Marine Renewable Energy Legislation
A Consultative Process

Report to the Government of Nova Scotia

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Executive Summary

The Province of Nova Scotia has embarked on a visionary process to develop marine renewable energies (MRE) drawn from offshore winds, waves, tidal technologies. In its formal response to a 2008 Strategic Environmental Assessment the government committed to a consultative process that would address potential legislation for this nascent sector. Two supporting documents were prepared, a discussion piece and a "backgrounder", that collectively addressed upwards of 50 separate issues, which were then reduced to four broad categories to facilitate public consideration and discussion. Two public consultations, plus a number of written submissions, were held in November 2010, followed by several informal meetings involving representatives from the Department of Energy, FORCE, OEER, and OETR, as well two meetings in Ottawa with provincial and federal regulators.

Verbal and written submissions show broad support for the government's initiative, albeit with some caveats. There is a tacit recognition that the Bay of Fundy is the finest tidal energy site in North America, if not the world. The considerable enthusiasm displayed for this initiative was tempered with a variety of concerns, not the least of which dealt with the long-term health and well being of marine environment adjacent to Nova Scotia. In addition, issues were raised with many aspects of the development process, and the need for it to unfold in a thoughtful, planned, fair, and sustainable manner. These concerns emerged in part because of the absence of a reasonably defined plan that offered some form of development "roadmap" for this emerging sector. This resulted in the first and perhaps most important recommendation, which is the need for a carefully reasoned Strategic Plan that would provide a clear vision, with objectives, goals and a mission statement available to all parties which would then guide development and the legislative, policy and regulatory processes.

The diverse array of issues discussed during the consultations was condensed to four overarching categories: Planning, Economic Opportunities, Research, and

Regulation. With regard to Planning, the inputs received were clear on several points. Transparency and public involvement in the development process ranked very highly, especially since they contribute directly to positive public engagement. To facilitate that outcome the creation of a comprehensive communication-education-outreach strategy was strongly endorsed. In addition, furthering the development of a provincial coastal management plan, that included marine spatial planning, is viewed as essential when considering conflicting uses in the coastal areas of Nova Scotia. Integrated coastal management and marine spatial planning are two vehicles that have been widely adopted worldwide within the marine renewable energy sector as a means of balancing competitive coastal uses. The Department of Energy should play a leadership role in advancing these two processes in parallel with the development of the MRE sector.

With regard to Economic Development, a number of different issues were considered, including supply chains, incentives, subsidies, royalties and electricity infrastructure and their application broadly across the spectrum from local communities to large corporations. As might be expected, considerable attention has been paid to participation by large corporations, even though immediate economic opportunities could just as well unfold from the efforts of local community participants. Consequently, effort should be devoted to further defining the needs of communities, especially with an eye toward enabling their participation. In addition, there is a need to define, within the context of strategic planning, a business plan that reviews economic opportunities, choices, and goals in a coherent and integrated fashion.

With regard to Research, the case was made that, due to the nature of the Bay of Fundy and the ambiguities associated with studying immature technologies, an ongoing program of study devoted to the natural, social, technical, and engineering environments was deemed to be critical. Potential research areas include: resource sustainability, monitoring, environmental impact assessment, socioeconomic responses, health and safety, and support for integrated coastal management. This ongoing process of investigation should be geared to the practical needs and impacts of the marine renewable energy initiative, and as

such they need to be formally supported as an essential component of its development. Integrating a research plan into the expected strategic plan would hopefully define the players such as OEER, OETR and FORCE, their relative responsibilities and roles, along with a definition of how research will be used to further sectoral development while ensuring environmental sustainability.

The topic of Regulation is similar to the previous issues in that it is integrated quite naturally throughout all sectoral elements, but it differs in the strength and importance of those linkages. Hence it will play a critical role in the development of a strategic plan. It is sometimes described by some as a barrier to development while others see it simply as a minor impediment. Certainly, a major goal is the harmonization of federal, provincial (and sometimes municipal) responsibilities leading eventually to a more streamlined, efficient and effective process. Consequently, the creation and advancement of a federal/provincial working group to advance these goals would be very useful for the Nova Scotia initiative but could also contribute to the advancement of a national framework. One such example might be the creation of legislation to facilitate reciprocal adoption of regulatory responsibilities there allowing federal or provincial regulators to adopt the responsibilities of the other when appropriate. Additional concerns in this area include: the identification of an individual who could act as the first point of entry for community or corporate interest in this sector; definition of some entity to fill the role of “trusted regulator” to remove any possible suggestion of bias; delineation of clear guidelines for regular environmental monitoring; the creation of thresholds for advancing a commercial interest through various developmental framework hurdles; and, guidelines related to routine health and safety audits.

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Introduction

Over the past several decades renewable energy has assumed a growing importance, resulting eventually in its present exponential rate of growth. With few exceptions attention was directed primarily at existing terrestrial energy sources, such as wind, biomass, geothermal, solar etc. However, relatively new interests have emerged that embrace marine energy sources such as offshore wind, waves, and tides, and now marine renewable energy is also undergoing a worldwide surge in attention.

Growth in renewable energies reflects a growing awareness of a changing environment, often summarized under the rubric of climate change. Nowhere has that change been more convincing than in a recent spate of observations made on the world's oceans; a part of the natural world normally slow to respond to external perturbations. Specifically, the rates of sea level rise, ocean acidification, and ocean warming are all showing dramatic increases along with strong evidence that the rates of change are themselves increasing. That plus the growing stridency of those who believe that change agents are unequivocally anthropogenic, has convinced many that new and innovative approaches are required. These latest oceanic results reinforce dire conclusions reached in the recent report by the Intergovernmental Panel on Climate Change (IPCC)[1].

Many Nova Scotians are familiar with the global environmental trends outlined above. They recognize the need for change, especially since until recently 90% of the province's energy generation depended on the use of fossil fuels (80% coal and 10% natural gas). To move away from fossil fuels and embrace renewables will result in a number of rewards, namely, reduction of our present dependence on coal with its acknowledged price volatility (One recent pessimistic study suggests that coal price increases are imminent due to peaking of available, useful coal resources[2]), greater energy security, lower atmospheric carbon emissions, a reduction in imports thereby retaining greater wealth in the province, and

[1] IPCC 2007
[2] Patzek and Croft 2010

stimulation of key sectors of the economy through investment in infrastructure and the creation of skilled jobs.

Over the past decade Nova Scotia has gathered momentum in its move toward greater use of renewable energies. In 2001 renewables represented 8.3% of installed capacity (obtained from hydro, biomass and tidal height). By the end of 2012 it will be 14%, with a legislated target of 25% by 2015 and 40% by 2020. Marine renewable energies are expected to contribute an increasingly greater share of total renewables with the passage of time.

Nova Scotia's Marine Renewable Energy Potential

The Bay of Fundy has been considered a possible site for marine renewable energy projects since the early 1900s. In the 1930s attention turned to tidal barrages, which remained the principal focus until the 1970s, except for a single short-lived wave-energy project on the Atlantic coast, also in the 1930s. In 1982 a tidal barrage was constructed at Annapolis Royal to test the commercial feasibility of low-flow turbines. All of these early efforts reflected a Nova Scotia conviction that the province is endowed with extraordinary natural resources that offer hope of accessible and plentiful ocean-derived energy. This view was recently reinforced by the work of the California-based Electrical Power Research Institute (EPRI), which considers the Bay of Fundy to be the best possible site for tidal power generation in North America[3].

In addition to its natural assets, Nova Scotia is superbly positioned to pursue marine renewable energy for other reasons. We enjoy strong multi-level government support that has produced important economic, procedural and infrastructural changes in a remarkably short time. In addition, over the past 80 years Nova Scotia has developed a sizable, skilled workforce that includes scientific, engineering and socio-economic research capacities resident in our universities and government laboratories. The Halifax-Dartmouth area is widely acknowledged to be among the top 5-6 global centers of marine-related research. These human skills are an important resource contributing to all facets of a fledging marine renewable energy initiative. Finally, Nova Scotia contains the largest concentration of private companies working with ocean technologies in Canada. 300 firms specialize in offshore oil and gas, aquaculture, fishing, and national defense, as well as many other supporting players to these larger

[3] EPRI (2006)

enterprises. Many skills are available, honed in international marketplaces including: ocean mapping, marine engineering, sub-sea fabrication and installation, remote monitoring, and safety and survival, to name but a few.

As Nova Scotia increasingly commits to the marine renewable energy sector, a number of questions and concerns that play on that development come into sharper relief, namely, socio-economic, environmental, resource, engineering, scientific, jurisdictional, regulatory and legal issues, that must be clarified and defined as this process unfolds. The immature state of the marine renewable energy sector suggests that much remains to be done before its full potential can be realized. For example, neither comprehensive supporting legislation nor a mature regulatory regime has yet been developed for any single jurisdiction, including the U.K, the present world leader, or China which is considered to be the heir apparent. In other words this can be viewed as either a shortcoming or an opportunity for Nova Scotia to independently develop its own package of laws, policies and regulations to assist in the proper development of this sector; while ensuring environmental sustainability, broad social support, and avoidance of detrimental aspects of development, or possible conflicts in the future uses of ocean space.

Important Early Sectoral Accomplishments

It is important to realize that although much remains to be done, a great deal has already been accomplished. Over the past several years a number of infrastructural, procedural, legislative, and regulatory steps have been taken in support of renewable energies broadly and marine renewable energies, specifically. All of these changes are listed below:

- **Ocean Energy Environmental Research (OEER)/Ocean Energy Technical Research (OETR)** – two independent not-for-profit corporations that operate at arm's length from the Department of Energy. The goals of these associations are to fund offshore energy, environmental, and geosciences research and development related broadly to marine energy issues. Created in 2006 they have played an important role in guiding research relative to tidal in-stream energy recovery, such as tidal resource assessment, sediment dynamics, and near- and far- field effects due to turbine presence.
- **Fundy Ocean Research Centre for Energy (FORCE)** – is a not-for-profit research centre, located on the shore of Minas Basin, It has a highly qualified independent board of directors and is supported by public and

private funding. FORCE will be used to test in-stream turbine devices in tidal waters of the Bay of Fundy, which is known to possess the most demanding conditions anywhere in the world. In addition, considerable attention will be paid to many environmental issues, such as, tidal flows, seabed habitats, fisheries activities, ship traffic, and the complexities of the sea floor off the planned demonstration site in Minas Passage.

- **Strategic Environmental Assessment (SEA)**[4] – In 2007-2008 the Nova Scotia Department of Energy provided funding to OEER to enable it to conduct a preliminary Strategic Environmental Assessment of tidal energy development in the Bay of Fundy. The objective of the SEA was to "assess social, economic and environmental effects and factors associated with potential development of renewable energy resources in the Bay of Fundy with an emphasis on in-stream tidal. The SEA [was meant to] inform decisions on whether, when and under what conditions to allow pilot and commercial projects into the water of the Bay of Fundy and under what conditions renewable energy development is in the public interest over the long term"
- **One-Window Standing Committee** –Federal and provincial authorities brought together under the Federal-Nova Scotia Assessment Agreement to help ensure that the current regulatory process is as coordinated, effective and efficient as possible. The committee consists of key federal and provincial regulators from 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 Natural Resources.
- **Demonstration Projects** – initially, four demonstration projects, beginning in 2011, will showcase emerging in-stream tidal power technology. They are presently sanctioned for 4 years (2+2) although longer tenures appear to be anticipated or even expected. The demonstrations will be carried out on full size prototypes, to be followed by multiple units in pre-commercial farms. Up to 5 MW of electricity is expected to be generated during this initial process. The four proponents include: Nova Scotia Power and Open Hydro; Minas Basin Pulp and Paper and Marine Current Technologies; Allstrom and Clean Current; and, Atlantis, Lockheed Martin Canada and Irving Shipbuilding.

[4] Jacques-Whitford 2008

- **Fundy Subsea Cables** –Four subsea cables have been produced and will be installed in 2011 in the Minas Passage test site. They will connect demonstration turbines with the FORCE transmission substation, thereby permitting access to the Nova Scotia electricity grid. These cables, when fully engaged, can carry 64 MW, thereby providing considerable expansion capacity.
- **Community-Based Feed-In Tariff (COMFIT)** – An economic device to encourage the development of local renewable energy projects by municipalities, First Nations, cooperatives and non-profit groups. It allows these groups to receive an established price per kilowatt-hour for projects producing electricity from qualified renewable resources. It is anticipated that 100 MW of power from these projects could be delivered to the grid at the distribution level.
- **Tidal In-Stream Feed-In Tariff (FIT)** – This economic device covers direct incremental costs related to technology deployments for developmental tidal arrays connected to the grid at the transmission level
- **Enhanced Net Metering** – A program that allows consumers to meet their annual electricity needs of up to 1 MW using electricity generated by their own facilities. The facility must be connected to the distribution grid through a meter that measures the flow of electricity in both directions.
- **Non-Marine Enhancements** – The following legislative accomplishments speak to change occurring in Nova Scotia along a broad renewable energy front. Approvals have been received for: additional responsibilities, directly related to renewable energies, for the provincial Utilities and Review Board; the position of a provincial Renewable Electricity Administrator; enhanced biomass use as a renewable source; and, the signing of an agreement between Newfoundland and Nova Scotia to develop, extract and transport 825 MW of hydro power from the Lower Churchill in Labrador, of which Nova Scotia will claim 20%, while 40% is expected to transit through Nova Scotia into Maritime and New England markets.

Guiding Principles

Up to the present, in the absence of specifically targeted legislation, responsible authorities were guided in their early decision-making regarding the in-stream tidal initiative by using an *ad hoc* assemblage of principles. There is good evidence that these principles, deemed to represent the interests of Nova Scotians, have been rigorously adhered to throughout the early stages of the tidal in-stream

development process. They are repeated here because they continue to be relevant to the ongoing process of marine renewable energy development. They are a promise:

- To protect the marine ecosystem
- To embrace a process of collaboration and consultation
- To employ an adaptive and staged framework for development
- To consider health and safety as priorities
- To ensure environmental protection and conservation of natural resources
- To recognize a balance of interests offshore
- To develop industry in a sustainable manner
- To maintain and ensure community sustainability

Marine Renewable Energy Sector

For the purposes of this consultation the term marine renewable energy (MRE) includes four technologies that vary greatly in maturity. They include: offshore wind, waves, tidal height, and tidal in-stream energy conversion (TISEC). Nova Scotia's long-term stated goal is to embrace and advance all four technologies in that sector. The present consultation may appear somewhat skewed because of the present emphasis on TISEC but that is simply an initial point of departure.

The general assessment of these technologies is somewhat mixed at the present time, presumably because they remain for the most part an immature subset of the renewable industry as a whole. According to a recent article in the Business Section of the New York Times [5] the marine renewable energy sector " has had limited popularity and mixed success, even as the number of installations generating power from other renewable resources like the wind, sun and biomass has grown rapidly". However, a major U.S. consulting firm[6] offers a contrary view by suggesting that over the next few years we can expect to see huge advances in our ability to harness power from the ocean's waves and tides. They also feel that the global ocean energy sector is at a turning point with more than 45 wave and tidal prototypes ocean tested in 2010 and 2011, when only nine were tested in 2009. These four technologies are briefly reviewed below.

