STATEMENT OF BEST PRACTICES FOR

IN-STREAM TIDAL ENERGY DEVELOPMENT & OPERATION

STANDARDS AND PRACTICES FOR IN-STREAM TIDAL ENERGY

Prepared by:
Nova Scotia Department of Energy
and Marine Renewables

NOVA SCOTIA

Contents

Background

The tidal energy sector is advancing quickly and Nova Scotia is well positioned to be a global leader in the development of commercially-viable tidal energy projects and solutions. In recognition of these opportunities the Province of Nova Scotia has invested considerable resources in research and development, communication, regulatory matters, and enabling policies.

In 2012, the Nova Scotia Department of Energy (DOE) launched the *Province's Marine Renewable Energy Strategy (MRES)* to outline the pathway for the development of tidal energy. Implementing the strategy will create the conditions necessary to support the advancement of both large utility-scale and community-scale tidal projects, and also to broaden strategic research and testing initiatives. Taken together, these actions will help to achieve a 300 megawatt (MW) target of commercial development beyond 2020.

The MRES contains a number of fundamental enabling activities to support the advancement of tidal energy, including the establishment of a Statement of Best Practices for In-Stream Tidal Energy Development and Operation (hereafter called the Statement). The objective of the proposed Statement is to provide a stand-alone document to identify the necessary elements and overarching principles for an adaptive approach to the growth of tidal energy industry in Nova Scotia. Additionally, the Statement acts as a tool to harmonize development and environmental interests, and as a benchmark, or reference standard. The Statement also builds on the work already completed by the Nova Scotia Department of Energy, such as the development of the Federal/Provincial One Window Committee on In-stream Tidal Energy, to assist in providing a clear path to development.

The following sections outline the key elements of the Statement for in-stream tidal development and operation.

Regulatory Considerations

The Statement provides a practical and comprehensive tool on how to proceed with tidal energy development, recognizing that regulatory conditions are evolving at this stage on in-stream tidal energy development.

Permits, licenses, approvals, and leases may be required from both the federal and provincial government, as well as from municipal authorities. The Province of Nova Scotia has established the Federal/Provincial One Window Committee on In-stream Tidal Energy to coordinate the regulatory review of in-stream tidal energy project proposals as they relate to environmental assessments, permits, and approvals.

One of the essential steps in the regulatory review of tidal energy projects will be to identify and address environmental concerns. Based on specific energy output thresholds, a hierarchy of federal/provincial environmental regulatory review requirements have been established and are summarized as follows:

1. **50 MW or more:** Large scale in-stream tidal power projects, with a production capacity of 50 MW or more, may require a federal environmental assessment, under the Canadian Environmental Assessment Act (CEAA). The CEAA will make a determination whether a federal-level environmental assessment is required upon submission of a project description. The factors that go into a screening decision are listed in section 10 of CEAA 2012.

2. **2 MW – 50 MW:** In-stream tidal power projects with a production capacity of 2 MW, up to the CEAA threshold, will be subject to an environmental assessment, pursuant to the *Nova Scotia Environmental Assessment Regulations, under the Environment Act.*

3. **Less than 2 MW:** Smaller scale in-stream tidal power projects (less than 2 MW) that may be covered under the Nova Scotia Community Feed-in Tariff (COMFIT) program, likely will not require a federal or provincial environmental assessment, but may require review and/or approvals under the *Species at Risk Act (2002), Fisheries Act (1985), Navigation Protection Act (1985)*, as well as provincial and municipal permits to construct, operate, and occupy.

   However, smaller scale in-stream tidal power devices (up to 500 kW) qualifying under the COMFIT program will require the preparation of an environmental impact statement. The document *Environmental Considerations for COMFIT Projects* identifies general types of information required to complete an application package, including a checklist.

