • Unlikely that an auction or financial tender would be appropriate during the period when the industry is developing due to considerable economic and financial uncertainties	public given uncertainty Con(s) • May prevent developers who have already invested in demonstration and pre-commercial projects from continuing at a steady pace	the uncertainties of site development • Allows projects to start and proceed through different development stages so that we can learn from them • Less complicated administratively Con(s) • May allow inferior technology to lock-up high value sites, although eligibility requirements reduce the risk

(*See Appendix B, p. 70* *for more details regarding approaches to leasing rounds and awarding of rights)*

10.2.3 Application Requirements

The awarding of projects would be dependent on proponents' ability to achieve criteria set by application requirements. Depending on the project development stage criteria may differ. During the early stages of the marine renewable energy industry, demonstration or developmental/pre-commercial projects may require an Expression of Interest (EOI), Notice of Interest (NOI), or Request for Proposal (RFP). Awarding of commercial projects would likely involve a tender process which would focus on the scale of development proposed and the mitigation of wider impacts. In this case, application requirements and criteria against which tenders would be judged could include the following aspects:

1. Engagement and/or consultation with the Mi'kmaq of Nova Scotia (the *Proponents' Guide* (NSOAA, 2009) outlines best practices and steps)
2. Public and stakeholder engagement
3. Application requirements

- the underlying development plan, including planned timetable
- experience in constructing offshore marine energy generation
- experience in electricity generation
- approach to obtaining the relevant permits
- financial viability
- underlying financial guarantees
- relationship of planned area of investigation to planned output
- environmental record
- willingness to cooperate with adjacent developers
- regional and community opportunities, benefits and impacts

It will need to be determined how contracts would be awarded based on the above criteria. For example, in the UK, offshore wind contracts are awarded based on who meets eligibility criteria and who has the most economically advantageous tender. (*See Appendix C for a draft potential Project Development and Approvals Process).*

10.3 Decommissioning Obligations and Funding

Prior to granting permits for the installation of any device, the province would need to be satisfied that appropriate planning and funding arrangements are in place to decommission marine energy devices at the end of their working life. Other jurisdictions with marine industry operations (i.e. UK, US, Denmark, Netherlands) have included decommissioning obligations in legislation. For example, under the *Energy Act* of 2004, the UK requires that developers submit decommissioning plans and comply with decommissioning obligations prior to lease expiration (CCC, 2006).

In many offshore sectors, governments' approach to decommissioning has been to require the producer to pay for disposal of its own waste (CCC, 2006). If the liable entity defaults in carrying out the decommissioning program, enforcement of obligations can be enacted under the regulator's compliance and enforcement policy. In the UK, criminal penalties are available if a liable entity fails to carry out agreed upon decommissioning responsibilities (CCC, 2006).

Decommissioning requirements are typically detailed in development permits by regulators which will also determine what type of financial security is appropriate (DTI, 2003, p.42). The type of financial security is an integral aspect of decommissioning as it could affect investor confidence and the public purse if developers fail to carry out their duties. Therefore, securities should be clear, transparent and provide security for the developer and government.

It is important that the Government of Nova Scotia determine the strategy and policy for decommissioning of marine renewable energy operations. Currently, the Department of Natural Resources Letter of Authority used for demonstration and developmental/pre-commercial projects includes conditions that govern the early decommissioning of a device before the end of its working life if there are unacceptable environmental impacts that cannot be adequately mitigated (NS, 2007, 5). However, in terms of legislated obligations, the Province may want to consider an adaptive, flexible approach to decommissioning, determining on a case-by-case basis whether structures need to be fully or partially removed and what type of financial security will be the most effective for the regulator and developer.

11.0 REGULATORY ISSUES AND MODEL

Regulations are designed to address the public interest and provide public and environmental protection. Across Canada, the nature of an industry or business determines what federal or provincial legislation or regulations are applicable. However, in respect to the Nova Scotia offshore, jurisdictional claims make the issue more complex. The presence of multiple public interests using a shared, public resource—the ocean—means that layers of federal and provincial regulations exist to cover different types of uses. Canada and the province have resolved this issue in respect to offshore petroleum operations through the creation of joint legislation. This may also have some important lessons for regulation of the marine renewable energy.

The marine renewable energy industry will require a framework for strategic planning and permitting that is consistent and robust. This will be important for every stage of growth and development of the industry. The current regulatory process, consisting of both provincial and federal approvals, permits, and regulatory requirements is complex and may not provide predictability for industry or the public – especially if the current cooperative and coordinated approach is stressed by multiple applications and opportunities.

A regulatory model developed under new marine renewable energy legislation would need to encompass a variety of objectives to ensure that the industry grows and progresses in the public interest. The following are objectives desirable for a regulatory model:

- Separates policy formulation and advice from regulatory administration, where practicable given issues of scale and capacity
- Minimizes need for multiple approvals or duplicate assessment requirements
- Minimizes overlapping administration by multiple authorities, or defined, clear administrative arrangements where multiple agencies are involved
- Minimizes inconsistencies in legislative requirements and decision making
- Ability to enforce activities on submerged lands in cases where there are different viewpoints regarding ownership (provincial or federal)
- Ensures regulators have independence, accountability, and clear regulatory objectives and do not face conflicts of interest

11.1 Environmental and Safety Regulation

Environmental and safety regulation have been identified as two key areas where provincial and federal regulatory responsibilities should be coordinated or integrated in order to avoid the possibility of duplication, conflicting decision-making processes, and regulatory uncertainty for industry.