[5] NY Times 2010
[6] IHS 2010

Offshore Wind

The first offshore wind farm became operational in 1991 in Vindeby, Denmark. By 2008 large offshore wind farms had been built in Denmark, U.K., Netherlands, Ireland and Sweden with a total capacity of 1200 MW, while present capacity is estimated at 3 GW online, and a further 2 GW under construction. Over the five year period to 2015, more than 11 GW of new capacity will be installed. The UK, Germany and China, the three biggest markets, will together install approximately 83% of total capacity for the period. The UK consultant Douglas-Westwood has conducted research that anticipates an expenditure of $60.7 billion over the next five years. The UK will continue its leadership position for offshore wind through that period, with China becoming the world leader in offshore wind early in the next decade. By 2015 annual expenditure is expected to be $19B.[7]

In North America plans are underway to construct a $5 billion, 560 km long submarine cable 30-40 km off the coast of the United States stretching from New Jersey to Virginia. This will serve as an energy superhighway capable of receiving and moving 6 GW of clean energy received from offshore turbines, thereby offering an efficient approach to energy aggregation and delivery to shore-based facilities with eventual access to the North American grid. Although no offshore wind farms presently exist off the Atlantic coast of North America the Obama administration recently announced[8] that the Interior Department would expedite environmental reviews of six potential wind sites. They have set a goal of 10 GW by 2020 and 54 GW by 2030. Wind farms are widely viewed as a reasonably mature technology on land, and with offshore capacity growing rapidly the marine component is not far behind. One important contributing factor behind this recent surge is that the cost of onshore wind power has dropped to record lows and in some regions has become competitive with coal-fired electricity.

Wave Energy

Research in this area can be traced back to a patent awarded in France in 1799. In 2011 perhaps 50 competing designs are being pursued to convert kinetic energy in ocean waters into mechanical energy using different approaches with the common goal of turning a turbine or generator to produce electricity. Of the 50 known competing designs perhaps 10 devices are approaching commercial

[7] Marine Technology Reporter 2010
[8] U.S. Department of Energy 2011

viability. This technology holds great promise as a potentially useful resource with estimates of 2 TW per year deemed possible. Due to the direct influence of prevailing westerly winds, wave energy is normally available between 40-60 degrees of latitude.

Despite the general belief that these technologies are not quite ready for deployment the Agucadora wave farm was created off the northern coast of Portugal. This multi-unit facility is made up of several flexible, articulated, cylindrical semi-submerged devices. Unfortunately the experiment met with mixed results before it was halted for financial problems. One stumbling block was that the floating machines, like many other wave experiments that preceded it, absorbed wave energy and quickly broke under their constant assault. Wave energy extraction is presently considered to be an immature technology.

Tidal Height

Also commonly referred to as tidal barrages or tidal lagoons, this technology extracts energy from water as it moves into and out of some form of holding basin. Three operational tidal barrages presently exist. The largest and best known straddles the entrance to the La Rance estuary in northern France where the extraordinary tidal ranges of the English Channel produce 240 MW. Next is the facility in Annapolis Royal, well known to Nova Scotians, capable of generating 20 MW. And finally, the modest Russian facility at Kislaya Guba adjacent to the Barents Sea generates 0.5 MW. Tidal lagoons differ from barrages in that they do not block an estuary with a barrier since offshore tidal power generators use an impoundment structure making it completely self contained and independent of the shoreline. Most would agree that the barrages are quite mature while the tidal lagoons have yet to be rigorously tested.

Tidal Currents

Tidal current and tidal height technologies have been in use for centuries to power coastal machinery such as forges and mills. The first modern in-stream current generator in Canada was installed at Race Rocks on southern Vancouver Island in 2006. Shortly afterward, 6 three-blade turbines were installed in New York's East River (Roosevelt Island Tidal Energy Project), which has to date delivered 50 MW into the New York grid. However, the most recent and best known initiative for Nova Scotians is underway in Minas Passage in the Bay of Fundy. Four consortia will position and test different technologies on the sea

floor, initially as demonstration projects and later, if approved, as fully commercial energy producers. The activities in the Minas Passage are consistent with research and development of TISEC which over a four year period early in this decade underwent a five-fold increase in the number of funded projects. It is viewed as a reasonably mature technology. For both the wave and tidal sectors, a large number of devices are presently under development but with no particular design having yet emerged as the obvious front runner.

Development Framework

In the absence of comprehensive supporting legislation and regulation much of the early efforts in tidal current development have been successfully cobbled together in what might be referred to as an *ad hoc* approach. It is to the credit of the Nova Scotia Department of Energy that this stepped process has resulted in a workable framework that is inclusive, flexible, and responsive, albeit somewhat limited when considering the future development of an entire multi-technology sector.

The framework is not without problems but it does offer a logical, broadly-based and stepped approach upon which to base future development, especially as a vehicle: to introduce new technologies into a dynamic energy-rich environment; to understand the resulting environmental effects; and, to integrate new activities with traditional uses. In addition, the legislative and regulatory issues discussed further on are inextricably linked to various steps in the framework. The principal steps in the Development Framework include:

- **Strategic Environmental Assessment**
  (Government-driven, broad regional overview of project development, emphasizing baseline data collection and the possibility of multiple initiatives
- **Investigation**
  (Industry-driven, project-specific, emphasizes site planning, facility design, and due diligence)
- **Demonstration**
  (Addresses: engineering validation, environmental Impacts, user conflicts, technology optimization, progressive regulatory development and consultation)

- **Development**
  (Reviews: environmental impacts, user conflicts, grid-connection prototypes, close proximity interactions, construction-operation-maintenance costs, engineering validation, regulatory refinement)
- **Commercial Operation**
  (Advances: projects and industry that have demonstrated commercial viability)
- **De-Commissioning**

Several issues were raised in the consultation process that are worthy of mention in the context of possible regulatory measures. These include the absence of a step within the framework entitled Project Termination. This could be invoked if important environmental, technical or socio-economic violations to the operational code were detected. Also, financial guarantees were recommended to accompany project commercialization in order to ensure proper decommissioning of a particular device. Finally, one issue common to all framework stages is the apparent lack of well defined criteria, against which decisions would be made regarding whether a project would advance from one level to the next. This was especially true about the transition from Development to Commercial Operation, but it would apply to every transitional step.

Legislation

Nova Scotia's goal is to utilize marine resources within its jurisdiction in order to access a clean, renewable source of energy. In the absence of a specific regulatory structure considerable ambiguity, misconceptions and presumptions exist. Specific areas of need have been identified, namely: creation of a policy framework for siting, permitting and developing offshore renewable energy facilities; reduction of regulatory complexity and redundancy; recognition of and support for environmental protection, worker safety, and public resource conservation; recognition of competing users and uses; and, consideration of potential revenue-sharing, among others.

Common practice in these situations is to review existing legislation in other jurisdictions and to derive guidance and insights from the development process of others. Unfortunately that is not an entirely viable option, because even though

other countries, notably the UK and Denmark are more advanced in these areas, rather than developing coherent holistic plans in support of their MRE activities have opted for a "piecemeal" approach tailored to their specific and immediate needs. In addition, countries oftentimes approach legislation from uniquely idiosyncratic viewpoints, sometimes making it inadaptable in a foreign setting. This suggests the need for an essentially independent Nova Scotia process that would address current and future needs through a multi-pronged approach that addresses legislation, policy delineation and regulation as three equally important tools.

Legislative changes could take the form of revisions of existing laws or the development of entirely new legislation. Each approach carries with it benefits and shortcomings. Revisions are probably more efficient but the result is legislation dispersed over as many as 4-6 provincial and an equal number of federal departments. So tinkering or revising enshrines new laws in a system some view as flawed, slow, inefficient and at odds with the stated goal of streamlining the MRE sector. Writing entirely new legislation also carries tradeoffs in that while the final product is consolidated and tightly focused it can sometimes take an extended period to produce and involve many different players, some of whom may not appreciate the need for short time lines.

One final consideration is the present state of the technological environment, or more specifically its present rate of change. On the whole the MRE sector contains emerging technologies, suggesting that opportunities are indistinct and timing is uncertain. It is not unrealistic to anticipate considerable technological change, along with many inextricably related issues, in years to come. The absence of predictability, reasonable assurances or even a lengthy track record, should be viewed as important considerations. It is probably unwise to be too detailed or prescriptive when defining legislation as it may quickly become insensitive, unresponsive, or inflexible in a rapidly changing environment. Instead, in some cases legislation might be by-passed in favor of greater flexibility offered by efficient regulations (see section on Regulation near the end of this document) as a means of controlling and encouraging this nascent MRE sector.

Existing Legal Framework

Federal and provincial jurisdictional issues relevant to the possible extraction of marine renewable energy are complex and unlikely to be resolved in the near

future. For example, Nova Scotia has a strong claim to portions of the Bay of Fundy but this issue remains legally unsettled. In addition, specific activities conducted in one jurisdiction might well be subject to the laws of another. The present situation underlines the need for a full range of interactions between responsible authorities that could potentially embrace intergovernmental cooperation, collaboration and possibly integration as the development of this sector advances. A more complete discussion of these issues is available elsewhere[9]. Meanwhile, below is an annotated list of selected relevant federal and provincial legislation applicable to marine offshore energy activities[10].

Federal Regulatory Legislation

Canadian Environmental Assessment Act **(CEAA)[11]**

The Canadian Environmental Assessment Act, administered by the Canadian Environmental Assessment Agency, will almost certainly come into play during the course of the immediate tidal in-stream initiative in the Bay of Fundy as well as the remainder of the marine renewable energy sector throughout the province's coastal waters. This act addresses projects that involve federal decision-makers, fall under federal legislation, use federal funding, contain federal proponents, take place on federal lands or fall under federal jurisdiction. Assessments are carried out, in ascending order of complexity through the use of the following processes: screening, comprehensive studies, panel reviews, and joint panel reviews. Joint panels report to both federal and provincial ministers. All but the screening approach require public engagement.

Species at Risk Act **(SARA)[12]**

The responsible authorities for SARA are Environment Canada and the Department of Fisheries and Oceans. SARA has been designed to protect identified species considered to be at risk on federal lands, including territorial seas and internal waters. Species are protected through a process of general prohibitions combined with project permitting requirements to avoid certain potentially harmful activities. Some species that could be affected by tidal power projects include: North Atlantic right whale, leatherback turtle and Atlantic salmon. Since SARA legislation has been in existence less than a decade the data

[9] Doelle 2009
[10] Doelle et al 2006a, Doelle et al 2006b, Doelle 2009
[11] CEAA 1992
[12] SARA 2002

necessary to properly carry out its spirit and intent may not be complete, which is an ongoing concern of some importance.

***Fisheries Act* (FA)[13]**

The Fisheries Act is federal legislation dating back to Confederation. It was established to manage and protect Canada's fisheries resources. It applies to all fishing zones, territorial seas and inland waters of Canada and is binding to federal, provincial and territorial governments. As federal legislation, the *Fisheries Act* supersedes provincial legislation when the two conflict. The prime focus of the DFO Habitat Management Program's regulatory activity is Section 35 of the *Act*, which is a general prohibition of "harmful alteration, disruption or destruction" (HADD) of fish habitat, which could possibly result from the construction, operation and/or decommissioning of tidal projects.

***Navigable Waters Protection Act* (NWPA)[14]**

The NWPA, currently administered by Transport Canada, applies to the Bay of Fundy because it is a navigable water and a permit is required for any work that is built, placed in, on, over, under, through or across any navigable water.

***National Energy Board Act* (NEBA)[15]**

The NEBA is responsible for energy projects of an inter-provincial or international nature. Projects that cross provincial boundaries extend beyond the territory of a province or include an inter-provincial or international power line, a certificate or permit is required. It is unlikely that the NEBA will apply to the construction and operation of most tidal energy project projects. However, if infrastructural improvements are needed to export some or all of the electricity generated from the tides of the Bay of Fundy to New England, a certificate of public convenience and necessity would be required.

***Oceans Act (OA)*[16]**

With the passage of the Oceans Act in 1996, the release of the Ocean's Strategy in 2002 and Canada's Ocean Action Plan in 2005 a new legislative and policy framework was created to modernize oceans governance. The Oceans Act, founded on the principles of Sustainable Development, Integrated Management

[13] FA 1985
[14] NWPA 1985
[15] NEBA 1985
[16] OA 1996

and the Precautionary Principle, is clearly relevant for tidal projects in a number of ways.

Additional federal legislation that could be applicable is listed below, although their possible roles, if any, are less clear than those described above.

- **Migratory Birds Convention Act**
- **Canada Environmental Protection Act**
- **Shipping Act**
- **Canada Labour Code**
- **Canada Human Rights Act**

Provincial Regulatory Legislation

Nova Scotia Environment Act (NSEA)[17]

Environmental assessments for tidal energy projects over 2MW are mandatory. Projects of that nature are listed as Class 1 undertakings and must be registered with the Minister in accordance with the Environmental Assessment Regulations. Such a project cannot commence until the Minister has granted approval following completion of the EA. Additional restrictions would likely come into play if the project is also subject to additional reviews by municipalities or the federal government. At that time the act allows the Minister to enter into an agreement with the additional party in order to conduct a joint assessment.

Fisheries and Coastal Resources Act (FCRA)[18]

This Act specifically addresses approvals for aquaculture activities below the coastal low-water mark. Potential conflicts are always possible between a licensed aquaculture operation and tidal in-stream activities although the need for elevated tidal currents in the latter could ultimately reduce potential overlap. If, for the sake of argument, conflicts arise over a specific site there does not appear to be any provision in the Act to address those conflicts. Although this specific example addresses aquaculture it is in fact a generic issue that could just as easily be concerned with any number of potentially conflicting uses in the Bay of Fundy, such as, fishing, tourism, recreation, or ship traffic. Marine Spatial Planning is often used to address this type of conflict, normally followed by new

[17] NSEA 1995
[18] FCRA 1996

or modified legislation. However, at this moment the absence of detailed information regarding planned energy extraction makes this discussion moot.

Endangered Species Act (ESA)[19]

The ESA mandates the compilation of a listing of endangered or threatened plant and animal species out to the coastal low-water mark. Species listed are then subject to a number of prohibitions which are in force unless otherwise specifically authorized in the Act or through the use of permits or approvals.

Energy Resources Conservation Act (ERCA)[20]

This Act was created to regulate and ensure efficient practices in the exploration, development, production, transmission and transport of energy resources on all Nova Scotian lands (including those below the low-water mark). Although this legislative authority was originally developed to create regulations for the oil and gas sector it provides for the economic, orderly and efficient development of all energy resources in the public interest, which would include the nascent marine renewable sector.

Electricity Act (EA[21])

The Electricity Act passed in 2004 made important changes to Nova Scotia's electricity sector with the introduction of the renewable portfolio standard that mandated energy providers supply specific percentages of electricity from renewable sources. In addition, the Act also mandated Nova Scotia Power Inc (NSPI) to develop an open access transmission tariff (OATT), so as to allow the Nova Scotia electricity market to operate more inter-provincially and internationally with regard to imports and exports. In 2010 the Electricity Act was amended[22] with the addition of an enhanced net-metering program, the establishment of a feed-in tariff for small scale community-based renewable energy projects (COMFIT) and developmental tidal arrays (special FIT), and the appointment of a renewable electricity administrator to oversee independent power-producer competitions for medium and large-scale renewable electricity projects. All of these changes have moved the legislative and regulatory framework to a position of greater support for renewable energy sector and specifically for the marine component.