The environmental assessment process provides a means to identify, evaluate, and predict the environmental effects of a project, and ultimately to render a decision on the acceptability of the overall undertaking. The assessment considers the specific technology and site characteristics to determine anticipated environmental effects of the project. Multiple criteria are evaluated to support the conclusion and environmental assessment approval to proceed with a project.

From a planning and regulatory perspective, in-stream tidal power development can pose a number of potential environmental risks. Environmental risk can include an actual or potential threat of adverse effects on living organisms and/or components of the environment resulting from the deployment, operation, or decommissioning of an in-stream tidal power development. Determining the level of risk requires an understanding of both the magnitude and the probability of multiple interactions associated with the overall project. The uniqueness of these new technologies, coupled with the variability in biophysical characteristics as well as the uncertainty of responses, is a key factor that must be considered in assessment of environmental risk for tidal energy. Given the unknowns, the approach to address any risks must rely on close monitoring and adaptive management. An adaptive management approach will recognize other users in the marine environment, provide monitoring to evaluate cause and effect, identify actions / interventions to mitigate adverse impacts, and also assess potential cumulative effects.

Understanding the full scale of a potential development at the earliest stage is essential for both proponents and regulators. This allows for early identification of site suitability, environmental concerns, public engagement, and baseline data collection, and it may avoid the possibility of scheduling delays that could result from additional regulatory reviews.

Tidal Resource / Environmental Evaluation

The objective of a resource assessment and environmental evaluation is to provide essential data about physical ocean processes so as to support the development of an in-stream tidal energy project. It also addresses a number of other interrelated matters, including:

- establishing an understanding of baseline conditions
- identifying gaps and inconsistencies in available information
- serving to assess the effects of tidal energy technologies on the marine environment
- providing a means to assess socioeconomic impacts from the development
- providing a means to evaluate mitigation measures to avoid, reduce, or offset any significant adverse effects on the environment, on fisheries, and on other marine resource users, as well as on communities
- providing the basis for determining the scope of potential monitoring and evaluation requirements

Community Engagement and Information Sharing

Effective communication with stakeholders is essential to ensure a social license for in-stream tidal energy projects and that overall objectives and timelines are realized. It will also help to inform communities of the potential for participation and benefits arising from project development.

Community and stakeholder engagement should begin early and continue throughout the project development process. To be effective, communication should be two-way, foster trust, develop networks, and build relationships. Successful communication will rely on different methods and coordinate consultation and engagement processes and ideally be part of an overall strategy.

Consultation and engagement best principles and practices for tidal energy will be similar to those for any type of project. However, given that tidal is a new and emerging industry, it may be subject to higher public concern and scrutiny, and thus effective consultation and transparency will be especially important.

First Nations Engagement and Information Sharing

Although only governments are responsible for initiating Crown consultation with First Nations, (in Nova Scotia the Mi'kmaq) it is essential that proponents are also directly involved in communication and engagement regarding their projects. Engagement should commence at an early stage and continue throughout the life of the project.

The province of Nova Scotia has prepared a document to guide the engagement process: Proponents' Guide: *The Role of Proponents in Crown Consultation with the Mi'kmaq of Nova Scotia*. The Statement will build on the approaches presented in this document.

Mi'kmaq to Crown Consultation

There are two cooperative mechanisms for Canada and Nova Scotia Mi'kmaq consultation—the Canada-Nova Scotia Memorandum of Understanding (MOU) on Consultation Cooperation and the tri-partite Terms of Reference for a Mi'kmaq-Nova Scotia-Canada Consultation Process (TOR). The TOR identifies decision-making authorities, principles for consultation, confidentiality provisions, funding provisions, and an amendment process.

The Nova Scotia Department of Energy leads an Energy Consultation Table with the participation of federal authorities and the Mi'kmaq where provincial energy issues are discussed. The province's Energy Consultation Coordinator organizes a consultation meeting with the Energy Consultation Table if the Assembly of Chiefs requests consultation or the Department of Energy offers to consult on a specific project or initiative.