11.1.1 Environmental Regulatory Responsibilities

Under current rules, carrying out environmental regulatory responsibilities in the marine environment would require additional development of expertise and resources at the provincial level, as well as increased collaboration with federal partners. The development of a regulatory model that stipulates regulatory responsibilities and protocols for environmental protection, assessments, approvals, and operational regulation could serve to coordinate the regulatory requirements of both provincial and federal governments.

11.1.1.1 Assessment

Current environmental assessment legal requirements follow from both the Nova Scotia *Environment Act* and the Federal *Canadian Environmental Assessment Act*. Installation of marine renewable energy projects/technologies—whether deployed as a single prototype device or an array—will have varying levels of environmental impact that may trigger assessment requirements under either or both statutes.

- **Provincial Assessment Process**

  Nova Scotia's *Environmental Assessment Regulations* were amended in August 2008 to require an assessment for facilities that produce more than 2 MW of energy from tides or waves. Projects that meet or exceed this threshold are required to be registered as Class 1 Undertakings and are subject to a 50 day review process that includes a 30 day public comment period. At the end of the 50 day process, the decision on the project is made by the Minister of Environment.

  Under this amendment, the province now has authority to regulate a tidal or wave marine renewable energy activity that could affect the marine environment. However, it is important to implement these responsibilities in a manner that avoids duplication between the province and federal departments during environmental assessment processes.

  Projects that are approved through the provincial assessment process are subject to terms and conditions to ensure any potential adverse effects are avoided or mitigated to non-significant levels. Terms and conditions can include specific mitigation measures that must be implemented at various phases of development as well as monitoring and reporting requirements.

- **Federal Assessment Process**

  Federal assessment requirements for marine renewable energy are triggered if there is need to issue a federal permit or authorization under legislation such as the *Navigable Waters Protection Act*, the *Fisheries Act*, or by the involvement of federal funding or federally controlled lands. The federal department or agency which issues a permit, provides the funding or manages/owns the land is a "responsible authority" under the *Canadian Environmental Assessment Act* and is required to ensure an assessment is carried out before making a decision to issue permits or provide funding or lands.

  The outcome of the federal review is a determination on the environmental effects of the project. If the review determines that significant effects are not likely, then the responsible authority may proceed to make a decision on a permit application, a request for funding, or the sale, transfer, or use of federal lands. The responsible authority's decision may include specific conditions to address potential environmental effects of the project.

11.1.1.2 Current and Future Assessment Processes

Under the current legislative framework, both levels of government have authority to coordinate assessment processes where practical for marine renewable energy projects that require provincial and federal environmental assessments. For example, the environmental assessment for the demonstration in-stream tidal projects at FORCE are being reviewed jointly under the terms of a project-specific harmonization agreement—the Federal-Nova Scotia Assessment Agreement.

While this type of agreement can serve to harmonize the assessment process and establish a common decision-making timeline, the process is not entirely integrated or coordinated. Environmental assessment documents are still subject to review by provincial and federal governments and relevant departments within each government (e.g. DFO, NS Fisheries and Aquaculture).

The lack of an established coordinated environmental review process could create regulatory challenges in the future if there are increases in project applications along with the need for environmental assessments. Therefore, consideration of how to design a consistent and effective environmental review process that encompasses provincial and federal environmental regulatory requirements must be taken. Possible options for creating a more integrated or coordinated process include a harmonized approach through a bi-lateral agreement (similar to the Federal-Nova Scotia Assessment Agreement that was established for the Minas Basin demonstration project) or administration through a lead regulatory authority. (*These options are analyzed further in section 11.2.2, p. 60)*.

11.1.2 Safety Regulatory Responsibilities

During the start-up of the industry the number of employees and contractors will be small, but as the industry gains momentum the number of workers will likely increase (UK estimates that their marine renewable energy workforce will reach 500 people by 2010) (HSE, 49, 2006). Duty holders (operators, employers, contractors, sub-contractors, employees, labourers) in the marine renewable energy industry will have administrative obligations to comply with industry specific legislation and regulations and legislation and regulations affecting Nova Scotia's submerged lands. Therefore, the implications of applicable health and safety social legislation need to be taken into consideration.

Currently, operational and occupational health and safety issues are governed by federal and provincial legislation.[26] In respect to submerged lands off of Nova Scotia it may argued that one set of laws apply only to find a counter-argument about the application of another set. Lack of clarity in both the application of federal and provincial legislation and regulation could pose challenges for ensuring the health and safety of workers. Legislative and regulatory duplication created by jurisdictions could lead to confusion regarding workers' rights and workplace responsibilities, presenting unsafe or hazardous conditions for workers.

In order to create a healthy and safe working environment that promotes safety culture, attention should go towards how current legislation and regulations should be applied and whether new agreements or arrangements should be incorporated into a regulatory model. This will serve to establish primary regulatory responsibilities and ensure consistent approaches to regulating.

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[26] Federal: *Canada Human Rights Act; Canada Labour Code*
Provincial: *Occupational Health and Safety Act; Labour Standards Code; Human Rights Act; Trade Union Act; Workers Compensation Act; Health Protection Act; Smoke Free Places Act*

11.1.3 Compliance and Enforcement—Environmental and Safety

Activities carried out by marine renewable energy developers will need to comply with current and future license requirements, legislation, regulations and policies. Environmental protection, safety, and resource conservation throughout the lifecycle of a marine renewable energy project can be addressed through a strategic approach to compliance and enforcement including expertise and a comprehensive mix of compliance and enforcement tools.