[19] ESA 1998
[20] ERCA 2000
[21] EA 2004
[22] EA 2010

Public Utilities Act (Utilities Act)[23]

The Utilities Act primarily deals with the procedural activities of the Utility and Review Board (UARB) and its regulatory powers over NSPI. Amendments to the Electricity Act in 2010 broadened the capacity of the UARB to address renewables generally and MRE specifically. The addition of community-based feed-in tariffs, special feed-in tariffs, enhanced net metering and the creation of a renewable electricity administrator are among the changes made to the powers of the Board.

Environmental Goals and Sustainable Prosperity Act (EGSPA)[24]

The EGSPA sets the overall goal of fully integrating environmental sustainability and economic prosperity. In the process, the province seeks to become an international leader in environmental sustainability while achieving economic prosperity above the Canadian average by the year 2020. The Act sets more specific targets that are relevant to the development of tidal energy, including goals with respect to greenhouse gas emissions and the use of renewable energy for the generation of electricity. The overall goals and specific targets may not directly translate into decisions on whether, where, when and under what conditions to encourage or permit tidal power development, but they are likely to provide important context for future decisions on this new industry.

Additional provincial legislation that might be applicable is listed below, although their possible roles, if any, are less clear than those described above.

- **Crown Lands Act**
- **Beaches Act**
- **Special Places Protection Legislation Act**
- **Municipal Government Act**
- **Wilderness Areas Protection Act**
- **Occupational Health and Safety Act**
- **Labour Standards Code**
- **Human Rights Act**

[23] PUA 1989
[24] EGSPA 2007

- **Provincial Parks Act**
- **Trade Union Act**
- **Workers Compensation Act Health Protection Act**
- **Health Protection Act**

Consultations

Legislative consultations were promised to Nova Scotians in the province's response to the Bay of Fundy Strategic Environmental Assessment (SEA). They were intended to build upon earlier activities and relationships established during the course of the SEA and to engage the public prior to commercialization of any tidal current demonstration projects. This process was directly focused on the eventual creation of legislative tools to help guide the development of the MRE sector. New legislation would influence public confidence in the ability of government to: manage environmental impacts, ensure resource sustainability, encourage the realization of economic opportunities, fill in gaps in current legislation, coordinate and integrate an efficient regulatory approach while also avoiding overlap and confusion in jurisdictions and legislated mandates.

In preparation for formal consultation two documents were prepared by the Department of Energy entitled "Marine Renewable Energy Legislation for Nova Scotia "and an excellent companion "backgrounder" that provided additional detail. Together these two documents offer a clear and well-explained array of issues and choices facing Nova Scotians. It was hoped that they would provide a starting point for the consultative discussions and lend some public bias to the legislative decision-making process. These documents were circulated and made available online, one month prior to the public meetings.

Two consultations (by invitation) were held on: 2 November 2010 at the Old Orchard Inn in Wolfville and 4 November 2010 at the World Trade and Convention Centre in Halifax. Approximately 50 people were in attendance. In addition, discussions took place: on 9 November with the Executive Director of FORCE, on 30 November 2010 and 11-12 May 2011 in Ottawa with federal and provincial regulators representing a wide range of responsible authorities, and lastly on multiple occasions over the course of this process with provincial Department of Energy, OEER and OETR personnel. In addition written submissions were received before, during and after the public meetings.

Building on a Firm Foundation

During the course of the consultations and later analysis of the results, it became increasingly clear that insufficient information was available to define future legislation in any detail. The consultations were useful and the supporting documents were good but serious omissions remained, namely a clear enunciation of important sectoral elements such as goals, objectives and timelines, or perhaps more specifically, an overview of long-term planning, insights regarding potential public benefits, anticipated natural and social science research, as well as expectations regarding the anticipated regulatory framework.

Responsible legislation should embrace consensually-derived principles, objectives and goals that help to guide the legislative process and subsequent decision-making. Following a clear enunciation of principles the province would be in a much better position to design, develop and operate a detailed regulatory process that would permit individual projects (both large and small) to advance in support of sectoral development. Although the evolution of the MRE sector has often been described in general terms, no detailed plan presently exists to fill in the requisite gaps.

A properly developed Strategic Plan would function as a de *facto* statement of intent. It would identify where we are at present (Values and Shared Beliefs), where we intend to go (Vision), and, it would identify goals and policies that will get us there (Mission). Strategic planning would assist with the development of "a comprehensive policy framework for future decisions at the project level [and would] be the key to any effective governance framework"[25] for the future development of the MRE sector. Such a plan must define objectives and priorities in order to place the province "in a position to develop a regulatory response to maximize opportunities to reach these objectives collectively"[26]. Hopefully the final product would comprise, as a minimum, all four components of this report: Planning, Economic Opportunities, Research, and Regulation.

The absence of a clearly delineated plan at this time casts doubt on the wisdom of attempting to develop a full legislative undertaking when one considers the following items:

[25] Doelle et al 2006
[26] Ibid

- The tidal in-stream industry does not presently exist in Nova Scotia, nor do we have any real sense as to what it will look like in the future;
- The three additional components of the planned MRE sector (offshore wind, wave energy and tidal height) are even less well defined than the fledgling tidal in-stream industry; and,
- Several years are expected to pass between the commencement of the Demonstration Phase (2011) and possible commercial viability (2015 - 2016), so that legislation created now would be based on tenuous assumptions regarding the stability or volatility of the energy, economic, social, financial and technological sectors.

At this juncture there are three possible courses of action for the remainder of this report. First, acknowledging that legislation might be premature, a thorough discussion of all relevant issues could be conducted but no legislative recommendations would be offered. Second, broad, somewhat tentative legislative recommendations could be made that only reflect inputs from the consultation process, even though many gaps and much uncertainty exists. Third, overarching recommendations would be offered on all of the key foundational issues, including legislation. This might be viewed as an analog of the incremental technological approach that has been embraced elsewhere. Overarching recommendations would reflect generally understood broad strokes of MRE planning that are essential to create a firm foundation for the future advancement of that sector. This approach would also lend itself to greater applicability to MRE issues across Canada rather than being viewed simply as a specifically Nova Scotian initiative. This latter course has been adopted for the remainder of this report.

RECOMMENDATION 1: It is recommended that the Department of Energy embark on the creation of a strategic plan for the development of the marine renewable energy sector in Nova Scotia, with an immediate emphasis on the tidal in-stream energy conversion (TISEC) initiative. The plan should consider a five-year horizon and range from a broad-brush overview of sectoral expectations to a detailed analysis of Planning, Socio-Economic, Research and Regulatory issues raised in the consultative background document.

RECOMMENDATION 2: It is recommended that the Department of Energy include within the proposed strategic plan a complete set of guiding principles for the

MRE sector (along the lines of those informally promulgated) so as to provide an overarching view or common foundation for all future legislation.

RECOMMENDATION 3: It is recommended that the Department of Energy develop a licensing system that contains clear quantitative criteria, against which decisions would be made regarding advancement of industrial activities from one level to the next within the Development Framework. Of special interest are the criteria that would govern the transition from Demonstration to full Commercial.

The Issues

The pre-consultation discussion and background documents identified and expanded on a very large number of issues of varying importance. Whether or not a specific item ultimately becomes the focus of actionable legislation will depend on a number of factors. However, all of the issues presented below have been drawn from those documents, although they have been reorganized and consolidated into several broadly inclusive categories **(Planning, Economic Opportunities, Research, and Regulation)** in order to facilitate their discussion and treatment. In fact, many of the issues are addressed in a broadly integrative manner rather than dividing, separating and treating them as separate entities. In some respects this interconnected and interdependent approach might be viewed as a form of self regulation, exhibiting some checks and balances, since no issue stands alone independent of others. Even though each of the following issues has been thoroughly discussed in the pre-consultation documents they are once again reviewed here in order to form a coherent and complete document.

Planning

Nova Scotia's interest in marine renewable energy sector is evidenced by its present involvement with tidal in-stream technology. Throughout its history the Bay of Fundy has been continuously used by Aboriginals, Europeans and Canadians but that usage has changed depending on extant circumstances. Present activities are simply part of that continuum. Preliminary approaches to MRE technology have introduced new activities into the land-water interface commonly referred to as the coastal zone. Traditional activities, such as fishing and transportation, have been excluded from some areas while the first of several very large in-stream turbines was positioned and then operated in Minas Passage. It is hoped that those exclusions, plus others bound to occur with increasing MRE activity, will be seamlessly integrated into the whole, using accepted approaches

of information accessibility and transparency, consultation and collective planning. In that way potential conflicts will be lessened with the development of a comprehensive management plan.

Public Involvement

It has become accepted practice to invite public participation in transitional activities that can potentially impact on various levels of society. This is especially true for environmental assessments where this requirement has become part of the code of practice used by the Canadian Environmental Assessment Agency[27]. CEAA refers to the public in the broadest sense including in that designation individual citizens, communities, municipalities, first nations and NGOs. However, despite this practice many situations or issues are not covered by rules, regulations, legislation or accepted practice. Consider: development activities; strategic planning; potential regulatory changes; documenting traditional knowledge; taxation issues, zoning, or infrastructure modifications. Also, ensuring regular exchanges between different levels of government, for example, introducing municipalities into Federal-Provincial discussions on any number of issues could prove to be very important. Regardless of the topic or the venue, the issue devolves to a search for mechanisms that will ensure a broad and continuing involvement by the public in present and planned activities related to marine renewable energy extraction. An important contributor to the balance between public and private interests is to ensure that all parties are well informed and well represented in all relevant discussions. Legislation might not be able to guarantee either of those expectations but it can provide some essential preconditions, namely, access to information and membership in relevant organizations.

Individual, Community and Municipal Engagement

Individual involvement in the development of the MRE sector will take many forms: unbridled support for the technology, concern for the environment, a desire to actively participate, a wish to share in some of the benefits, or the provision of local ecological knowledge. Dissemination of critically needed objective information, such as a development strategy, timelines, local site specific information, and planning decisions, would enable informed decision-making by stakeholders. Exchange of this information would send a strong signal of openness and transparency. In addition, active collaboration with environmental stakeholders could identify areas deemed worthy of protection,

[27] CEAA 1992

help to mitigate key environmental and social risks, reduce existing data gaps, and possibly contribute to a discussion on the best approach to incorporate natural resource considerations into the permitting and siting process. Such an approach would ensure the development of grassroots capacity that would, in the long-term, assuage concerns and provide support for a province-wide sectoral initiative.

Well informed persons without a venue to exercise their concerns or interests would almost certainly see themselves as excluded from the process. However, legislating contact details, given the inherent unpredictability of an evolving sector, could be seen as unduly confining. Instead, one might follow the approach used in CEAA legislation that emphasizes the need for public engagement throughout the environmental assessment process, and often well into a project's operational phases. In this case legislation simply ensures that public engagement occurs while the exact details will be spelled out during the assessment or through the actions of a regulator.

Communities and Municipalities define the Province of Nova Scotia. No community is further than 50 km from the ocean and all 18 municipalities embrace some part of the coastline. The ocean and its resources, such as fishing and shipping, have been shared by Nova Scotians from earliest days. The extraction of renewable energy is a new usage of the marine environment but in other respects it is no different than earlier benefits. In fact, the development of this resource might very well displace or alter some long standing traditional activities, although there is no evidence of that possibility at the moment.

RECOMMENDATION 4: It is recommended that the Department of Energy produce a clear statement of its intentions regarding the degree of transparency and public involvement it wishes to achieve throughout its advancement of the MRE sector. This statement should address the full range of planning activities, economic opportunities, research and regulatory issues.

RECOMMENDATION 5: It is recommended that the Department of Energy develop a comprehensive and accessible communication/education/outreach strategy, targeted variously to different affected parties, in order to advance their comprehension and further their engagement in marine renewable energies as the province advances this initiative.

RECOMMENDATION 6: It is recommended that appropriate Provincial and Federal government departments collaborate in the modification of existing environmental assessment regulations that apply to the role of project-specific public participation in the advancement of the MRE sector, with special emphasis on information transparency, access to planning documents, and participation in public consultations.

First Nations

First Nations are also included in the comments outlined above that refer to the public (broadly defined). In addition, they also warrant special treatment based on their historical rights and title claims. The consultation documents outlined the relevant issues very well. They make clear Nova Scotia's commitment to "encourage the sustainable development of marine renewable energy in a manner consistent with the recognition and affirmation of existing Aboriginal and treaty rights in section 35 of the Constitution Act, 1982, including the duty to consult". Consultations are, in fact, ongoing between the Mi'kmaq and Nova Scotia under the aegis of the Mi'kmaq-Nova Scotia-Canada Consultation Terms of Reference. Discussions are focused on understanding and addressing potential infringements on Aboriginal or treaty rights. In addition, a Mi'kmaq Renewable Energy Strategy is being developed that will include tidal energy. The Province is currently working with the Mi'kmaq to develop a renewable energy strategy. Also, discussions are ongoing regarding current and future electricity projects, and their policy implications. It is more than likely that extant regulations will change following completion of ongoing consultations

The province working through OEER and FORCE commissioned the Mi'kmaq Ecological Knowledge Study (MEKS), an investigation of the planned tidal in-stream project site using traditional knowledge. The purpose of the MEKS was to gather and document ecological knowledge within the area held by the Mi'kmaq community which has been passed on from generation to generation. This study involved several archaeological sites, some of which contained cultural artifacts, along with plant and animal harvest sites. Plans are underway to extend MEKS, first, to the upper bay and then eventually to the entire bay.

Traditional knowledge, in the broadest sense, is information collected experientially by individuals living close to the land or the ocean over many

generations. This knowledge complements natural and social science by providing insights that would almost certainly be otherwise unavailable. It can be found in any group but it is personified most clearly and appropriately in the Aboriginal experience because of: the length of time over which observations were made, the resolution and continuity of observations associated with a specific geographic area, the inclusion of information regarding historical and cultural sites, and many observed correlations between seemingly disparate ecosystem components. As with modern science, traditional knowledge has many strengths and weaknesses but on the whole is considered a valuable adjunct to other approaches when collecting information to support the environmental impact assessment process. CEAA agrees and stresses the need to gather Traditional Knowledge whenever possible.

Relevant Comments Received

Below are representative examples of the verbal and written input received on the subject of Planning during the consultation process:

- We need a communication and education strategy that builds bottom-up support;
- Establish a provision for project and site-specific information to be made available to the public;
- Details of community engagement should not be specified in legislation but rather tailored to specific projects;
- Community partnership should be made mandatory;
- Nova Scotia government should develop an integrated management plan for the Bay of Fundy;
- Province should support the development and implementation of marine spatial planning process carried out by the federal government; and,
- Legislation should include a clause requiring proponent consultation with Mi'kmaq for MRE projects in accordance with the Consultation Terms of Reference, and all approvals should be dependent on consultation with the Mi'kmaq.

RECOMMENDATION 7: It is recommended that the Department of Energy provide a clear public statement reaffirming the need for continued consultation with First Nations, expressing support for aboriginal aspirations regarding renewable energies, encouraging participation and the supply of services in individual

initiatives, and, reaffirming the importance and role of Traditional Knowledge in future decisions regarding the MRE sector.

Integrated Coastal Management

Nova Scotia is practically an island with a coastline approximately 13,000 km in length[28] (depending on the mode of measurement) and, not surprisingly, a long and remarkably intertwined association with the sea. Over the centuries the ocean has played a prominent role in the psyches of Nova Scotians due in large measure to the dependencies that were forged in those associations. Surprisingly, very little legislation exists that directly governs the manner in which coastal areas are treated. Many conflicts exist among various multiple uses such as living and non-living resource extraction, tourism, recreation, ports, protected areas, community development and industrial projects. Marine renewable energy represents but one more potential usage that carries with it potential benefits and conflicts.