Application of the Statement of Best Practices to Project Development

The Statement has been framed to follow the life cycle of an in-stream tidal energy project, from concept to decommission. Where possible, gaps in knowledge and the implications of specific decisions or tasks have been identified. Also, in some circumstances, options have been identified to gain knowledge, reduce risk, and facilitate future decisions.

The Statement embeds standards and practices for

- risk assessment
- a precautionary and adaptive approach to environmental assessment and licensing
- site assessment methodologies
- follow-up environmental monitoring requirements
- modeling and monitoring energy production
- deployment of devices
- stakeholder consultation and engagement
- operation and decommissioning

The Statement will apply to all in-stream tidal energy activities in Nova Scotia and will complement, but not replace, existing regulatory processes or requirements. It will provide regulators, tidal developers, community stakeholders, and the general public with an outline of how development of the in-stream tidal industry can function in a sustainable manner.

It is well recognized that in-stream tidal energy is an evolving sector, and the body of scientific knowledge is continually expanding. As new findings, technologies, and innovative industry practices emerge, revisions to the requirements will be incorporated. The Statement will be reviewed on a periodic basis by industry, participating governments, and potentially other stakeholders, and amended and revised as necessary.

Statement of Best Practices

Introduction

As marine renewable energy is still an emerging sector, there are few established standards or best practices for planning and/or operation of in-stream tidal energy projects. In Europe, the UK, and the USA, work has commenced to prepare protocols and methodologies, but experience with commercial-scale projects remains very limited and only portions of existing standards and protocols will be directly transferable to Nova Scotia.

The "Statement of Best Practices for In-Stream Tidal Energy Development and Operation" (Statement) follows a sequence of essential steps in planning, deployment, operation, and decommissioning of an in-stream tidal energy project. These steps will apply to all tidal in-stream energy conversion (TISEC) device development projects, and it must be recognized that some aspects may be more involved owing to the complexity of the specific project. It is also understood that many of the steps, such as consultation with regulators, stakeholders, and communities, will be ongoing throughout the life cycle of the project. These steps include:

1. Initial planning / pre-registration
2. Conducting effective consultation / engagement
3. Mi'kmaq engagement
4. Tidal energy resource assessment
5. Environmental evaluation
6. Baseline surveys
7. Risk assessment factors follow-up and monitoring
8. Regulatory matters
9. Construction / deployment
10. Operations and maintenance
11. Decommissioning

Context

The Statement is intended to be a living guide and reflects the Province of Nova Scotia's commitment to clarify, facilitate, and improve decision-making processes for the development of in-stream tidal energy as a viable sector. It will ensure that the industry grows in an environmentally and socially responsible manner. The Statement identifies measures to guide planning and operational activities of in-stream tidal energy projects in order to minimize any adverse impacts of related activities in the environment. These measures are set as minimum standards and will complement existing regulatory processes.

The Statement provides guidelines against which project proposals and plans will be measured. It is expected that in-stream tidal projects will adhere to both the existing federal and provincial regulatory frameworks, obtain all necessary approvals for the project, and follow to the extent possible the best practices outlined in the Statement. The Statement has been prepared for use by policy makers, industry, tidal developers, regulators, governments, and other key stakeholders.

Definitions

Adaptive management – a structured, iterative process of decision-making, with an objective of reducing uncertainty, based on monitoring results. In the context of in-stream tidal power, monitoring results could trigger a hierarchy of management actions, including re-evaluation of monitoring, more frequent reporting, additional mitigation, temporary cessation of operations, or, if issues cannot be resolved or mitigated, termination of the project.

Best practice – a method, technique, or procedure that consistently results in a superior outcome to those achieved with other means. Additionally, based on experience, best practices can evolve over time to become better as technology or procedural improvements are discovered. Best practices provide a benchmark or a standard way of doing things.