As the marine renewable energy sector is in its infancy and is a relatively new development in Nova Scotia, expertise of the marine environment will be essential to identify non-compliance and promote compliant behaviour. Currently, environmental compliance and enforcement powers are split between Nova Scotia Environment and federal authorities depending on the area of regulation. Occupational safety compliance and enforcement powers fall under the authority of Nova Scotia Department of Labour and Workforce Development's Occupational Health and Safety Division and federal authorities. The division of regulatory responsibilities among several departments may not provide for a consistent or effective approach to regulation or a standardized body of personnel with shared knowledge of marine renewable energy project regulation. In order for compliance and enforcement to work effectively inspectors and personnel equipped to audit, inspect, investigate and interpret reports relating to renewable energy projects in the marine environment will be necessary.

Determination of available and appropriate compliance and enforcement tools will also be necessary during the creation of new legislation. The chosen compliance and enforcement model should be equipped with a range of tools to motivate compliance and remedy or penalize non-compliance. An incremental compliance and enforcement model would provide a range of tools including preventive, persuasive, compulsive and punitive measures. If an operator fails to adequately and appropriately respond to detected non-compliance, enforcement severity is escalated incrementally, beginning with persuasive measures and ending with punitive measures such as prosecution (Department of Primary Industries and Resources South Australia, 2008; Malavazos, 1998). Environmental and safety officers would be responsible for correcting a breach in compliance with a suitable enforcement tool.

11.1.4 Addressing Challenges of Environmental and Safety Regulatory Activities

Currently, the province has limited experience in assessing and analyzing environmental monitoring reports to determine environmental impacts and cumulative effects of renewable energy projects in the marine environment. On the other hand, the federal government has expertise in environmental regulation in the marine environment, but has indicated that they currently do not have the capacity to take on the additional regulatory responsibilities presented by the marine renewable energy industry.

In order to assess projects effectively, identify safety hazards and environmental effects, and conduct compliance and enforcement activities, actions need to be taken to address capacity challenges and develop expertise while ensuring that a collaborative approach between federal and provincial governments is upheld. The incorporation of environmental and safety regulatory activities within an administrative model that coordinates or integrates both governments' processes could serve to address these issues. Possible options include a federal-provincial agreement or the creation of an independent organization that integrates federal and provincial regulatory requirements.

11.2 Regulatory Model Approaches

There are three regulatory models that are applicable to the marine renewable energy industry, each addressing different approaches to jurisdictional responsibility and arrangements between relevant provincial and federal authorities.

- **Cooperation**
  A cooperative regulatory model would involve information-sharing between federal and provincial authorities on the development and management of marine renewable energy. The creation of a committee could provide a forum for this type of model. Each jurisdiction would maintain their authority and approach to managing the industry. This model has proven successful when applied to the environmental assessment and permitting process for the in-stream tidal projects at FORCE. However, this model could become inefficient if the volume of projects increase. It also may not easily resolve potential conflict, as each jurisdiction would maintain its role and responsibilities in the planning and permitting process. In some offshore locations where the issue of federal or provincial ownership could be debated, proponents may face conflicting advice and regulatory processes if both governments' regulators intervene.

- **Collaboration**
  A collaborative approach to regulating marine renewable energy would involve federal and provincial authorities working together to establish, develop and manage the industry. This model would allow for more coordination and joint efforts than a cooperative approach. However, proponents of the industry would continue to be subject to approval by a number of authorities and authorization of development.

- **Integration**
  An integrated regulatory model would have the ability to set jurisdictional and ownership issues aside, allowing for the creation of one body administering regulatory tasks on behalf of both federal and provincial authorities. The creation of an integrated model may initially result in higher costs and take longer to establish due to the involvement and commitment required of both provincial and federal governments. However in the long-term it would offer the most comprehensive and accessible way to manage the marine renewable resource.

11.2.1 Considerations and Experiences

Although marine renewable energy is in the early stages of development worldwide, other jurisdictions are undergoing similar processes in developing the sector and have demonstrated the importance of adopting a concise legal and regulatory framework.

In the United States, MMS and FERC's overlapping jurisdictional claims have demonstrated how regulation by multiple jurisdictions, if uncoordinated, can be an impediment to investment in marine renewable energy technologies. For example, the transaction costs of permitting a given project can increase if agencies do not collaborate on matters of regulatory concern, particularly preparation of the environmental impact reviews that underpin their permitting decisions (EDF, 2008).

Conferences, commissions and workshops involving multiple marine renewable energy jurisdictions have also noted the need for a clear regulatory approach and model to the development of a sustainable sector. In December 2005, the Commission of European Communities released a report documenting experiences of Member states and identified the following administrative limitations that warrant consideration in the design of a regulatory model for Nova Scotia's marine renewable energy sector:

- Large number of authorities involved and a lack of coordination between them
- Long lead times needed to obtain necessary permits
- Renewable energy projects were insufficiently taken into account in spatial planning

(Doelle et al., 2006, 60)

The Commission advised that a solution to these administrative barriers could be the creation of "one-stop authorization agencies" to process authorization and provide assistance to applicants (Doelle et al., 2006, 60).