Marine renewable energy will draw on several technologies that eventually will be positioned in Nova Scotia coastal waters. To some this will represent economic opportunity while for others may be viewed as potential conflict. There is a rapidly growing need to address the many and varied uses presently extant within the coastal zone, as well as additional planned activities. Coastal planning falls under the broader rubric of Planning and as such it contains public participation, as a key component, a participative process that covers the full cycle of information collection, planning, decision-making, management and monitoring.

Issues repeatedly discussed concern public involvement in a process to address spatial conflicts, competing uses, potential benefits agreements and safety zones. Many uses have evolved over hundreds of years and with the sudden appearance of new interests and activities some pressures will certainly arise. Resolution of these conflicts will require a forum perceived as fair and transparent in which all parties will be able to state their claims and, assuming that some displacement were judged to occur, receive some form of compensation. This is especially important when the claims presented directly impact on individual's livelihoods. One could imagine such a scenario arising from the delineation of marine safety zones where the goal would be to protect the public while unfortunately

[28] Our Coast 2009

excluding traditional uses. Such a process would, in addition to minimizing conflicting uses, unite governments, communities, researchers and managers along with sectoral and public interests.

The planned introduction of several different forms of energy extraction underlines the need for a comprehensive and proven process. In 1992 at the Earth Summit in Rio de Janeiro the concept of Integrated Coastal Zone Management (ICZM) was promulgated and eventually adopted by many nations of the world. The European Commission[29] defines ICZM as:

> "a dynamic, multidisciplinary and iterative process to promote sustainable management of coastal zones. ICZM uses the informed participation and cooperation of all stakeholders to assess the societal goals in a given coastal area, and to take actions towards meeting these objectives. ICZM seeks, over the long-term, to balance environmental, economic, social, cultural and recreational objectives, all within the limits set by natural dynamics."

There has been an awareness of the need for coastal planning for some time. In fact, a consortium of Nova Scotia government departments has been participating in the Provincial Ocean Network (PON) for several years with the express purpose of moving the province toward some form of Coastal Strategy. However, the advent of a potentially new industry has brought that awareness into very sharp relief. A Coastal Strategy for the entire province that meaningfully addresses the multiple uses of the coastal and near shore and is established before any serious renewable energy activities are initiated, would be most desirable, but may be impossible if the new sector emerges quickly (or the PON process slows). However, even a partial first step for the Bay of Fundy would be a very positive move. Such a plan would offer considerable protection and predictability to all users, not the least of which are the private-sector developers of renewable energy who might run the risk of being held to ransom as newcomers to the region.

[29] European Commission Coastal Zone Policy

Marine Spatial Planning

Marine Spatial Planning is a subset of Integrated Coastal Management and as such is a tool that brings together multiple users, namely, energy, industry, government, conservation and recreation, to make informed and coordinated decisions about how to use marine resources. The Intergovernmental Oceanographic Commission of UNESCO defines it as[30]

> "a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that usually have been specified through a political process."

Many countries around the world have embraced this approach, notably Sweden, Germany, Netherlands, Norway, the United States, United Kingdom and Australia which is generally considered the leader[31]. Examples of some of the issues routinely under discussion within many of the countries that have adopted MSP include: compensation for disruption/displaced fisheries or damaged fishing gear, environmental protection or mitigation, alternative /comparable fishing opportunities, establishment of safety zones based on possible MRE impacts on other marine users, and the creation of voluntary contract agreements by industry for locally-sourced benefits.

RECOMMENDATION 8: It is recommended that the Government of Nova Scotia's future Coastal Strategy take into account the development of a marine renewable energy sector. The Coastal Strategy should be followed by targeted legislation to address the many and varied immediate and future coastal issues that face Nova Scotians, not the least of which will be the protection of the Bay of Fundy ecosystem.

RECOMMENDATION 9: It is recommended that the Department of Energy seize the opportunity to play the role of "champion" within the Provincial Ocean Network (PON), which is currently developing a coastal development strategy for Nova Scotia. This would involve advancement of the broader process while attempting to integrate immediate issues related to the MRE Development Framework and the burgeoning tidal in-stream initiative into a broader coastal regulatory approach.

[30] IOC 2009
[31] Marine and Coastal Access Act 2009

RECOMMENDATION 10: It is recommended that the provincial Department of Energy and the federal Department of Fisheries and Oceans enter into discussions regarding possible strengthening of the province's role in the governance of coastal areas in the Bay of Fundy, given their rapidly growing focus on that area and the present lack of clarity regarding jurisdictional responsibilities in that body of water.

RECOMMENDATION 11: It is recommended that until such time a comprehensive Coastal Plan becomes a reality, the Department of Energy should actively embrace and advance the concept and practice of Marine Spatial Planning (MSP). This process would parallel the current MRE initiative, focusing initially on the Minas Basin, Cumberland Basin and Minas Passage as a pilot project, reflecting present emphasis on those parts of the Bay of Fundy. MSP would address many of the issues raised throughout the earlier portions of this report and should be viewed as a valuable tool to oversee planning, information transfer, consultation, preservation, allocation and use of marine and coastal resources, along with many other activities germane to the advancement of the marine renewable energy sector.

Economic Opportunities

In addition to the benefits expected to result from Nova Scotia's pursuit of additional renewable electrical capacity, the potential creation of a new energy sector in the province can also offer considerable economic opportunities. This can happen at many different levels through stimulation of potentially promising activities, capacities, skills, and infrastructure such as marine systems engineering, new computational tools, financial services, resource planning, sitting and permitting in environmentally demanding environments, and port and vessel infrastructure, to name but a few. However, it is expected that the greatest long-term opportunities will result from the development of supply chains that address infrastructure, products, and services in support of offshore wind, wave and tidal industries[32].

[32] Crown Estate 2009

An example drawn from the UK offshore wind industry[33] illustrates the supply chain approach in the form of a six-layered pyramid representing the fabrication of a turbine. The pyramid's base shows the supply of generic blade materials (resins, moulds etc), the next level addresses the fabrication of turbine blades, while levels 3-5 represent additional components (rotors, hubs, shafts, nacelles, towers, and control systems). The uppermost level of the pyramid is occupied by the developer or turn-key contractor who receives the final assembled product for installation on the site, illustrating the economic and employment opportunities leading up to the installation of a device on the sea floor. The creation of supply chain would involve many things, not the least of which could mean access to funding, provision of peripheral services, research in relevant fields, infrastructural support, and perhaps even tax concessions. Perhaps even more importantly it will benefit from a mindset that envisions the creation of a center of excellence that would eventually market to the rest of the world.

Many feel the moment is right, since a global economic, environmental and technological window appears to be opening with increasing realization of the promise of competitive MRE development. Capitalizing on these new activities could happen through a process of random events or it could emerge from a reasoned, thoughtful and comprehensive strategic plan. Application of these elements should occur during a project's earliest phases, where a thorough understanding of project requirements, services and skills are defined. This is not an *ad hoc* approach, but rather one that demands rigorous preparation prior to engagement, with a clear understanding, grounded in a consensus-driven process, as to what one hopes to achieve in these negotiations.

Two Levels

The realization of economic benefits is expected to occur at two levels: large industrial and small community/municipal. At present, the principal activities in this sector are four industrial demonstration projects planned for Minas Passage in 2011-12. This industrial scale approach requires a great deal of complex planning, possibly with dedicated zones and interconnected arrays that will connect to the Nova Scotia grid and displace some of the present fossil fuel derived contribution. Many benefits will accrue to Nova Scotians as a result of this approach, especially for those living and working adjacent to the Bay of Fundy.

[33] Mott MacDonald 2011

Benefits at this level will more than likely conform to those associated with other familiar industrial models.

However, a second model, at a somewhat different level, would embrace community- or municipally-driven initiatives linked to local coastal policies, such as economic development. In this scenario communities/municipalities would be the driving forces behind more modest marine energy extraction initiatives. These could be planned from the outset as local sources of energy earmarked for local consumption rather than for delivery into the provincial grid. This would involve creation of companies, selection of suitable sites, acquisition of infrastructure to generate, transmit, and monitor such a process. The recent passage of the community-based feed-in tariff (COMFIT), the special FIT for new tidal in-stream development, and enhanced net metering offer new opportunities for NSPI, large independent producers, individuals, communities, municipalities, First Nations, cooperatives, non-profit groups and under special circumstances, small businesses.

Potential small scale tidal sites are expected to be identified by the province. These would be in addition to those, previously tabulated by EPRI[34], with tidal current velocities of 1.5 m/s or higher. The EPRI list included, in addition to Minas Passage and Minas Channel, Cumberland Basin, Cobequid Bay, Digby Gut, Petit Passage and Grand Passage (Fig. 1). In fact, some partnerships have already been struck to pursue energy extraction from these smaller sites, e.g., between Westport-based Fundy Tidal with Alberta's New Energy Corp and/or Maine's Ocean Renewable Power company. Initial interest is being directed at Petit and Grand Passages[35].

The province is providing support for community involvement through facilitation programs and tools to assist with community-based development projects managed by the Sustainable and Renewable Energy branch of the Department of Energy. Also, active ownership or partnerships using Community Development Economic Investment funding (CDEIF) are possible, along with other sources of up-front capital to start independent projects. Despite those incentives many questions remain regarding the economic feasibility of this approach, such as whether communities should consider the possibility of coops, whether a

[34] Electric Power Research Institute. 2006
[35] Chronicle Herald, May 2011.

partnership with NSPI is desirable, the question of whether energy produced by a community should be used in that community and issues of initial financing. EU producers have addressed the latter issue by recouping costs through licensing or incrementally on production-the first batch is bought at a higher price than subsequent batches, acting as a form of upfront subsidy for new developments. Germany has similar approach using a fee and tariff system.

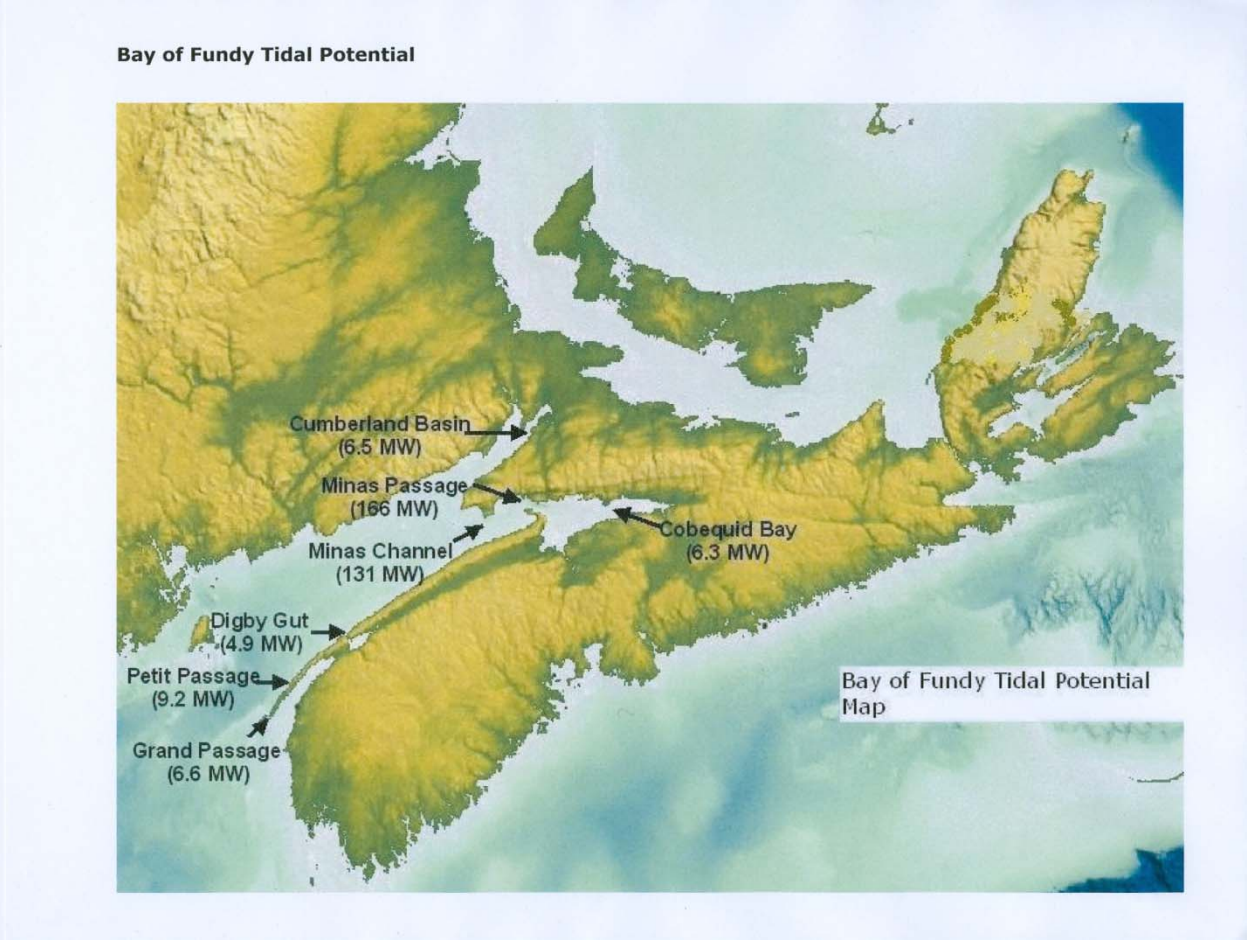

Fig. 1 Early assessment of the Bay of Fundy tidal potential (after EPRI 2006)

While no one currently has a firm grasp of the full potential of these activities it is clear that many questions must be addressed in a rigorous and orderly manner prior to any serious encouragement of community/municipal entrants in the burgeoning MRE initiative. For example, the capacity of a community to engage in localized energy generation would almost assuredly depend on its collective will, economics, and the extent of their information pertaining to all aspects of such an

initiative. This is an area where, with the assistance of the provincial government, a carefully detailed economic planning process could be conducted in order to better define the options, choices, and alternatives that are available for potential non-industrial users. Along those lines, the province recently provided funding to OEER to conduct research and analysis on the commercialization of small-scale in-stream tidal technologies. A further consideration is the possible realignment of the Strategic Environmental Assessment (SEA) process which was initially focused on environmental issues but could also be used to examine potential socio-economic development in a comparable manner.

RECOMMENDATION12: It is recommended that the Government of Nova Scotia work with communities to understand their special needs regarding small-scale tidal in-stream development; especially since community stakeholders will almost certainly differ in their response capacities from large industrial players. Understanding those differences will be the first step toward the development of a comprehensive plan to assist and encourage communities to participate in these initiatives. Issues that require some consideration include: financing, infrastructure, resource availability, appropriate choice of technologies, risk assessment, the potential utility of locally generated electricity without cost-effective grid access, geomorphological considerations, and policies or legislation specific to communities, to name but a few.