Community Feed-in Tariff (COMFIT) – a Nova Scotia Department of Energy program to promote community-based power projects through the establishment of a feed-in tariff. It provides a fixed price per kilowatt hour (kWh) for projects producing electricity from renewable sources, including in-stream tidal power.

Compliance monitoring – activities and procedures to determine whether projects comply with conditions of regulatory permits and approvals and appropriate legislation and policies.

Consultation – the process of providing people with information and listening to their responses.

Engagement – an agreed-upon, two-way, interactive approach to communication that builds relationships.

Environmental assessment – a structured process to evaluate the possible impacts that a proposed undertaking may have on bio-physical attributes, as well as on socioeconomic aspects of the environment.

Environmental monitoring – are processes and activities used to characterize and evaluate the quality of the environment. Ongoing monitoring of specific parameters can be used to assess change in relation to specific elements of an in-stream tidal power project.

Environmental risk – an actual or potential threat of adverse effects on living organisms and/or components of the environment resulting from any aspect of the deployment or operation of an in-stream tidal power development.

Developmental Tidal Feed-in Tariff (Developmental FIT) – a Nova Scotia Department of Energy program that provides a fixed price per kilowatt hour (kWh) for projects producing renewable electricity from an in-stream tidal power generation facility consisting of a single device with a capacity greater than 500 kW or an array of devices each of which with a capacity greater than 500 kW.

Follow-up program – ongoing activities and procedures to determine the accuracy of the conclusions of an environmental assessment and the effectiveness of mitigation measures.

Tidal in-stream energy conversion (TISEC) devices – are technologies deployed in tidal waters and used to convert the kinetic energy of moving water into electricity.

Precautionary principle – a strategy to cope with possible risks where full scientific understanding remains incomplete. The precautionary principle recognizes that the absence of complete scientific evidence to take precautions shall not be used as a reason for not taking precautions to avoid risk—especially when there is a possibility of irreversible damage.

Receptor – living organisms, or communities, potentially impacted by stressors.

Risk assessment – a systematic process of evaluating the potential risks that may be involved with project activities. Determination of the risk is based upon understanding the consequence and the probability of an interaction occurring.

Stakeholder – a community, individual, or organization that potentially can be directly impacted by a project.

Stressor – components and/or activities of a project that result in a stress response within the environment and possibly result in alterations to systems or biota. These can be physical and/or chemical.

Application

- Unless otherwise provided, the standards and practices set out in this Statement apply to all in-stream tidal energy development, operation, or decommissioning activities to be conducted in Nova Scotia.
- The standards and practices set out in this Statement do not apply to river current, tidal range, wave or offshore wind activities.
- Industry, tidal developers, and regulators are expected to adhere to this Statement to the extent feasible when engaged in in-stream tidal energy development activities in the marine environment. Notwithstanding the above, the Statement does not in any way limit or hinder regulators from exercising their powers where deemed necessary.
- The standards and practices set out in this Statement are intended to provide a set of parameters and processes to assist developers in planning their projects and ensure an environmentally and socially responsible approach to in-stream tidal energy development.
- Early communication with the Nova Scotia Department of Energy is essential, and developers are encouraged to develop an overall strategy regarding common goals and expectations, at the concept stage, well in advance of conducting any surveys.

Principles

Below are the fundamental principles of the "Statement of Best Practices for Tidal Energy Development and Operations."

- Project development consistent with protection and sustainable uses of the environment
- Transparency in communications, including information sharing when appropriate, with special consideration to commercially sensitive information
- Appropriate consideration of ecosystem-scale and cumulative effects
- A precautionary and adaptive management approach to deal with uncertainty;
- Early initiation of baseline studies
- Early and continuing engagement with the Mi'kmaq
- Early and continuing engagement with communities that could be directly impacted by the project due to economic or environmental reasons
- A level of environmental review that is based upon a risk assessment framework that includes multiple variables (e.g., site characteristics, scale, proposed immediate and long-term energy extraction levels, etc.)
- Where possible, government, researchers, and industry working cooperatively to address gaps in knowledge

Best Practices

1.0 Initial Planning / Pre-Registration

Background

The province of Nova Scotia has recognized the need for advanced planning and, in particular, early engagement of the public, well in advance of project construction/operation/commissioning. To facilitate responsible development, the province has conducted Strategic Environmental Assessments (SEA) for tidal power development. The first report was completed in 2008 for the Bay of Fundy SEA.