11.2.2 Regulatory Model Options

A long term view needs to be taken for the regulatory framework and legislation. There is also a need to determine who will be responsible for regulating. In order to ensure the public interest it will also be necessary to regulate economic interests associated with marine renewable energy separately from land and public interests. In short, a dual mandate of acting as both regulator and promoter of the marine renewable energy resource is not advisable as it can create a conflict of interest situation and negatively affect public confidence.

- **Collaboration/ Joint Agreement**

A collaborative or harmonized approach to regulating marine renewable energy would ensure that provincial and federal government processes were coordinated and reduced regulatory uncertainty. Regulatory collaboration and harmonization can be facilitated by a consistent set of legislative objectives that can be achieved through agreements and incorporation by reference of another government's law. Under this type of administrative and regulatory framework, regulators in one jurisdiction would delegate their work to their equivalents in the other government. This type of regulatory model is demonstrated by the *Donkin Coal Block Development Opportunity Act* for the Donkin Coal Block in Nova Scotia. Matters pertaining to licensing, labour, safety, and royalties are addressed in this act and regulatory responsibilities of provincial and federal governments are coordinated through incorporation by reference.

An agreement could be devised between federal and provincial governments for the purpose of coordinating regulatory requirements of both governments. In the event that a project requires environmental assessments, for example, under both federal and provincial legislation, both governments would work together to create a cooperative environmental assessment process. Projects that are small or limited in nature and do not trigger a provincial and/or federal environment assessment would still be bound to move through the provincial approvals and permitting processes. Monitoring and reporting could still be required of the renewable energy developer.

- **Lead Integrated Regulatory Authority**

While certain aspects of marine renewable energy activities will fall under the regulatory authority of other agencies, a lead regulatory authority could be created to ensure effective coordination of all the regulatory requirements and serve to meet regulatory objectives. Essentially, one organization would work to expedite the approval and awarding of all necessary permits and approvals (excluding land). In order to do this, the regulator would need to enter into a Memorandum of Understanding with the appropriate departments and agencies to ensure effective coordination and avoid duplication of work and activities.

An integrated approach would allow policy authority and economic interests (Call for Bids, Award of Licences, Rents and Royalties) to remain with governments, while the agency could have operational authority over:

- Administration of tenures
- Regulation and monitoring of operations including exploration, development, production and decommissioning
- Health, safety, environmental and resource conservation matters including compliance and enforcement
- Environmental assessment of proposed development activities
- Scientific research—required, sponsored, or recommended
- Public information and education

Other jurisdictions have adopted variations of integrated approaches as part of their marine renewable energy regulatory regime and permitting process including Denmark, Ireland and the UK. In Denmark, a "one-stop-shop" approach was adopted by the Danish Energy Authority (DEA) during the approval phase for the Wave Dragon wave project and a similar single-authority approach has been established for the regulating of the offshore wind industry. An integrated approach is also representative of the UK's regulatory model in which proponents can complete one application for all land and regulatory approval and the Department for Business, Enterprise and Regulatory Reform (BERR) disperses it to the appropriate authorities.

The separation of economic interests from regulatory interests also has benefits in public accountability and trust. This separation of responsibilities received significant consideration in Nova Scotia after the 1992 Westray mine explosion. The inquiry and subsequent Westray Recommendations endorsed the idea of the Department of Natural Resources (DNR) to "no longer act as both promoter and regulator of the development of mineral and energy resources" as this presented a dual mandate and conflict of interest. The Province accepted this recommendation and determined that DNR's responsibility was to work to ensure compliance with the general structure of legislation.

One of the major benefits from an even partially integrated regulatory approach is the possibility of harmonization on jurisdictional matters and the ability to address the multiple marine interests in an integrated manner. Nova Scotia's offshore oil and gas arrangement shows that it is possible to create a joint development and management board with specific regulatory authority. Among the issues to be resolved would be possible sharing and application of federal and provincial laws. Mirror federal-provincial legislation giving force to the joint board approach could be followed as has occurred in the oil and gas context (Doelle et al., 2006, 69). This type of legislation could include incorporation by reference of suitable law(s) and delegation of roles to an integrated body created under the legislation.

Option 1 *Collaboration/Joint Agreement*	**Option 2** *Lead Integrated Regulatory Authority*
Pro(s) • Minimizes biases • Could reduce regulatory burdens when federal and provincial environment assessments are triggered • May be suitable for early stages of the industry Con(s) • Province still may not have necessary expertise or resources • Initially, may pose challenges for creating a system that can coordinate activities	Pro(s) • Minimizes biases • Integrates and coordinates provincial and federal legislation and regulation effectively • Reduces regulatory burden • Builds expertise Con(s) • Initially, may pose challenges for creating a system that can integrate activities

12.0 CONCLUSION

Marine renewable energy presents a significant opportunity for Nova Scotia. Harnessing the natural resource effectively could potentially allow the province to obtain a clean, green source of energy and address a number of policy objectives and goals. However, development of the industry poses several challenges from regulatory, environmental, and socio-economic perspectives including the presence of multiple jurisdictions, uniqueness of the marine ecosystem, and multiple users/uses.

Current challenges could be addressed through the creation of marine renewable energy legislation. A legislative framework would serve to provide regulatory clarity that could ensure appropriate licensing, environmental protection, safety of workers and the public, resource conservation, recognition of other users/uses, community benefits, and appropriate provincial revenue. It will be integral to the effectiveness of any new legislation that an appropriate regulatory model is established. This will contribute to sustainable development of the industry and establish predictable, efficient regulatory processes.