Export Market

Exports are the movement of goods or services across our borders to other jurisdictions for the purpose of commerce. If and when electricity is competitively priced, reliably produced, and in sufficient quantities at appropriate times it could be an important product that, in addition to reducing our reliance on fossil fuels, could also represent an important export commodity. The issue of exports as one component of the expected derived-value from tidal and other marine energy needs to be placed within the context of Nova Scotia's total required capacity. At peak on a cold winter day, approximately 2200 MW of electricity are required but on a warm summer evening demand can drop as low as 700 MW. One possible scenario would have future installed wind capacity reaching 500 MW coincident with tidal in-stream output approaching 300 MW resulting in summer surpluses. Exporting the surpluses makes full use of our renewable capacity and improves overall project economics. At the very least, higher returns in the United States

could be used to offset price differentials between conventional costs of production and tidal in-stream generation.

In addition to electricity, technology and services are two additional export categories that should be considered as significant opportunities in the development of this new sector. At present Nova Scotia does not have any marketable competitive advantage based on turbine technology, since they are currently designed and built in countries other than Canada. Once this sector is fully operational and Nova Scotians are involved in assembly and development of new and improved technologies their export is a real possibility. In addition, Nova Scotia's initial competitive advantage would almost assuredly lie in a skills package developed around the extraction of tidal energy from probably the most uncompromising tidal environment on the planet. These skills or " know how" could include the geological siting of facilities, strategic environmental assessment practices, monitoring environmental effects, resource assessment, socio-economic analysis, risk analysis, cumulative effects, research needs, the balance of conflicting uses, benefits packages and financing. All of these would draw on the Nova Scotia experience in an area which also happens to be an important fishery, a valued ecosystem, an area of aboriginal significance, surrounded by communities with a vested interest in the status quo. Surely, many of these issues are universal in nature and the Nova Scotia experience of dealing successfully with these issues would more than likely provide valuable knowledge to others interested in similar technologies. Such an experiential package would involve social scientists, engineers, scientists, economists, regulators and more than likely a partnership with technical proponents who also have experience working in the Bay of Fundy.

Relevant Comments Received

Below are representative examples of the verbal and written input received on the subject of Economic Opportunities during the consultation process:

- Create opportunities to share site use within communities, for example, aquaculture, tourism and tidal energy extraction in one place;
- Employment, business, economic interests can be supported through requirements for community and regional benefit plans – voluntary compliance only;
- Benefits should flow to the communities before exporting;

- Transmission planning must be conducted in an open, transparent, all-inclusive manner – not done solely by the utility;
- Transmission upgrades to reach export markets should be born by the whole electricity system and a quasi governmental entity should oversee the connectivity process;
- Royalties should be tiered and calibrated to long term facility profitability. Rental rates should be suspended until project is operational; and,
- Allow front-end incentives such as rent- or royalty-holidays to minimize FIT costs.

Incentives/Subsidies

Some countries have shown strong political leadership in the use of tailored financial incentives to encourage the development and deployment of their own early marine renewable energy industries. Documents describing the history of wind farm development in Denmark or wave, tidal or wind technologies in the UK show these governments playing important roles in the transformation of their fledgling industries into world leaders[36]. Incentives are commonly accepted as an appropriate way of doing business when viewed as an early investment designed to yield long-term benefits. This is especially true when one considers that the "up front" costs of marine projects remain high and uncertain.

Incentives already adopted by the federal and provincial governments in Nova Scotia include: the creation of FORCE, OEER, OETR, the provision of underwater transmission cables, COMFIT, special Tidal FIT, enhanced net metering, and long term Power Purchase Agreements (PPAs). Other potential incentives might include: the development of a market for green electricity; the provision of seabed or resource tenure; and, provision of rent and/or royalty holidays to minimize FIT costs. A somewhat different form of incentive is the need to define and prepare for project decommissioning. This would involve surety bonds, a mandatory de-commissioning plan in place at least two years prior to the end of the lease, and complete decommissioning within 2 years of lease termination).

Finally, the provision of incentives in any form, e.g., the provision of critical infrastructure, is a clear sign of government commitment. It also ensures that essential questions are asked and answered, such as the nature of environmental impacts or quantification of resource sustainability. Given the somewhat murky

[36] Mott MacDonald 2011

future of tidal in-stream commercial prospects it is presently difficult to give detailed answers to questions regarding who should receive incentives, what form they should take, or when they should be applied, given that we are still in the early stages of development, experiencing considerable uncertainty. However, industry reaction to the present suite of arrangements has been positive and shows the sector is moving in the right direction.

Royalties

Royalties were defined in the Sable offshore energy project along a sliding scale. They were nonexistent or very low in the project's earliest stages when production was ramping up, gradually rising with output, and reaching their highest values during the latter stages. This often seems to be the normal course of events, where a low demand for royalties initially acts as a form of incentive and high royalties acknowledge the success of the project and reward the owner of the resource. With the development of MRE sector one could expect many difficulties and detours throughout. In its earliest stages the future of the project is anything but clear and ensuring returns to the public coffers may make short-term fiscal sense but compromise the long-term viability of this sectoral initiative. In Nova Scotia, a royalty framework is premature at this time. A significant levy at a time when electricity will be largely consumed in Nova Scotia would only increase costs to ratepayers. However, over the longer term, if exports and excess profits are achieved, then a "profits based" regime should be considered, using a tiered approach calibrated to long-term profitability that would allow for a reasonable return on investment.

Electricity Infrastructure

Governments can strongly influence and coordinate the development of required infrastructure, such as harbors and electrical grids. The importance of public support for marine technologies is illustrated by the success of offshore wind has had in some countries where the provision of these was strongly encouraged[37].

Generation Technology In-stream tidal in Nova Scotia is currently being pursued by four groups: Nova Scotia Power and Open Hydro; Minas Basin Pulp and Paper and Marine Current Turbines; ALSTROM and Clean Current; and, Atlantis, Lockheed and Irving. For the next several years considerable effort will be directed at both the technology and all aspects of the Bay of Fundy environment.

[37] Ibid

During the demonstration phase many engineering and environmental decisions will be addressed under the auspices of FORCE, in its role as overseer of the in situ research process. It is not realistic or practical for all engineering or environmental decisions, such as turbine design, turbine spacing, safety zones relative to shipping lanes, the nature of turbine grid interconnections, to be made by a large external group lacking appropriate lines of accountability. In other words proponents and regulators should make these decisions within well defined, consensually arrived at guidelines.

Transmission Technology Generating electricity from any marine renewable technology is an important first step. The remainder of the equation involves the movement of that energy to shore and into the Nova Scotia grid for replacement of coal-fired energy or possible export. The feed-in capacity of the submarine cables that will be installed during the next 12-18 months, and which will connect the turbines to the grid, is 64 MW. Presently, the only possible avenue for export is through the 350 MW, 345 kv connection with New Brunswick which is presently fully subscribed. Some concerns have been raised regarding a possible upgrade of that connection. However, it would appear that those concerns may be premature, at least as they apply to in-stream tidal sources. The output from four demonstration projects in the Minas Passage over the next several years is unlikely to exceed 8 MW.

The recent agreement between Nova Scotia and Newfoundland to extract 825 MW from the lower Churchill with up to 60% of that output exported through Nova Scotia and into the United States would demand an upgrade of the present infrastructure. If built with sufficient capacity it could accommodate growth in the marine renewable energy sector, as well. These transmission upgrades will presumably be borne by the entire electricity system rather than taxpayers or ratepayers and regulated by the UARB in an open, transparent, all-inclusive manner.

RECOMMENDATION 13: It is recommended that the Department of Energy develop a business plan, within the next 6-12 months or sooner, depending on the availability of requisite socioeconomic data, within the broader context of a strategic plan that addresses issues related to the development of the MRE sector, with immediate emphasis on the tidal in-stream energy generation. Examples of outstanding issues that require further clarification include: the

possible economic uncompetitiveness of tidally generated electricity; considerations of potential market penetration; assessment of competition from other renewable and non-renewable energy sources; anticipated informational needs such as labor force experience; community expectations; potential direct and indirect benefits; possible supply chains; the economic impact of in-stream tidal energy with and without export sales; the feasibility of knowledge-based export potential; an economic balance sheet associated with project development; and, an economic valuation of the major environmental components of the Bay of Fundy ecosystem. Clarification of these and other related issues would provide considerable guidance to all parties during expansion of the MRE sector.

Research

One of Nova Scotia's unquestioned strengths, as it attempts to establish itself as a major user and eventual purveyor of marine renewable energy expertise, is the breadth and depth of its professional capacity. Several universities, government laboratories and a strong private sector provide considerable intellectual capacity, infrastructural support and a diverse array of marine skills rarely aggregated in one location. The Halifax-Dartmouth locus is generally ranked among the top five or six locations in the world for marine research, while other foci, such as the research capacity around the Bay of Fundy, centered at Acadia University, is of special importance. Overall, Nova Scotia contains engineers, social scientists, and health and safety professionals with marine background all set in a strong historical and cultural environment with ties to the ocean extending back 250 years.

Many of these professionals participated in some preliminary research, such as the Strategic Environmental Assessment, conducted in the Bay of Fundy prior to the commencement of the Development Framework process. Useful as those early studies were they have not only defined additional issues but have made it abundantly clear that as the level of activity and the number of turbines increases so too will the need for additional research. There is abundant evidence that growth in both size and activity have the potential to morph early small impacts into unexpected synergistic or cumulative effects. These changes warrant ongoing studies that are tailored to the size and scope of the project and sometimes strategic collaborative research will undoubtedly be necessary on issues that might pose extraordinary risks.

Some research issues/questions are so fundamental that they hold a special and continuing place in the development of the MRE sector. Due to the changing nature of the projects and the environment, research in these areas will never be completed. Projects and devices will be monitored and assessed with the application of corrective measures, whenever necessary. In fact, economic viability of this energy resource will be enhanced by matching optimal environmental conditions with appropriate energy infrastructural design, two conditions that clearly warrant research. The need for mitigation illustrates the linkages between research and ongoing regulatory concerns, such as what corrective measures are appropriate when specific thresholds are reached. In some ways tidal in-stream success will rest on a clear understanding of the limits of that resource relative to accepted standards.

Bio-Physical Environment

One issue judged to be of fundamental importance to the tidal in-stream initiative is the need for a continuing, increasingly detailed assessment of tidal resource capacity in the Bay of Fundy. The Bay is a challenging and sophisticated energy conservation regime, involving as it does shallow tidal races, twice-daily tidal reversals and some of the highest velocity tidal currents on the planet. Because of these impressive statistics there is a tendency to assume that the Bay is a limitless reservoir of energy (much as the ocean was once thought to contain an inexhaustible supply of fish).

The Bay of Fundy ecosystem has evolved since the end of the last ice age within the constraints of a vigorous well-defined tidal regime. It is an ecosystem of global significance and Nova Scotia has stewardship responsibilities to preserve dynamic features critical to its continuing operation. Whether those effects will be significant or not remains to be seen. Removal of energy from that dynamic and interactive system will undoubtedly influence some of the Bay's more important properties, such as tidal heights, critical spawning grounds, waves, upwelling and productivity, sediment dynamics, food webs, migratory behaviors, and large scale distant effects. In addition, the physical presence of several large turbines during the demonstration period, positioned directly in the Minas Passage will almost certainly produce additional environmental effects, such as, noise, electrical and magnetic fields, and increased pressure on shipping corridors. When four turbines become 40, or more, there is no way to predict the resulting synergies except by a

continuous and vigilant research presence. In addition, until proven otherwise, one cannot assume that regulations invoked for one region of the Bay of Fundy will be necessarily applicable to another.

An important outcome of disciplined research is its ability to reduce uncertainty. A rigorous approach can rectify existing information gaps and generally provide a solid foundation for data collection, analysis, regulatory decision-making or policy delineation. In the case of tidal energy, issues that require greater understanding include a convincing definition of the sustainable level of energy extraction linked to the expectation regarding the expected size and geographic disposition of turbines. In addition, maps or models that show areas of high/low energy potential superimposed over areas of high/low environmental impact would be equally valuable. Models and maps would need to be created to acceptable international standards and have the capacity to be updated at regular intervals as new data became available.

An active research program is vital, as it will ensure responsible on-going decision-making regarding the potential environmental impacts of development. Ideally, an arms-length body should design and carry out research program.

Socio-Economic Environment

Social science research is equally important albeit with a very different focus on the assessment and understanding of the dynamics of participating individuals, activities, groups and communities in the development of this sector. Those closest to in-water activities will experience the greatest social and economic change. Areas of potential disagreement include: territorial conflicts, creation of exclusionary safety zones, coastal land usage, changes in fishery practices, along with aesthetic changes and quality of life concerns. These issues, plus many more, require study, analysis, definition and resolution. As with the biophysical world, many social issues can also experience cumulative effects.

Much is made of the potential benefits that could accrue to those coastal communities that embrace the opportunities offered by engagement in tidal in-stream energy extraction to enhance local economic development. This belief is based on the premise that communities are appropriate receptors of these technologies, simply waiting for an opportunity to seize the moment. However, a clear understanding of their socio-economic condition, including potential

opportunities, constraints and risks, could better ensure that future regulations, policies and legislation properly reflect individual cultures and capacities. In addition, a better understanding of local cultures can also provide greater understanding of local fisheries issues, such as geographic displacement, gear damage, environmental impacts, compensation and liability. The end result of this research could be a benefits strategy to ensure people of NS benefit substantively from these technologies. Recently the province provided funding to OEER to conduct more research and analysis which has led to the conduct of gap analysis that will be used to inform the future research agendas.

Ecosystem Approach

For the purpose of some studies it may be convenient to compartmentalize the environment into physical, biological and human components (as was done above). Oftentimes, assessment depends on evaluating valued environmental components, but such a categorization obscures the natural interactive complexities and synergies that make up ecosystems and communities. The boundaries chosen for specific organisms or ecosystems should accurately reflect the nature of the threats and effects being addressed within the proposed project. A strong foundation of scientific knowledge is fundamental to the assessment of potential environmental effects that may affect ecosystem health and viability.

Relevant Comments Received

Below are representative examples of the verbal and written input received on the subject of Research during the consultation process:

- Legislation should make reference to and support the creation of credible and proven models for all MRE technologies. Models should be compatible with international standards, able to evolve, and remain in the public domain;
- Mechanism should be developed to halt tidal generation if an environmental impact is detected;
- Research should be substantial and ongoing, funded by federal and provincial governments through the licensing structure;
- Reduce uncertainty: 1) map in-stream tidal potential, 2) produce integrated marine resource user map, 3) stakeholder consultation to discuss areas of high potential with low economic/environmental impact, 4) address

information gaps from demonstration projects and report data to central repository, 5) identify a potential energy corridor route for energy cables.
- No project of any scale should be permitted to compromise the operational characteristics of the ecosystem;
- After extraction process is underway a suspension based on cumulative effects would be a poison pill to investors – permitting authorities should make cumulative effects assessments during the approval process;
- CEAA has no management plan to foresee what kinds of activities will take place in assessed areas – Marine Spatial Planning would operationalize CEAA provisions for cumulative effects assessment; and,

A long-Term View of Research

There are too many important physical, biological and social issues surrounding the planned commercialization of the Bay's waters to be individually addressed here. However, research is not simply a series of front-end investigations that gradually fade away once an enterprise is initiated. That might be the case if four turbines were placed in one location and allowed to operate at one predictable level in perpetuity. Instead, estimates of the amount of energy potentially extractable from the Bay of Fundy vary between 300 to 2000 MW, a 6-7 fold variation. It follows, therefore, that the number of turbines, and their environmental influence, would vary proportionately.