Recommendations from the SEA included the creation of policies/legislation, promotion of demonstration projects, ongoing consultation, and an incremental approach to development based on adaptive management. Commitment to revisit the recommendations, as well as the state of knowledge, included a subsequent Bay of Fundy SEA update, and, as a result of planned in-stream tidal activities in Cape Breton, an SEA for the Cape Breton Coastal Region was conducted in 2013.

The province of Nova Scotia has also established a number of enabling measures to assist developers, including the establishment of a Federal / Provincial One-Window Standing Committee for Tidal Power projects (OWC). The intent of the OWC is to streamline and better coordinate the application and subsequent approvals for in-stream tidal energy projects in Nova Scotia.

The province of Nova Scotia has prepared the following guidelines to assist developers:

Guidelines for Permitting of a Pre-Commercial Demonstration Phase for Offshore Renewable Energy Devices (Marine Renewables) in Nova Scotia

Developers are encouraged to adopt the following as best practices to guide initial planning/pre-registration.

1.1 Developers are encouraged to contact the Nova Scotia Department of Energy to confirm the current requirements/application process before going ahead with developing a project proposal.

1.2 Developers are encouraged to seek the services of a professional for guidance, to understand the regulatory requirements and the environmental context, and for assistance in preparation of an initial project application.

1.3 In preparing application documents, wherever possible, developers should demonstrate how innovations in their design concept, materials, construction/deployment methodology, location, and specific orientation can mitigate anticipated environmental effects.

1.4 Developers are also encouraged to review applicable standards, methods, and protocols, including the reports prepared by the International Energy Commission

Technical Committee for Marine Energy Standards TC 114 for hydrokinetics and in-stream tidal energy conversion (in preparation). Developers should also review all relevant applicable standards adopted by the Canadian Standards Association and the Canadian Electrical Association.

2.0 Effective Stakeholder Consultation

Background

As conditions of the environmental assessment process, COMFIT, Developmental FIT, and other regulatory decisions, developers will be required to consult with local communities and stakeholders. Consultation allows stakeholder input in the planning of the project and provides a feedback mechanism to demonstrate how local issues, identified as priorities, will be addressed.

In-stream tidal projects, like any new activity in the marine environment, have the potential to conflict with other established uses: commercial/aboriginal/recreational fisheries and aquaculture, navigation, recreation, other renewable energy projects, and other uses. Effective communication with stakeholders is essential to ensure acceptance of in-stream tidal energy projects and that overall objectives and timelines are realized. Failure to engage with communities may result in a failure to obtain social license.

Based on the experience of previous consultations in Nova Scotia, including the Fournier Report and *Acadia University's Community and Business Toolkit for Tidal Energy Development*, as well as in the US and the UK, the public is generally in favour of in-stream tidal power developments in their community, and early input in the planning process will be essential to maintain and grow public support.

References

Tidal Energy Community Engagement Handbook

Community and Business Toolkit for Tidal Energy Development

In addition to the Nova Scotia documents, there are a number of relevant international references:

International Energy Agency's *Communication Best-Practices for Renewable Energy (RE-COMMUNICATE)*

Best Practises for Consultation for Offshore Wind Energy project

Community and stakeholder engagement should begin early and continue throughout the project. To be effective, communication should be two-way, foster trust, develop networks, and build relationships.

Developers are encouraged to adopt the following as best practices for conducting effective consultation.