APPENDIX A—Land Issuance Issues and Options

Land issues and strategic allocation of ocean space play a large role in the sustainable development of the marine renewable energy industry. Legislation that is created to guide and regulate future commercial interests will need to address jurisdiction/ownership and consider or incorporate the following issues and options in regards to the leasing and licensing of ocean space:

Site Allocation

Allocation of sites will be an important aspect to developers who wish to commit funds to research and site assessment. A process to allocate sites must provide some assurance that if development permits are eventually granted they will have the development rights on clear and certain terms (DTI, 2002, 39).

There are two general approaches to site allocation—specified or open. Specified allocation defines a set of blocks of land to put on offer. Alternatively, developers could bid on a number of smaller blocks as necessary for project specifications. Open site allocation allows developers to specify exactly the location and size of their site.

- **Specified block allocation**
  Specified allocation defines a set of blocks to put on offer, based on known features of the seabed and analysis of renewable resources. This option is commonly used in minerals and hydrocarbon licensing.

- **Open site allocation**
  Open allocation is a flexible approach, allowing developers to specify exactly the location and size of their site (subject to criteria applied in selection process).

- **Alternative option—*Small block bidding***
  An alternative to a purely specified or open site allocation has also been proposed (SNH, 2003, 4). Developers would be invited to bid for smaller blocks than the standard 10kmx10km used in petroleum licensing. They could then bid for as many of these smaller blocks as needed to cover the required site options.

Option 1 *Specified block allocation*	**Option 2** *Open site allocation*	**Option 3** *Small –block bidding*
Pro(s) • Facilitates competition, administration and exchange of licenses, providing a simple reference framework • Avoids possibility of overlapping interest/bids Con(s) • Not clear at this early stage of offshore renewable energy development whether the block approach would apply well • Difficult to identify the	Pro(s) • In the process of considering applications bids could be modified when necessary (including reducing the scale of any bid for exploration rights which seemed inappropriately large in relation to planned electricity output) • Could allow for developers to also specify their generating capacity	Pro(s) • Provides flexibility to developers and regulators flexibility in determining the appropriate site size for a project Con(s) • May be more resource intensive to determine exactly how many blocks should be awarded

appropriate number and size of blocks • May artificially limit the development possibilities in a particular region	Con(s) • May result in competing or overlapping interest/bids for the same site	

Speculation – Scrutiny Policy

There is a speculative element to marine energy development. If not planned strategically, factors such as application criteria, fees and time allotted to gather statutory permits and data can have a speculative outcome. These factors could create an incentive for speculators to scoop up sites that they have no intention of developing or that they hope to auction to the highest bidder if legal provisions are not in place to prohibit such activity(OREC, 2007, 8). Methods to reduce speculation can be implemented during the application process as well as during the terms of the various project development stages (Vold & Sranko, 2006, 31). The following methods could be employed to help ensure the diligent use of Crown land in a timely manner:

- **Anti-speculation clause**
  Anti-speculation clauses, such as penalties or loss of concession can be included in a permit to ensure that a developer cannot hold claim on a location indefinitely without installing a marine renewable energy device (Mast, van Kuik & Zaaijer, 2007).

- **Restrictions on transferring permits/licenses**
  In order to reduce the incentive for developers to acquire permits for a number of sites with the intention of auctioning them to others, restrictions on permit/license transfers could be put in place. Restrictions may discourage the speculators who may want to file multiple permits or seek to acquire sites that they do not intend to develop (i.e. to block a competitor, bolster a business plan, etc.) (OREC, 2007, 8). However, it is important that proper provisions are put in place to allow transfers to occur if they are detailed in a business development plan or if a developer is faced with bankruptcy or foreclosure.

Option 1 *Anti-speculation clause*	**Option 2** *Restrictions on transfers of permits/licenses*
Pro(s) • Ensures that developers who have acquired land must develop/attain certain project milestones within a pre-determined amount of time Con(s) • Project timelines may be different for individual projects, and therefore anti-speculation clauses that emphasize one	Pro(s) • Prevents site-banking as it deters companies only interested in acquiring permits for resale • Encourages fair industry standards and competition • Prevents intentional blocking of competitors Con(s) • Prevents smaller companies who have successfully developed small scale prototypes

specific timeline could prove problematic for some developers	from becoming acquisition "targets" for established companies seeking to enter the wave or tidal energy industry[27] • May dissuade smaller developers or municipalities from developing sites, as some would want to work with a developer which will own, construct and operate the project and provide the municipality with power *(This would be the case if municipalities were granted first in permit processes)*

Priority Rights

Governance systems in such dynamic settings should pay particular attention to avoiding spatial and temporal mismatches. They should be responsive to local conditions but also pay attention to large-scale processes. Given the various users of the marine environment, attention will need to go towards whether certain users/uses have priority over certain areas and if so, how that is determined. Options to determine priority rights include:

- **First-come-first served approach**
  Priority of an ocean area would go to the first user that applied for rights and were subsequently granted access to the area.

- **Pre-determined priority use areas**
  Certain areas of the seabed would be designated for particular uses and designated users would have priority over those areas. Other users would not be authorized to conduct activities in pre-determined priority areas.

- **Committee designation process**
  Marine areas could be nominated for use by users, but final authorization would be determined by a committee or board. This approach could take into consideration whether some activities could co-exist in the same area.