The province's research sector is slowly becoming involved in the marine renewable energy sector in the Bay of Fundy. Recognizing the importance of a solid research foundation, the N.S. Department of Energy created a model that contains three arm's length not-for-profit entities: the Offshore Energy Environmental Research Association (OEER), the Offshore Energy Technical Research Association (OETR), and the Fundy Ocean Research Centre for Energy (FORCE). This substantial research capacity is the cornerstone of the proper development of the marine renewable energy sector. OEER and OETR are playing active roles as facilitating vehicles to engage and focus Nova Scotia scientists on immediately relevant problems, thereby fostering research, albeit each with a slightly different focus, while FORCE is currently sheparding the development of the tidal in-stream initiative. Each of these organizations has played an important role in engaging scientists in a process that demands active scientific participation.

One issue of some importance concerns the need for assurances that a strong research presence will continue to operate, and be felt, in concert with advances in the marine renewable sector. Research can be expensive but operating without the benefit of insights provided by dispassionate analysis can be even more expensive, at many different levels. To properly assess any environmental changes that might occur, such as synergistic or cumulative effects, during the implementation of the marine renewable energy sector will require a comprehensive array of baseline data as a starting point. Monitoring change, assessing risk, or ensuring compliance within a regulatory framework will require rigorous social or natural science measurements at regular intervals as environmental constraints change or the scale of energy removal increases. At the present time no long-term plan exists that is tied to the development of the MRE sector.

One final comment concerns the Strategic Environment Assessment (SEA) that was conducted by researchers in the Bay of Fundy in 2008 as one of the earliest actions in the process to initiate tidal in-stream activities. This process was generally viewed as an initial attempt to assess environmental, social and economic considerations so as to fully integrated them into plans and programs prior to their final adoption. Generally, a SEA is conducted prior to carrying out an Environmental Impact Assessment (EIA) so that the information obtained in this process could then cascade downward for use in the subsequent EIA process. Environmental impact assessments, expected to be triggered at the 5 MW energy extraction level, will probably take the form of CEAA-driven Comprehensive Study. Normally a complex and detailed undertaking, a SEA conducted at specific intervals within the Development Framework could be used for the dual purpose of obtaining greater efficiencies in the EIA process while simultaneously conducting periodic assessments triggered by predetermined thresholds.

RECOMMENDATION 14: It is recommended that a long-term research plan be created, as part of the strategic planning process, to accompany the development of the MRE sector. This plan should define the individual roles and responsibilities of OEER, OETR, and FORCE, and at a minimum should reflect the ongoing importance of research toward: sustainable utilization of tidal resources; enhancement of the monitoring process; assessment of environmental impacts; contributions to greater health and safety; and, the provision of support to integrated coastal management and marine spatial planning.

RECOMMENDATION 15: It is recommended that the Department of Energy continue its support of, and association with, the three arms-length not-for-profit research entities that facilitate the involvement of university researchers (natural scientists, social scientists and engineers) in the ongoing development of the marine renewable energy sector. The continuing participation of OEER, OETR, and FORCE should be timely, credible and adequately funded.

RECOMMENDATION 16: It is recommended that legislation be enacted that will define the ongoing role of research in the development and evolution of the MRE sector. Since funding availability is often a limiting factor the recommended legislation should identify approximate levels of funding that the government will support. With increasing industrial activity, mechanisms could be developed that link funding to that activity such as royalties paid, cost of agreements, or a percentage of initial investments.

RECOMMENDATION 17: It is recommended that information collected through research and monitoring in order to fulfill requirements of existing environmental assessment legislation should be circulated among developers, researchers, regulators, investors and the public in order to provide a transparent and informed process.

Regulation

The need for a proper regulatory framework to guide the development of the burgeoning MRE sector is unquestioned. Much of the legislation, policies and regulations already exist albeit in disparate jurisdictions and in forms not necessarily conducive to immediate tidal in-stream needs. The marine renewable energy sector, when fully developed, will comprise several technologies at different levels of maturity. They will be dispersed geographically and set against a temporal backdrop of unpredictability that will surely include accelerating environmental change, volatile economic conditions, an unknown social agenda, and increasing public stridency.

Any attempt to create legislation that addresses 40-50 separate issues over an extended period and experiencing a certain amount of volatility might be optimistic, even unrealistic. Under these conditions, legislation that is too refined, attempting to address every possible eventuality, might remove a critical

amount of flexibility from the process. On the one hand, these concerns could be seen as unduly constraining, while on the other ongoing legislative tinkering could send an inappropriate message to developers and markets that the government is not truly committed or unable to "get its act together". A viable alternative could be the creation of well-reasoned, broadly encompassing overriding policies that would be subject to operational oversight to ensure compliance with laws, permits, and obligations. A long-term goal for the proposed regulatory framework should be to harmonize federal and provincial regulations where appropriate, in an ongoing stepped or incremental process in order to chart a balanced path between constraint and flexibility, while remaining accessible and efficient.

Jurisdictional Issues

Regulatory practices are often viewed by project proponents as conflicted, providing protection to society consistent with accepted guidelines, while simultaneously slowing and complicating development activities which are also perceived as a benefit to society. Many firms considered to be good corporate citizens frequently complain about the "morass" or "swamp" they encounter when attempting to obtain approvals for their planned activities. These difficulties are often attributed to the multiplicity of jurisdictions that come into play, especially in the offshore, when a project is announced and set into motion. Figure 2 provides an outline of the policy framework developed in 2008 by the N.S. Department of Energy coincident with early steps to develop the MRE sector. This flow diagram graphically displays the jurisdictional interdependence, interconnectedness, and potential complexity described above.

Problems encountered (as related by harried proponents) are often multifaceted: overlapping, duplicate, or inconsistent legislative requirements and decision making; different policy formulations and advice from different regulators; administrators are said to lack independence, accountability and clear regulatory objectives; and, on occasion regulators seem to work at cross purposes, creating long lead times that undermine confidence in developers, investors and others attempting to move a project forward. For some, jurisdictional harmonization is considered to be an important goal of any new regulatory legislation, ultimately leading to less ambiguity and delays, greater responsiveness, less duplication, improved clarity, and a much higher degree of predictability in the processes that

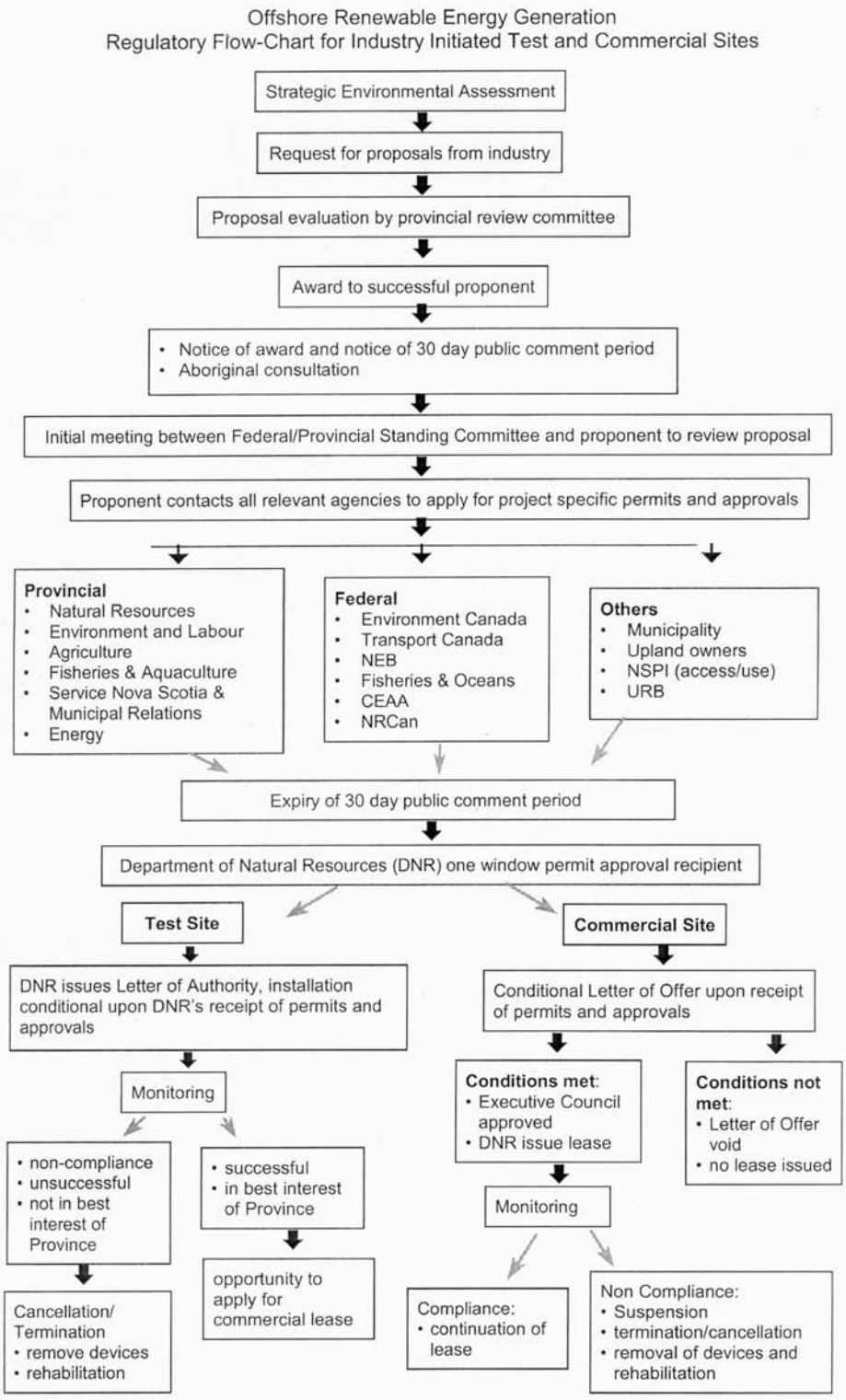

Fig. 2. Outline of Nova Scotia's policy framework for offshore renewable energy (2008)

fall under the rubric of regulation. Consequently, some feel that harmonization is the only possible course of action if Nova Scotians seriously wish to advance the MRE sector.

The consultation discussion paper offered three models for possible interaction between federal and provincial regulators. They are presented in ascending order of harmonization, as Cooperation, Collaboration, and Integration. Cooperation, a reasonable approximation of the status quo, involves information sharing and the conduct of business via *ad hoc* federal/provincial committees. Collaboration embraces a greater degree of ongoing interaction, including joint agreements, such as the Donkin Coal Block Development Opportunity Act. Integration would involve a single authority administering federal and provincial regulatory requirements, such as presently practiced by the Canada-Nova Scotia Offshore Petroleum Board (CNSOPB). An integrated approach could facilitate and expedite but it could also potentially weaken existing federal-provincial legislative requirements or the acquisition of which could turn out to be an extended process that could jeopardize the expeditious development of the MRE sector.

Other Jurisdictions

The European community[38], faced with many of the same regulatory issues in the area of offshore wind farms, made the following recommendations:

- Create one stop agencies to process authorization applications and provide assistance to applicants;
- Issue clear guidelines for authorization procedures with clear attribution of responsibilities;
- Establish pre-planning mechanisms in which regions and municipalities are required to assign locations for different renewable energies; and,
- Disseminate guidance on the relationship with existing environmental legislation.

However, a recent review of offshore wind power in the U.S. looked at regulatory issues and models for regulation that also included comparative information from several countries in Europe[39], and came up with a slightly different conclusion.

[38] EC 2005
[39] Snyder and Kaiser 2009

The authors indicated that many "have concluded that the preferred way for nations to regulate the offshore wind industry is to set up a "one-stop shop" approach (as in Denmark), in which permitting authorities are consolidated into a single environmental agency. However, drawing from other countries that were not persuaded they added that with "the large amounts of time, capital and planning involved with the development of an offshore wind farm, it seems unlikely that the requirement to seek permits from numerous governmental agencies is a significant administrative burden on the applicants". They further pointed out that "Germany had been extremely successful in permitting offshore wind farms despite requiring input from multiple agencies." In those authors' view "the actual methods of regulation (approval criteria, EIS requirements, etc) are likely less important than the fees charged and subsidies offered by governments[40]". Finally, they suggest that "it may be possible to ascribe the success of Denmark and the UK to convenient regulations, but it may be more likely that a mix of financial subsidies and amenable offshore sites has led to the development of the offshore wind industry in these countries".

Closer to Canada, the US decided to regulate the industry under existing legislation, rather than starting with a clean slate, and it produced considerable regulatory conflict and overlap between the Federal Energy Regulatory Commission (FERC) and the Bureau of Ocean Energy Management (BOEM), which has only recently been overcome. In addition, problems other than jurisdiction have imposed serious limitations to offshore wind farms in the US. These include: the absence of a coordinated planning process; lack of authority to grant leases and exclusive use and occupancy rights for offshore areas; and an inability to assess resource rent for the space occupied; or fees and royalties for energy generated. These difficulties point out the importance of routine administrative activities and by comparison the lesser importance attributed to one-stop shopping.

One-Window Standing Committee

One significant example of Federal/Provincial collaboration was the one-window standing committee that was used in the early stages of tidal in-stream approvals. In lieu of an integrated legislative and regulatory structure the Investigation, Strategic Assessment and Demonstration portions of the Development Framework were addressed using a reasonably effective ad hoc approach. A "one-

[40] Bird et al.,2005 , Reiche and Bechberger 2004

window" committee, made up of federal and provincial responsible authorities, was established to ensure that the regulatory process was coordinated and efficient. However proponents were still required to submit applications for project development to each regulator (including some who were not on the standing committee). This committee was created using a project-specific harmonization agreement, known as the Federal-Nova Scotia Assessment Agreement.

From all accounts this approach worked satisfactorily with the modest level of activity engendered during the investigation/demonstration portion of the development framework. However, there is some concern that if activity levels were to rise significantly then this approach could become inefficient and confining. However, in the four years of demonstration projects planned for the tidal in-stream initiative the continued operation of the one-window committee would not likely present immediate or insuperable difficulties. In fact, employing this approach for that period would provide a respite to explore potential mechanisms that might lead to regulatory harmonization. However, assuming the MRE sector takes flight, following this four-year period, with increased technological diversity, new and varied geographic locations, different jurisdictions, and myriad other considerations then the one-window committee may be reluctant or incapable of handling these additional responsibilities.

One compromise suggested during the consultations provides some insight into potential options that might be available when attempting to bring greater responsiveness to regulatory legislation while in no way threatening its present rigour. A practical approach to the private rights issue in the development of tidal power is for both levels of government to enact similar legislation covering both the granting of rights to operators and the necessity of limiting public rights. Depending on the interests of the two levels of government this scheme could then involve delegation, with appropriate precursor legislation, of the administrative operation of the scheme to either the federal or provincial government.

Harmonization does not require a binary choice; it can occur using a mixture of the models, as appropriate, although many comments offered during the consultation supported the view that it is bound to be a long, costly, and

complicated process, given the number of government departments, their legislative mandates, differing jurisdictions, and fiduciary responsibilities. Despite these hurdles, change should be pursued, possibly on a parallel track with MRE sectoral development. Immediate emphasis would best be placed on tidal in-stream activities, and a reasonable short-term goal could be the implementation of a stepped collaborative approach. The most sensible approach, keeping in mind the European experiences, would be to move forward with a one window standing committee and a stepped harmonization process.