2.1 Prepare an overall consultation strategy.

2.2 Articulate the objective of consultation and anticipated outcomes.

2.3 Prepare a consultation timetable and link to anticipated project milestones.

2.4 Identify the appropriate stakeholders, regulators, communities, Mi'kmaq, and Mi'kmaq organizations.

2.5 Initiate early engagement/communication.

2.6 Select the most appropriate communication methods or techniques for the task or audience.

2.7 Provide and maintain a place where information on a project can be publicly accessed, such as a website.

2.8 Monitoring and evaluation of the consultation process and maintaining contact are essential.

2.9 Coordinate with regulatory / and any other planning initiatives.

2.10 As required, adapt communication methods to fit the circumstance.

2.11 Inform stakeholders of how their input was considered/incorporated in developing project outcomes.

2.12 At the concept stage, the project siting, design, size, spacing, navigation, access routes, sea cable routes, as well as shore based infrastructure, should be shared with local interests.

3.0 Aboriginal Engagement

Background

Aboriginal engagement is an essential part in the planning and ongoing operation of in-stream tidal power projects in Nova Scotia. The Nova Scotia Environmental Assessment Regulations make specific reference to proponent engagement with the Mi'kmaq of Nova Scotia. The Nova Scotia Office of Aboriginal Affairs has prepared guidance documents to explain how the proponent can play a proactive role in engaging the Mi'kmaq throughout the approval process.

References

Proponents' Guide: The Role of Proponents in Crown Consultation with the Mi'kmaq of Nova Scotia

A COMFIT Entity's Guide to Consultation with the Mi'kmaq

Phase 1 - Bay of Fundy, Nova Scotia including the Fundy Tidal Energy Demonstration Project Site — Mi'kmaq Ecological Knowledge Study

Developers are encouraged to adopt the following, as best practices for conducting aboriginal engagement.

3.1 Review and understand the current policies for engagement with the Mi'kmaq of Nova Scotia.

3.2 Prepare an overall consultation strategy based on the guiding principles of:

- Mutual respect
- Early engagement
- Openness and transparency
- Adequate time to review/respond

3.3 Sequential steps of engagement include the following:

3.3.1 Notifying the Mi'kmaq of the project early in the development process
3.3.2 Providing as much information as possible
3.3.3 Meeting with the Mi'kmaq community or communities
3.3.4 Completing a Mi'kmaq ecological knowledge study (MEKS)
3.3.5 Addressing potential project-specific impacts
3.3.6 Documenting the engagement process

3.4 In some circumstances, the option of entering into benefit agreements (BAs) with Aboriginal groups may be an outcome of the engagement process.

3.5 Best practices for the establishment of BAs:

3.5.1 The use of BAs reflects the principle that Aboriginal people should have an opportunity to participate in resource development.
3.5.2 BAs can establish good will and positive relationships among Mi'kmaq and industry proponents and government.
3.5.3 Other beneficial outcomes include employment, contracting, and financial benefits to the Mi'kmaq that enable self-sufficiency and help to diminish the existing economic gap between Aboriginals and non-Aboriginals.

4.0 Tidal Energy Resource Assessments

Background

A fundamental step in tidal power development is an accurate assessment of the power resource. At this time, available data on all of the necessary factors, criteria, and methods for resource assessment are still evolving. There are no established best practises, and methods will continue to evolve as monitoring results/knowledge become available. Additionally, scientists and regulators have not yet determined the exact thresholds for reduction in flow (and the associated environmental effects) related to the operation of TISEC devices. As such, the Province of Nova Scotia is committed to an incremental approach to in-stream tidal energy.