Option 1 *First-come-first served approach*	**Option 2** *Strategic use/priority areas*	**Option 3** *Committee designation process*
Pro(s) • Allows for quick and responsive decisions and allocations of land and resource use Con(s) • Does not provide sufficient planning mechanisms for best use of land/seabed	Pro(s) • Allows for a planned approach that could allow consideration of impacts of resource users/uses and interactions between users/uses Con(s) • Could be onerous to	Pro(s) • Provides flexibility for decision-making, regulators and marine users Con(s) • Could be onerous/resource intensive for a committee or board to balance and

[27] In the US, two such acquisitions have occurred—an Irish company, Open Hydro purchased Florida Hydro which holds a preliminary permit of the Gulf Stream, while Finavera, an Irish offshore wind company acquired AquaEnergy.

• Lack of planning and determination of best uses could result in negative impacts on the environment and other uses/users	determine where multiple activities are best suited for location • Does not account for changing environment or changing technology	coordinate the range of marine activities that occur in Nova Scotia's waters

Non-exclusivity vs. exclusivity
Consideration needs to go towards the granting of exploration rights to investigate a site and subsequently the rights to develop and operate that site (DTI, 2002, 43). As such, it will be necessary to decide at what phases and for what activities exclusive rights are granted. There are several options that could be implemented:

- **Exclusive use for entire marine renewable energy project**
  A lease option agreement approach would provide developers with an exclusive area while allowing them some flexibility during the early investigation stage. Once a full lease was granted, exclusive use would continue during the commercial stage. For example, the UK's Crown Estate offers a Lease Option Agreement which provides developers with an exclusive area while allowing them some flexibility during the early investigation phase.

- **Non-Exclusive use during certain stages of the project**
  A lease or license may state or specify that other users can use the land provided they do not interfere with the investigation or operations of the developer. Therefore, the lease or license may not grant total 'exclusive use' in the sense that no other activities can occur at all, but 'exclusive use' in the sense that no other activities can occur that would have an adverse effect on a project/jeopardize safety.

- **Mixed, exclusive and non-exclusive use for improved and non-improved lands**
  A mixed approach would include just the footprint for the generating device in the lease, and to cover the remaining area (including the area between devices) under a license of occupation type of issuance (Vold and Sranko, 2006, 16).

Option 1 *Exclusive use for entire marine renewable energy project*	**Option 2** *Non-Exclusive use during certain stages of the project*	**Option 3** *Mixed, exclusive and non-exclusive use for improved and non-improved lands*
<u>Pro(s)</u> • Provides developers with flexibility • Provides sense of security and ability for developers to obtain investment financing at the investigation stage • Enables the proponent to exclude conflicting uses • Administratively simple • Lower survey costs <u>Con(s)</u> • Developers might request rights of investigation over a larger area than they plan to develop subsequently, simply to give themselves a wider range of options • Larger area under the lease means the proponent will be paying more rent for the greater area with greater rights (dependent on how lease rental rate is determined) • May not allow for non-ocean energy uses	<u>Pro(s)</u> • Provides more opportunities and flexibility for multiple uses to operate concurrently <u>Con(s)</u> • Changes in technology and within other industries are not foreseen that may effect activities of the marine renewable energy industry and other users positively or negatively	<u>Pro(s)</u> • Allows for non-ocean energy use over the non-exclusive use area <u>Con(s)</u> • May cause land survey costs to be higher, given the need to survey each generating site

Length of license/lease and extension options

The length of a lease or license will be dependent on the project stage. Site license or lease terms for eligible demonstration projects could be restricted to a period appropriate to meet the objectives of the demonstration phase, which will be significantly shorter than the duration of a lease for commercial generation of renewable electricity (DTI, 2005, 7). Provisions allowing an increase in license or lease length have been cited as being desirable to create investor confidence. Extension of a license/lease could be dependent upon one of the following options:

- **Performance conditions**
  Performance conditions outlined in license/lease agreement could be met by the developer could allow for extensions of the lease length to be automatic.

- **Landlord's discretion**
  Developers would be granted standard license/length depending on project stage, but it would be open to developers to seek a variation in light of specific circumstances of their business case.

Option 1 *Performance conditions*	Option 2 *Landlord's discretion*
Pro(s) • Provides developers with a firm expectation of how they should operate and achieve performance objectives and goals Con(s) • Resource intensive to assess and enforce • Performance conditions may change and need to be updated as technology changes and more is known about cumulative effects and interactions between the environment and technology	Pro(s) • Allows designated authority to consider all project variables (i.e. performance conditions, status of the industry, interactions with other users) before extending lease length Con(s) • Does not provide developers with certainty or quantifiable measurements or objectives

Mechanisms to reclaim Crown Land

A company committing funds to exploration work takes risks and expects fair return on this expenditure, but it should not necessarily have an exclusive right to use that resource in perpetuity (DTI, 2003, 45). A company granted with an exploration permit or lease option who fails to explore an area properly or meet development milestones, should be subject to penalties under certain circumstances. Therefore, licenses and leases for exploration and investigation purposes could contain one or both of the following options if the agreed program of work is not met:

- **Area reduction**
  Area of development can be reduced to reflect the extent to which the program has not been achieved.