RECOMMENDATION 18: It is recommended that the Department of Energy pursue the development of a comprehensive regulatory plan, as part of a MRE strategic plan that integrates regulatory issues into the broader fabric of sectoral development, such as Planning, Economic Development and Research, with the ultimate goal of defining legislation in support of greater collaboration, efficiency, and effectiveness.

RECOMMENDATION 19: It is recommended that the Department of Energy promote the creation of an ongoing federal/provincial working group, made up of the principal regulators for the MRE initiative. Once assembled this group would engage in a broad dialogue to explore opportunities to harmonize legislation, policies and regulations over the forthcoming Demonstration phase of the Development Framework. Emphasis should be placed on the creation of a nationally acceptable framework that addresses, e.g., environmental assessment, monitoring, safety, property rights and economic regulation. The resulting harmonization should reduce complexity, improve accessibility and increase efficiency. An incremental or stepped approach could be used as it would be in keeping with the growth of the industry itself.

RECOMMENDATION 20: : It is recommended that the Department of Energy explore the possibility of creating legislation to enable a reciprocal process in which portions of the federal regulatory framework could be integrated into provincial law or provincial regulations might be transferred to the federal government, thereby removing redundancies and increasing efficiencies.

Rights Allocation and Permitting

Rights allocation and permitting are broadly inclusive categories. Although some elements might not conform to the accepted definition of regulation each is used to provide control or to position a filter within the decision-making process, thereby exercising a form of regulatory oversight. This topic is covered in some detail in the pre-consultation documents, where a variety of issues, collectively comprising much of the approval process that will be confronted by any proponent, are identified. Decision-making required under this heading will be expected to be fair, equitable and competitive while simultaneously addressing a diverse array of disparate issues. Some of those issues will include: proponent selection, permitting resource use, leasing land, licensing demonstration projects, and allocating resource/land tenure, to name but a few.

A recent review of different approaches to accelerate the deployment of offshore renewable energy technologies addressed the subject of potential barriers in considerable detail[41]. The authors suggest that: "Complex permitting processes are another major barrier to offshore renewable energy projects development in most countries ----While permitting processes are diverse and country specific, lessons can be learned from countries that have had more success with offshore wind. Streamlined application procedures, one-stop shops, pre-permitted areas are some of the potential mitigation measures to planning and permitting barriers. The allocation of seabed rights to competent and construction-focused developers is also important in order to avoid sites being leased to developers more interested in speculative applications or without the necessary resource to progress the development of projects". In addition, "Licenses should include expiry dates and require clear achievement of milestones from the developers in an effort to minimize sites being reserved for projects that will not materialize. Permitting requirements should be clear from the outset"

Attempting to plan legislatively for the MRE sector so early in its development is difficult due to the extraordinary amount of uncertainty that confounds such an attempt. It is difficult to know at this time what issues might exert the greatest influence on the planned MRE sectoral development. For example, technologies currently in use are considered to be immature or emerging, much as wind turbines were viewed 20-30 years ago. We can expect considerable changes in materials, mechanics, efficiencies and design to occur concomitant with

[41] Mott MacDonald 2011

increasing demand. In addition, environmental issues, and the public's sensitivity to them, are changing rapidly, almost in lock-step with some important marine parameters. Actions acceptable today may be severely questioned as the decade proceeds. And finally, even as the world economy returns to stability it continues to be viewed by many as volatile and unpredictable, presumably influencing investors and money markets. Canadians will learn to live with this volatility but a fair question is whether excessively prescriptive legislation will shackle governments, regulators and proponents as they navigate this uncertainty, rather than liberating them.

Concerns heard repeatedly during the consultations revolved around the mechanics of rights allocation and permitting, and how they might play out when addressing important project-related issues, such as land approvals, licensing, environmental regulation, leasing, proponent choices, and tenure, to name but a few. The concerns were a thinly disguised call for equitability, transparency, fairness, absence of bias etc. To make these decisions presumes agreement on the part of all participants regarding underlying principles. The consultation process was a useful vehicle to learn about the concerns of stakeholders but advice was seldom forthcoming regarding these principles or even a long-term vision for the sector. The establishment of these elements is certain to be a key stabilizing influence over the development life-cycle of the MRE sector.

It is not yet clear who will make the above decisions. There are a number of options: a designated individual in the Department of Energy; some version of a one-window committee that ensures federal/provincial breadth and depth; a newly appointed regulator; or legislating additional responsibilities to the current regulator, the Utilities and Review Board (UARB). One concern often heard addressed the independence of the "decision-maker" and how to ensure a true separation of regulator from policy-maker. The concerns expressed earlier regarding a "reasonable apprehension of" bias, transparency, fairness, justice, and equitability will hinge on the resolution of this issue.

In addition, both licensing form and options under the comfit process let communities decide if viable projects are to be brought forward. However, larger projects around Minas Passage require additional thought and planning as to how licenses should be awarded in this area in order to achieve maximum economic advantage to the province. Finally, since licenses are essentially economic tools,

awarding large scale initiatives should be linked to the advancement of provincial strategies, especially when good opportunities are limited

RECOMMENDATION 21: It is recommended that the Department of Energy, during the early stages of the federal/provincial harmonization process, identify a specific individual to act as the first point of entry for any developer interested in acquiring information related to possible participation in the MRE initiative. This person should be knowledgeable with the ability to guide and facilitate movement by potential proponents through the various early stages of knowledge transfer, approvals, licenses, permits, etc. for both the federal and provincial regulators.

Recommendation 22: It is recommended that the Department of Energy legislate the creation of a position or office imbued with administrative, decision-making responsibilities for the MRE sector. This office should be created using transparent criteria, visible lines of authority, identified responsibilities, decision making capacity, as well as recourses available for unfavorable rulings. This office should conform to the definition of "trusted regulator", that is, free in fact and perception of conflicting interests or bias.

Regulatory Framework within a Strategic Context

The existing array of regulations applicable to the MRE sector is quite extensive, reflecting many years of incremental change at both the federal and provincial levels. Admittedly there is a need to introduce modifications specific to the rapidly morphing energy environment but the degree of change, or whether emphasis should be placed on legislation, policy, or regulation remains to be seen. At the moment many issues that would benefit from close government control have not been decided. Some representative examples of issues that could eventually fall under the regulatory framework include:

- Should the province use a two-tier approval process, i.e., a site license providing conditional permission to investigate a site for development purposes, followed by an energy extraction license to remove tidal kinetic energy to generate electricity?
- What about provisional leases for 3-5 years duration while commercial leases would reflect the life cycle of the underlying technology?

- Should extraction limits be defined prior to construction and approval? Will they be based on the best scientific data available?
- How will MRE project sites be assigned and developed? Should developers nominate any site of interest at any time or should priority areas be created? Can a site be held without development activity?
- What is the process for awarding rights at different project stages (e.g., demonstration, pre-commercial or commercial)? Should it involve competitive bids, competitive auction, nomination or non-competitive first right approach?
- What would be the criteria around which a licensing system for energy extraction would be created? Would this involve setting limits for the amount of energy to be safely extracted, license according to proposed project scale, or establish precedent for possibility of royalty scheme to be considered when projects reach commercial viability?

Answers to these questions are not difficult to achieve but they require a strategic understanding of many issues, for example, long term expected benefits, sustainable resource usage and environmental goals, collectively decided and delineated in the aforementioned strategic plan. Without the plan the decision-making process would involve personal bias or random choices.

Environmental Assessment and Regulation

Federal and provincial governments have legislative authority for environmental regulation of Nova Scotia's offshore. A question of some importance is the appropriateness of existing rules, regulations and processes to address the planned MRE sectoral development. In some respects the question answers itself when one considers the number and diversity of issues that need to be addressed in a coordinated and integrated manner, for example: environmental assessments, varied and ever-changing technologies, collateral environmental impacts, the need for focused strategic research in natural and social sciences, synergistic and cumulative effects, safety zones, a responsible agency to monitor and enforce, the possibility of a management plan, renewable energy zones or corridors, and of course the physical and biological components of the ecosystem.

Working closely with the Canadian Environmental Assessment Agency (CEAA)[42] is critical, especially regarding "comprehensive studies". In addition discussions are

[42] Canadian Environmental Assessment Act, 1992

required regarding their strict definitions and degree of flexibility, especially with regard to overlapping assessments. An up to date review of CEAA's assessment criteria and guidelines along with the Ocean's Act is required. However, the key regulatory tool in Nova Scotia would likely be the NS Environment Act. While the process could be used to implement project specific conditions arising out of the environmental assessment process, it would not be suitable for establishing clear rules on access to the resource. It would be less than clear how the approvals process would deal with use conflicts that arise during the construction and operation stages.

Some additional concerns include the need for some thought on the question of possibly integrating the developmental framework procedures into current regulatory approach and legislation? It appears to be commonly accepted that the commercial phase begins when a fully developed project is brought forward for regulatory approval, including environmental appraisals and all necessary leases, permits and approvals. Does that mean that the assessment process begins and ends with the review prior to identification as a commercial project? Finally, processes or mechanisms need to be created to ensure that personnel are in place to conduct environmental reviews in an effective manner. Also, assessment of various issues could be addressed singly or in small groups, although that approach lacks the necessary coherence to embrace all of the environmental elements, regulatory issues, assessment needs, commercial interests and management concerns. Once again we draw attention to the need for a Coastal Plan and especially the valuable subset known as Marine Spatial Planning.

Precautionary Principle and Cumulative Effects

Finally, environmental decision-making must address the reality of scientific uncertainty and incomplete knowledge. The precautionary principle instructs the decision-maker to take a cautious approach, or to err on the side of caution, especially where there is a large degree of uncertainty or high risk. Further, it is widely understood that when threats are serious or might be potentially irreversible, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation. The application of the precautionary principle requires: that the onus of proof rests with the Proponent to show that a proposed action will not lead to serious or irreversible environmental damage; verifiable scientific research and high quality

information; and access to information, public participation, and open and transparent decision-making.

Cumulative effects are defined as long-term, large scale, difficult to measure consequences of an action or non-action. Projects may have impacts disproportionate to their apparent size and duration, and effects can emerge through one of four different processes, namely, **coincidentally,** in which two activities or events co-occur; **sequentially**, resulting from the order in which actions occur; **additionally**, when individual actions are considered together; and **synergistically**, effect resulting from interaction with other activities or events. Because of ambiguities surrounding this condition it is difficult to answer an often posed question: "If 49 units are in the water and a 50th is added producing a detectable cumulative effect then are all 50 units removed from the water?"

Cumulative effects are but one example of potential changes that can occur with industry growth and increasing numbers of arrayed turbines. CEAA has no management plan to foresee where and what kinds of activities will take place in the assessed area. In the absence of assessment based on the whole ecosystem, cumulative effects resulting from individual site proposals could be underestimated, especially, if hundreds of turbines are eventually deployed, as envisioned by tidal power proponents at the recent Renewable Energy Conference 2011 in Halifax.[43] It is important to be mindful that that the tidal system is nonlinear and therefore inherently unpredictable. Careful long-term monitoring will be critical to judge cumulative effects, especially when the number of turbines in the Bay begins to grow. Even small changes could potentially impact on the Bay ecosystem. During the consultation it was suggested that that the adoption of Marine Spatial Planning could be a useful mechanism to operationalize the CEAA provision for cumulative effects assessment. New marine renewable energy legislation could incorporate these values and principles – especially with respect to in-stream tidal.

Relevant Comments Received

Below are representative examples of the verbal and written input received on the subject of Economic Opportunities during the consultation process:

- Licensing should be overseen by the department regulating the industry - not by the department promoting it

[43] Chronicle Herald April, 2011

- Development licenses should require clear timetables for advancing the project.
- Concept of a two-step tenure process is essential. Conditional licenses should be for 3-5 years followed by an option for a full lease.
- Identification of approvals routine or complex? Who determines the priority queue for the review process? Who oversees the whole project?
- Early in the process, what process should be used to choose proponents equitably and competitively, and later, when a technology has proven itself how will commercial public rights be awarded?
- How are desirable sites, potentially useful for future use, allocated or "reserved", if at all?
- A strategic approach to development stages should be used rather than a first-come first-served approach or an open proposal call.
- "Use it or lose it", based on performance targets, should be an overriding principle to prevent land-banking.
- One consultation contribution suggested that no MRE development should be permitted at any scale if it will compromise the operational character of the ecosystem.

Monitoring/Compliance/Enforcement

The regulatory process begins with licensing and permitting at the "front-end" and monitoring, compliance and enforcement at the "back-end." Establishing rules for the proper conduct of environmental regulation is an important first step toward responsible behavior that reflects the wishes of society. However, it is a symbolic but toothless act until the process is complete with detailed, timely and relevant monitoring to assess the variance, if any, between practice and full compliance with extant laws and regulations. The final step, when variances are observed, is to ensure that rules are enforced and practice is fully aligned with regulations.

Monitoring by federal or provincial line departments is increasingly difficult due to limited manpower and an increasing workload of regulatory responsibilities. A process will be required to monitor all technologies in all phases of development in order to protect the natural environment, human health, and the resource. Ideally, what would ensure the greatest oversight would be an independent body, independent of proponents and regulatory agencies with a

clear legislated mandate to monitor assess and enforce compliance. Milestones agreed upon at the outset of the project offer an unequivocal approach to assessment and publicly available reports ensure transparency.

Given the environmentally sensitive nature of the Bay of Fundy and the high esteem in which it is held worldwide the need for regular monitoring of all aspects of the physical, biological, and socio-economic environments is unquestioned. There is a need to employ an unbiased, internationally acceptable approach that would measure change relative to an array of previously collected baseline data. In that way analysis and assessment could be conducted in a rigorous manner lending itself to decisions about the precautionary principle, cumulative effects, compliance and ultimately enforcement.

One approach to this monitoring process would be to imbed the Strategic Environmental Assessment (SEA) in the regulatory process such that it would be conducted at regular intervals or triggered by elapsed time, strong indications of physical, biological, and socio-economic change, or other criteria.

RECOMMENDATION 23: It is recommended that a Strategic Environmental Assessment (SEA) be conducted in the Bay of Fundy when industry is operating and expanding, at regular intervals or triggered by elapsed time, strong indications of physical, biological, and socioeconomic change. However, prior to initiating this process the SEA process initiated in 2008 should be reviewed, evaluated and possibly reconfigured to encompass additional aspects related to the MRE sector. Initially, some emphasis should be placed on Minas Basin to examine physical, biological, and socio-economic environments. Data should be analyzed and assessed relative to existing baseline data and be publicly available within six months of collection. Support for this process should be drawn from a collective fund provided by energy companies active in the Bay of Fundy over the interval since the previous SEA.

RECOMMENDATION 24: It is recommended that legislation be enacted requiring all technological or scientific data collected and used by all developers at the end of each six month working period should be made available to the Department of Energy. Technical criteria defining the reporting requirements will be provided by the Department of Energy.

RECOMMENDATION 25: It is recommended that the Department of Energy engage in discussions with CEAA regarding the operative thresholds that will be used to trigger the environmental assessment process. The Demonstration phase of the development framework will likely remain under 5 MW of generated electricity, while a move to pre-commercial or commercial could produce as much as 64 MW. Definition of the threshold should be accompanied by identification of the environmental assessment process most likely to be invoked (screening, comprehensive, panel or joint panel) and whether assessments will be tied to each individual corporate effort or will embrace a corporate aggregates or a specific geographic area.