References

Measuring and Assessing the Tidal Resource, in Community and Business Toolkit for Tidal Energy Development (Richard Karsten, 2013)

Assessment of the Potential of Tidal Power from Minas Passage and Minas Basin (Karsten, R.H., D. Greenberg, M. Tarbottom, 2011)

Assessment of tidal current energy in the Minas Passage, Bay of Fundy, Proceedings of the Institution of Mechanical Engineers (Karsten, R.H., J.M. McMillan, M.J. Lickley, and R.D. Haynes, 2008)

Guidance on Assessing Tidal Current Energy Resources (Andrew Cornett, 2008)

Guidelines for Preliminary Estimates of Power Production by Tidal In-Stream Energy Conversion Devices (Hagerman G., et al., 2005)

International Electrotechnical Commission TEC 114 – Specification for in-stream tidal resource assessment in progress. dash board overview (in preparation)

Developers are encouraged to adopt the following, as best practices for conducting tidal energy power resource assessments.

4.1 Methods should include the deployment of current metres using the most appropriate technology (e.g., Acoustic Doppler Current Profilers), at the correct locations throughout the project site, to assess the energy potential of the proposed location.

4.2 Monitoring should be continued for the appropriate duration (at least 35 days) to assess the tidal cycle and to predict future tidal flows.

4.3 Methods should be appropriate to allow the spatial analysis of currents throughout the project location.

4.4 When possible, surveys in support of tidal energy resource assessments, baseline assessment, and any other activity should be integrated.

5.0 Essential Components of the Environment to Assess/Evaluate

Background

An Environmental Impact Assessment is a tool through which the effects of a proposed undertaking are predicted and evaluated. The Province of Nova Scotia's Environmental Assessment process ensures that site specific decisions are made in a way that recognizes and avoids any significant adverse environmental effects of projects, including effects on other users of the ocean or on the marine environment.

It is the responsibility of proponents to provide details of their proposed in-stream tidal power project, including matters related to environmental impacts to the province of Nova Scotia. The project description should recognize the possibility of small changes in project scope (including scheduling), as well as the possibility of more than one method for construction/deployment. As such, it is important for developers to understand the steps to identify risks early in the planning of project development.

The preferred locations for tidal power development are very dynamic and challenging to assess, and there is also the added complication of factors such as climate change, sea-level rising, and natural variation in biological communities. The effects of anthropogenic activities like commercial fishing, aquaculture, and municipal waste discharge can all affect the receiving waters and result in environmental change. Given these variables, the essential scope of factors to consider and the depth of the assessment will likely vary with each project, and developers are encouraged to review and understand the approach(es) used for similar projects.

As a starting point, the terms and conditions identified in the Environmental Assessment Approval for the FORCE project may provide guidance in identifying the essential components/ elements to address. The Strategic Environmental Assessments (SEAs) completed for the Bay of Fundy and the Cape Breton Coastal Region may also provide guidance on elements to address.

References

Cumulative Effects Assessment Practitioners' Guide, Canadian Environmental Assessment Agency

A Proponent's Guide to Environmental Assessment, Nova Scotia Department of Environment, Policy Division, Revision (2014)

Environmental Assessment Approval, Fundy Tidal Energy Demonstration Project, Fundy Ocean Research Centre for Energy, Proponent Minas Passage, Nova Scotia (2009)

Developers are encouraged to adopt the following as best practices to assess/evaluate the environment.

5.1 The spatial boundaries for the evaluation of each of the above components should recognize the potential for offsite effects as a result of accidents/malfunctions, as well as cumulative effects, and each should be defined accordingly.

5.2 Although these will vary with each project, the essential components, or headings, to consider in the environmental assessment and/or the environmental impact statement include the following:

- Terrestrial habitats
- Terrestrial species at risk
- Marine fish and fish habitat
- Marine species at risk
- Intertidal habitat (wetlands, watercourses, fish, and fish habitat)
- Socioeconomic and cultural environment
- Commercial fishing / Mi'kmaq fishing / aquaculture
- Archaeological and heritage resources
- Significant and/or protected areas
- Other ocean users

5.3 Seek advice from qualified professionals and/or local experts in the above identified areas to help in understanding the current context.