- **Lease option withdrawal**
  Developers who are allotted a certain amount of time to develop a site and fail to construct within approximately 2 years (on average) are subject to losing the lease option. After a final analysis by the permitting authority, a lease option could be withdrawn. This option is present in the US FERC's Preliminary Permit and Conditional Lease, as well as the UK's Lease Option Agreement.

Option 1 *Area reduction*	Option 2 *Lease option withdrawal*
Pro(s) • Developers may be less likely to lose investments already made • Provides some assurance to developers that a project can proceed despite difficulties or unforeseen circumstances Con(s) • May produce onerous decision-making process for relevant authority • May divide land into "unusable" areas; marine areas not used to full potential	Pro(s) • Land that is not used under approved timelines will still be available for re-deployment Con(s) • Could pose complications for stages of project development if leasing "rounds" approach is also part of the permitting regime

APPENDIX B—Approach to Awarding Leases and Rights

The leasing rounds approach has been adopted by the United Kingdom for the commercial offshore wind industry and some aspects of the approach also guide demonstration and pre-commercial wave and tidal projects. The leasing rounds approach allows government to designate strategic areas for development as part of the competitive tender process. Impacts on the industry as a whole, on energy policy concerns, and environmental, social, and economic aspects are taken into consideration. There are two approaches to leasing rounds:

- **Fixed Leasing/Licensing Rounds**
  Fixed rounds would set certain time parameters on when proponents can submit applications or bids for project development. In the UK fixed leasing rounds are used to commence different project stages of offshore wind projects as way to open a strategic area for development. Fixed rounds are thought to minimize cumulative effects and encourage industry to develop in a controlled way. The time between rounds would possibly be related to the cycle of offshore development and investment. The UK has proposed intervals of 3 years.

- **Rolling Leasing/Licensing Rounds (Non-competitive approach)**
  A rolling leasing process would offer leases/licenses on demand and would not provide for competition between developers. This is a first-come-first served approach that allows more developers to advance further into the process. Based on consultations in British Columbia, there is general support for a first come first served approach to short-term land allocation (investigation, demonstration and developmental/pre-commercial)

Option 1 *Fixed Leasing/Licensing Rounds*	**Option 2** *Rolling Leasing/Licensing Rounds (non-competitive approach)*
<u>Pro(s)</u> • Possibility of developers sharing survey work • Possibility of developers sharing the cable route to land • Ability to consider demand for onshore connections and reinforcement in aggregate rather than an ad hoc basis • Government departments considering permit applications will find it easier to review the effect of a range of impacts <u>Con(s)</u> • Proponents may feel that time set rounds limit entry into the sector	<u>Pro(s)</u> • Convenient for developers • Creates less barriers to starting in the industry • Would serve proponents well who have successfully met the due diligence requirements of the investigative and demonstration phase <u>Con(s)</u> • More difficult to assess range of impacts and cumulative effects • Could lead to site-banking and inhibit optimal development • If there is an attractive market, authorities can be overwhelmed by applications (Doelle et al., 2006, 58) • Less transparency and accountability of the development process

APPENDIX C: Draft Marine Renewable Energy Project Development and Approvals Process

Marine renewable energy projects will be required to follow a development path and approvals process from project conception to abandonment. Within the project development framework, five phases may be identified: 1) pre-regulatory, 2) planning, 3) development plan and environmental assessment, 4) construction and operations, and 5) abandonment.

Provincial and federal roles and responsibilities will differ at each stage depending on project planning and regulatory activities. Under new legislation, project activities at each phase will need to be addressed and an appropriate and manageable framework established that ensures regulatory efficiency, predictability, and effectiveness.

Phase 1: Pre-Regulatory

The pre-regulatory stage consists of preliminary information gathering and site-screening activities that fall in the Province's interest and would likely be solely under provincial responsibility. At this phase the province would determine the general feasibility and desirability of projects in terms of general location, expected environmental impacts/considerations, generic technical and physical considerations, and proponent interest. Essentially, this phase allows for preliminary planning in order to determine criteria/characteristics for the potential licensing process.

While there are no legal obligations for the federal government at this stage, there are opportunities for provincial-federal collaboration and early communication between governments. Activities at this phase include:

- *Resource availability:* Identification of areas with suitable marine resource will help determine whether a potential marine renewable energy project will be located in an area that will maximize energy extraction and potentially lead to commercial viability.

- *Electricity connection*: Early discussions with the Nova Scotia electricity operations and planning authorities (Nova Scotia System Operator) will serve to identify whether the project requires a suitable grid connection point and if so, whether one is available in the area of study or whether upgrades/expansions will be required.

- *Strategic Environmental Assessment (SEA)*: A SEA will assess the environmental and social impacts of potential marine renewable energy projects in order to ensure the protection of the environment and promote sustainable development by integrating environmental and socio-economic considerations.

- *Archaeology and heritage:* Archaeological sites or areas of historical significance should be identified to determine constraints to the proposed project location.

- *First Nations/Aboriginal Interests:* Early engagement by the government on areas of interest from a resource perspective and areas of concern from an Aboriginal interest perspective will help facilitate future projects. Early engagement also allows for the Aboriginal community to assess the degree and manner they would wish to play in future projects.

- *Expression of Interest (EOI)/Request for Proposals (RFP)*: An EOI or RFP could be used by the Province to determine proponents' interest and qualifications for developing a marine renewable energy project in a particular location. Proponents could initiate this part of the process by nominating an area of interest. Areas of significant resource potential would likely be managed by the province through a competitive bidding (RFP) process. The EOI or RFP would also serve to identify suitable technologies, expertise, and financial qualifications proposed by proponents.