Health and Safety

Marine health and safety issues have existed for Nova Scotians for as long as they have engaged the sea. 75 years ago crewing a salt bank fishing schooner could be exceedingly dangerous, without any meaningful form of government protection or oversight. Today, that has changed and society demands a formal process that normally includes internationally accepted standards for equipment, behavior, monitoring, compliance and enforcement. One important case in point is the oil and gas industry which is covered by a strict set of rules that are monitored and enforced by the Canada-Nova Scotia Offshore Petroleum Board. Although promulgated for another industry the general principles developed for offshore oil and gas almost certainly apply, with some modifications, to the fledgling MRE sector. The underlying goal is to ensure that sufficient emphasis is placed on understanding and mitigating health and safety risks associated with diverse technologies during the course of installation, repair, maintenance, and full operation in all phases of the development framework.

RECOMMENDATION 26: It is recommended that legislation be enacted to require developers engaged in tidal in-stream energy extraction in the Bay of Fundy to conduct audits of their operations and submit results regarding health and safety standards for review at regular intervals to the Department of Energy.

RECOMMENDATION 27: It is recommended that the Department of Energy consider adopting relevant occupational, operational and safety standards used by the Canada-Nova Scotia Offshore Petroleum Board (CNSOPB).

Final Words

The consultative process set out to recommend specific legislative actions to support development of the MRE sector. Instead the process led to the inescapable conclusion that a number of critical precursors necessary to create the legislation were unavailable. Central to this revised view is the realization that without a strategic plan for the MRE sector it would be difficult to recommend clear legislative choices that possessed clarity and focus coupled with sufficient flexibility to properly meet future eventualities.

The absence of a Strategic Plan is a minor setback that can be quickly remedied. In the meantime recommendations as to legislation are still possible but they are of necessity overarching or foundational. A legislative, policy or regulatory framework is fashioned somewhat like a collection of pyramids that share a number of common components, notably a strong broadly inclusive base that expresses sustainable principles. Each pyramid gradually tapers upward as issues separate and become increasingly distinct. Finally, the apex represents a specific issue. In the process before us overarching legislation should be enacted first; it is broadly applicable and can be inferred from the consultations, earlier legislation or other jurisdictions. As a plan matures and experience grows through development, remaining layers are added to individual pyramids and a framework emerges. To be truly responsible this is a process that cannot occur in parallel with development but should be anticipatory. However, it is a stepped or incremental approach taking place in new territory with little in the way of pre - existing guidance available.

The process of defining a legislative framework undoubtedly benefits from access to a historical perspective, but not nearly as much from planning for the future. Defining a vision, mission, goals and objectives can contribute to a reasonably clear picture of what is intended. Using such a roadmap helps to guide decision-making since choices are then made with the hope of achieving some preconceived end. For example, the regulatory process is rife with binary choices: yes or no; good or bad; proceed or desist; short term or long term; etc. Decisions such as these, or others of much greater complexity, should be set in a context that has already been defined through the process of strategic planning.

Normally the elements that comprise a plan are derived from some form of consultation in which different views are expressed, hopefully resulting in

consensus. Most of the elements required for a thoughtful and detailed MRE Strategic Plan already exist; they are present in the two documents prepared for the legislative consultation process. These documents explore every important issue while providing alternative courses of action. However, these documents are one important step removed from a plan in that choices have not been made and clearly enunciated goals, priorities, objectives, set within reasonable time lines are absent. For the purpose of this report all the issues considered were allocated to one of four broad categories, namely, Planning, Economic Opportunities, Research, and Regulation as a vehicle to facilitate their discussion. However, a desirable end result would be a coordinated, integrated and comprehensive plan that saw many of these issues as part of an interconnected seamless whole.

Finally, many of those consulted offered legislative suggestions that were very detailed, and if executed would remove all subjectivity from any regulatory process. This raises an important question about how prescriptive this legislation should be. Defining a regulatory process in great detail will ensure clarity and transparency but it will greatly reduce any flexibility to adjust for changing conditions, while poorly defined legislation provides too much individual latitude leading perhaps to questions of bias. Clearly some form of compromise is called for if there is to be any future hope of adhering to the guidelines promulgated for and used by the one-window committee. In addition, one unstated goal of this endeavor is to create legislation that could form the spine of a national regulatory framework that could form the basis for a similar approach in all parts of Canada regardless of geography.

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Appendices

SUMMARY OF RECOMMENDATIONS

Legislation (pp. 14-24)

RECOMMENDATION 1: It is recommended that the Department of Energy embark on the creation of a strategic plan for the development of the marine renewable energy sector in Nova Scotia, with an immediate emphasis on the tidal in-stream energy conversion (TISEC) initiative. The plan should consider a five-year horizon and range from a broad-brush overview of sectoral expectations to a detailed analysis of Planning, Socio-Economic, Research and Regulatory issues raised in the consultative background document.

RECOMMENDATION 2: It is recommended that the Department of Energy include within the proposed strategic plan a complete set of guiding principles for the MRE sector (along the lines of those informally promulgated) so as to provide an overarching view or common foundation for all future legislation.

RECOMMENDATION 3: It is recommended that the Department of Energy develop a licensing system that contains clear quantitative criteria, against which decisions would be made regarding advancement of industrial activities from one level to the next within the Development Framework. Of special interest are the criteria that would govern the transition from Demonstration to full Commercial.

Planning (pp. 24-32)

RECOMMENDATION 4: It is recommended that the Department of Energy produce a clear statement of its intentions regarding the degree of transparency and public involvement it wishes to achieve throughout its advancement of the MRE sector. This statement should address the full range of planning activities, economic opportunities, research and regulatory issues.

RECOMMENDATION 5: It is recommended that the Department of Energy develop a comprehensive and accessible communication/education/outreach strategy designed to benefit all parties as the province advances its MRE strategy.

The goal of the communication/outreach strategy would be to advance the comprehension of all Nova Scotians in order to engage their support for the MRE initiative.

RECOMMENDATION 6: It is recommended that the Provincial and Federal governments collaborate in the modification of existing environmental assessment regulations that apply to the role of project-specific public participation in the advancement of the MRE sector, with special emphasis on information transparency, access to planning documents, and participation in public consultations.

RECOMMENDATION 7: It is recommended that the Department of Energy provide a clear public statement reaffirming the need for continued consultation with First Nations, expressing support for aboriginal aspirations regarding renewable energies, encouraging participation and the supply of services in individual initiatives, and, reaffirming the importance and role of Traditional Knowledge in future decisions regarding the MRE sector.

RECOMMENDATION 8: It is recommended that the Government of Nova Scotia's future Coastal Strategy take into account the development of a marine renewable energy sector. The Coastal Strategy should be followed by targeted legislation to address the many and varied immediate and future coastal issues that face Nova Scotians, not the least of which will be the protection of the Bay of Fundy ecosystem.

RECOMMENDATION 9: It is recommended that the Department of Energy seize the opportunity to play the role of "champion" within the Provincial Ocean Network (PON), which is currently developing a Coastal Strategy for Nova Scotia. This would involve advancement of the broader process while attempting to integrate immediate issues related to MRE Framework for Development and the burgeoning tidal in-stream initiative into a broader coastal regulatory approach.

RECOMMENDATION 10: It is recommended that the provincial Department of Energy and the federal Department of Fisheries and Oceans enter into discussions regarding possible strengthening of the province's role in the governance of coastal areas in the Bay of Fundy, given their rapidly growing

focus on that area and the present lack of clarity regarding jurisdictional responsibilities in that body of water.

RECOMMENDATION 11: It is recommended that until such time a comprehensive Coastal Plan becomes a reality, the Department of Energy should actively embrace and advance the concept and practice of Marine Spatial Planning (MSP). This process would parallel the current MRE initiative, focusing initially on the Minas Basin, Cumberland Basin and Minas Passage as a pilot project, reflecting present emphasis on those parts of the Bay of Fundy. MSP would address many of the issues raised throughout the earlier portions of this report and should be viewed as a valuable tool to oversee planning, information transfer, consultation, preservation, allocation and use of marine and coastal resources, along with many other activities germane to the advancement of the marine renewable energy sector.

Economic Opportunities (pp. 32-41)

RECOMMENDATION12: It is recommended that the Government of Nova Scotia work with communities to understand their special needs regarding small-scale tidal in-stream development; especially since community stakeholders will almost certainly differ in their response capacities from large industrial players. Understanding those differences will be the first step toward the development of a comprehensive plan to assist and encourage communities to participate in these initiatives. Issues that require some consideration include: financing, infrastructure, resource availability, appropriate choice of technologies, risk assessment, the potential utility of locally generated electricity without cost-effective grid access, geomorphological considerations, and policies or legislation specific to communities, to name but a few.

RECOMMENDATION 13: It is recommended that the Department of Energy develop a business plan, within the next 6-12 months, depending on the availability of requisite socioeconomic data, within the broader context of a strategic plan that addresses issues related to the development of the MRE sector, with immediate emphasis on the tidal in-stream energy generation. Examples of outstanding issues that require further clarification include: the possible economic uncompetitiveness of tidally generated electricity;

consideration of potential market penetration; assessment of competition from other renewable and non-renewable energy sources; anticipated informational needs such as labor force experience; community expectations; potential direct and indirect benefits; possible supply chains; the economic impact of in-stream tidal energy with and without export sales; the feasibility of knowledge-based export potential; an economic balance sheet associated with project development; and, an economic valuation of the major environmental components of the Bay of Fundy ecosystem. Clarification of these and other related issues would provide considerable guidance to all parties during expansion of the MRE sector.

Research (pp. 41-47)

RECOMMENDATION 14: It is recommended that a long-term research plan be created, as part of the strategic planning process, to accompany the development of the MRE sector. This plan should define the individual roles and responsibilities of OEER, OETR, and FORCE, and at a minimum should reflect the ongoing importance of research toward: sustainable utilization of tidal resources; enhancement of the monitoring process; assessment of environmental impacts; contributions to greater health and safety; and, the provision of support to integrated coastal management and marine spatial planning.

RECOMMENDATION 15: It is recommended that the Department of Energy continue its support of, and association with, the three arms-length not-for-profit research entities that facilitate the involvement of university researchers (natural scientists, social scientists and engineers) in the ongoing development of the marine renewable energy sector. The continuing participation of OEER, OETR, and FORCE should be timely, credible and adequately funded.

RECOMMENDATION 16: It is recommended that legislation be enacted that will define the ongoing role of research in the development and evolution of the MRE sector. Since funding availability is often a limiting factor the recommended legislation should explicitly identify a level of funding that the government will support. With increasing industrial activity , mechanisms could be developed that link funding to that activity such as royalties paid, cost of agreements, or a percentage of initial investments.

RECOMMENDATION 17: It is recommended that information collected through research and monitoring in order to fulfill requirements of existing environmental assessment legislation should be circulated among developers, researchers, regulators, investors and the public in order to provide a transparent and informed process.

Regulation (pp. 47- 62)

RECOMMENDATION 18: It is recommended that the Department of Energy pursue the development of a comprehensive regulatory plan, as part of a MRE strategic plan that integrates regulatory issues into the broader fabric of sectoral development, such as Planning, Economic Development and Research, with the ultimate goal of defining legislation in support of greater collaboration, efficiency, and effectiveness.

RECOMMENDATION 19: It is recommended that the Department of Energy promote the creation of an ongoing federal/provincial working group, made up of the principal regulators for the MRE initiative. Once assembled this group would engage in a broad dialogue to explore opportunities to harmonize legislation, policies and regulations over the forthcoming Demonstration phase of the Development Framework. Emphasis should be placed on the creation of a nationally acceptable framework that addresses, e.g., environmental assessment, monitoring, safety, property rights and economic regulation. The resulting harmonization should reduce complexity, improve accessibility and increase efficiency. An incremental or stepped approach could be used as it would be in keeping with the growth of the industry itself.

RECOMMENDATION 20: It is recommended that the Department of Energy explore the possibility of creating legislation to enable a reciprocal process in which portions of the federal regulatory framework could be integrated into provincial law or provincial regulations might be transferred to the federal government, thereby removing redundancies and increasing efficiencies.

RECOMMENDATION 21: It is recommended that the Department of Energy, during the early stages of the federal/provincial harmonization process, identify a specific individual to act as the first point of entry for any developer interested in

acquiring information related to possible participation in the MRE initiative. This person should be knowledgeable with the ability to guide and facilitate movement by potential proponents through the various early stages of knowledge transfer, approvals, licenses, permits, etc. for both the federal and provincial regulators.

Recommendation 22: It is recommended that the Department of Energy legislate the creation of a position or office imbued with administrative, decision-making responsibilities for the MRE sector. This office should be created using transparent criteria, visible lines of authority, identified responsibilities, decision making capacity, as well as recourses available for unfavorable rulings. This office should conform to the definition of "trusted regulator", that is, free in fact and perception of conflicting interests or bias.

RECOMMENDATION 23: It is recommended that a Strategic Environmental Assessment (SEA) be conducted in the Bay of Fundy when industry is operating and expanding, at regular intervals or triggered by elapsed time, strong indications of physical, biological, and socioeconomic change. However, prior to initiating this process the SEA process initiated in 2008 should be reviewed, evaluated and possibly reconfigured to encompass additional aspects related to the MRE sector. Initially, some emphasis should be placed on Minas Basin to examine physical, biological, and socio-economic environments. Data should be analyzed and assessed relative to existing baseline data and be publicly available within six months of collection. Support for this process should be drawn from a collective fund provided by energy companies active in the Bay of Fundy over the interval since the previous SEA.

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GLOSSARY

CDEIF Community Development Economic Investment Fund
CEAA Canadian Environment Assessment Agency
CNSOPB Canada-Nova Scotia Offshore Petroleum Board
COMFIT Community Feed-In Tariff
DFO Department of Fisheries and Oceans
DNR Department of Natural Resources
DOE Department of Energy (N.S.)
EC Environment Canada
EIA Environmental Impact Assessment
EIS Environmental Impact Statement
EGSPA Environmental Goals and Sustainable Prosperity Act
EPRI Electric Power Research Institute
ERCA Energy Resources Conservation Act
ESA Endangered Species Act
FCRA Fisheries and Coastal Resources Act
FERC Federal Energy Regulatory Commission
FIT Feed-In Tariff
FORCE Fundy Ocean Research Centre for Energy
HADD Harmful Alteration, Disruption or Destruction
ICAM Integrated Coastal Area Management
ICZM Integrated Coastal Zone Management
IEA International Energy Agency
IOC Intergovernmental Oceanographic Commission
IPCC Intergovernmental Panel on Climate Change
Kv kilovolts
MEKS Mi'Kmaq Ecological Knowledge Study
MRE Marine Renewable Energy
MSP Marine Spatial Planning
MW Mega Watt
NEB National Energy Board
NGO Non Governmental Organization

NRCan Natural Resources Canada
NSEA Nova Scotia Environment Act
NSPI Nova Scotia Power Inc.
NWPA Navigable Waters Protection Act
OATT Open Access Transmission Tariff
OEER Ocean Energy Environmental Research
OETR Ocean Energy Technical Research
OGAAC Oil and Gas Administrators Advisory Council
PON Provincial Ocean Network
PPA Power Purchase Agreement
PUA Public Utilities Act
RETD Renewable Energy Technology Deployment
RPS Renewable Portfolio Standard
SEA Strategic Environmental Assessment
TC Transport Canada
TISEC Tidal In-Stream Energy …..
UARB Utilities and Review Board
UNESCO United Nations Education, Science and Culture Organization