Phase 2: Planning and Project Design
The planning and project design phase would allow for project plans and details to be further refined to be incorporated into a final development plan (submitted in Phase 3). At this phase, some activities could be specifically required under legislation. The majority of activities would involve land-based and electricity infrastructure planning that would fall under the authority of the Province due the nature of the activities.

As it is still largely a planning phase, there may be federal involvement, but it may be more in the nature of coordination and information-sharing. This would depend on possible federal legislative triggers and the scope and intent of future federal legislation. It would be desirable for both federal and provincial legislation in this area be designed to minimize duplication of effort or overlap of responsibilities. Activities at this phase include:

- *Refinement of project location details*: The exact project location and extent of area needed would be established to ensure suitability of potential technology. This would also determine details of the stakeholder engagement process and potential issues to address and/or mitigate.

- *Marine resource assessment (energy quantum)*: In order to confirm the power availability at a certain location, data gathered from monitoring and resource assessment studies will need to be further analyzed.

- *Technology selection and financial assessment*: The most appropriate marine energy converter technology should be identified that will best fit the project objectives, provided that the developer does not have a preferred preselected technology. From a preliminary assessment, one or more technologies could be shortlisted based on the technical, physical, environmental characteristics of the identified site(s). An initial financial assessment will also identify the selection options of the marine renewable device and the preferred design.

- *Electricity infrastructure*: Technical and contractual arrangements for connection shall be identified and possible connection layouts and indicative costs assessed. For larger-scale, grid-connected projects, this includes requirements for a long-term power purchase agreement (PPA), offshore cables, onshore electrical lines and structures. Developers may wish to access the transmission system (owned by NSPI) under the Open Access Transmission tariff (OATT).

- *Socio-economic spatial impacts*: To the greatest extent possible, potential projects should be located in an area that will minimize disturbance to other users/uses. In order to mitigate any potential negative impacts, the interaction between marine devices and other users/uses should be identified. Assessment of socio-economic impacts could be delegated to the province as another aspect of the engagement process.

- *Formal Proponent First Nations/Aboriginal engagement and community/municipal engagement*: Early engagement by the proponent could be made mandatory under legislation or guidelines to ensure that all interests are addressed. Proponents would be required to demonstrate the appropriate level of engagement with the Mi'kmaq. They would also be required to undertake consultations with municipalities, adjacent communities/municipalities, and the public. A mandatory consultation report outlining the consultation plan, results, and plans to mitigate any potential issues/impacts could be required as part of the final project plan and application submission (Phase 3). Reports would be reviewed by relevant departments and adequacy of engagement and mitigation plans would be determined. Relevant federal authorities would be informed of results of engagement and proponents' subsequent mitigation plans.

After these studies and process take place, the proponent would be required to submit an initial project proposal. Upon review by relevant departments, a provisional/conditional permit could be issued by the province to the proponent. This permit would include details of how development should progress and additional issues and requirements that may need to be addressed before project commencement. The proponent would have the ability to engage in activities necessary to finalize project development plans. Provincial authority to oversee proponents' activities would be firmly grounded in jurisdiction for land-based planning and electricity infrastructure.

Phase 3: Project Development, Regulatory Approvals, and Environmental Assessment

At this phase final project details would be submitted to the appropriate regulatory authorities for approval. The following components would be required:

- *Regulatory Approvals:* Marine renewable energy projects will be required to obtain specific regulatory approvals and permits before development can commence. As each project will be unique in terms of technology, location, and scope, regulatory requirements may be different.

  In the previous phases, proponents would have engaged in activities and studies that would help inform project design and provide details necessary for determining applicable regulatory requirements.

- *Business case and financial model*: A business cash flow model for project development, operation, and decommissioning should be derived from project life costing. The proponent will also be required to detail financing information and expected return on investment. This will provide a case for whether the project is economically feasible.

- *Insurance and decommissioning requirements:* The project development process should clarify the extent of the required insurance during the construction, operation and decommissioning phases. Prior to granting final permits for the installation of any device, the Province would need to be satisfied that appropriate planning and funding arrangements are in place to decommission the device(s) at the end of project life.

Upon receipt of the development plan, provincial and federal review and environmental assessment (EA) would commence if required. Depending on project details, an EA could be triggered under federal legislation such as the *Navigable Waters Protection Act*, the *Fisheries Act*, or by the involvement of federal funding or federally controlled lands. Provincial EAs are triggered when tidal or wave projects produce more than 2 MW of energy. Once the EA is reviewed and approved by regulatory authorities, a lease can be issued that would likely include requirements for project monitoring.

As both federal and provincial regulatory authorities are involved at this stage, opportunities for single-filing, joint information requests, joint decisions, and timeframes should be explored.

Phase 4: Construction, Operation, and Maintenance
During this phase, the developer would need to establish comprehensive management, safety, and environmental plans according to potential legislative requirements and ensure that project activities meet the conditions of the lease. The appropriate legislated regulatory authorities would monitor the project for compliance and conduct enforcement activities when necessary.

Phase 5: Abandonment/Decommissioning
At the decommissioning stage, the proponent would be required to follow through with decommissioning plans previously established within the final development plan submission. Similar to the previous phase, the appropriate legislated regulatory authorities would be responsible for compliance and enforcement activities.

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