5.4 The temporal boundaries of the evaluation should consider the full life of the project, including initial planning, deployment, construction, operation, maintenance, and decommissioning.

6.0 Baseline Surveys

Background

The overall purpose of baseline surveys is to characterize the biophysical components of the ecosystem (i.e. terrestrial and marine resources including fisheries) within and around the project area that may be affected by elements of the project. These surveys will include compiling existing information and collecting new environmental data (e.g., terrestrial/marine life, including fish, marine mammals, sea turtles and sea birds, benthic habitats, and oceanographic conditions—currents and tides).

It is the developer's responsibility to design the baseline survey(s), and developers are encouraged to seek the services of a qualified environmental professional early in the planning of their project.

There is a great deal of variability in the types of sites that may be considered for tidal power development, and, in consideration of local conditions, the survey should employ the appropriate equipment and analytical techniques to collect the necessary information.

In general, the depth of baseline information required to support the regulatory decision will be proportionate with the risk and the scale of potential environmental effects. Where greater risks are identified, baseline surveys may be more involved, assessment requirements will be more rigorous, and, as a consequence, the depth/duration of mitigation measures and follow-up monitoring will be proportionate and aligned accordingly.

As general background, developers are encouraged to review previous studies and consultant reports and other environmental assessments that may be relevant to the project area. Previous works or undertakings, including dredging/ocean disposal, port developments, coastal infrastructure projects, and aquaculture, may have been subject to an environmental assessment, and relevant reports and/or follow up monitoring studies may be accessible. Developers should contact the appropriate regulatory bodies for assistance regarding potential background information that may currently be available and to determine what baseline surveys and information may be required to meet regulatory requirements.

References

Environmental Considerations for COMFIT Projects

Guidelines for Submission of Spatial Data for Atlantic Offshore Renewable Energy Development Site Characterization Surveys (2013)

Developers are encouraged to adopt the following as best practices for conducting baseline surveys.

6.1 The primary objective is the establishment of pre-construction baseline environmental conditions that may be used to assess whether detectable changes occurred in marine life and habitat (including fish presence, absence, or abundance), as well as physical processes post-construction.

6.1.1 Methods should be appropriate for identification and enumeration of seasonal presence/absence of terrestrial/marine life (including fish that support commercial, recreational, and Mi'kmaq Food, Social, and Ceremonial (FSC) fisheries, marine mammals, sea turtles, and seabirds) within the project footprint and surrounding areas.

6.1.2 Methods should also be appropriate for identification of seasonal presence/absence of threatened or endangered terrestrial/marine life (including, fish, marine mammals, sea turtles, sea birds) recognized by the province of Nova Scotia as having special conservation status and/or under the Species at Risk Act (2002).

6.1.3 Methods should be appropriate for identification of critical or important habitats of terrestrial/marine life that are necessary to the life history of present species (including spawning, rearing, and migration corridors for fish, invertebrates, marine mammals, and seabirds) within the project footprint and surrounding areas.

6.2 Collect additional information aimed at reducing uncertainty associated with existing data and/or to help inform the interpretation of survey results.

6.3 Develop an approach, including the establishment of reference/control sites to quantify any detectable changes in marine life (in particular the presence, absence, or abundance of fish) associated with proposed operations.

7.0 Factors to Consider in the Preparation of the Environmental Assessment / Environmental Impact Statement

Background

Risk can fall into two broad categories: 1) that is defined by the combination of the probability or likelihood of an adverse event and the consequences of that event should it occur; and 2) that is defined by the uncertainty of an outcome. In an effort to understand risk, regulators are guided by the precautionary principle and rely on risk assessment as part of the environmental assessment process. As a starting point, in the absence of complete scientific understanding, regulators assume the possibility of the worst case scenario. A complete explanation of the precautionary principle can be found in the Government of Canada document identified in the references.

One of the tools that regulators use to demonstrate the origin of risk are Pathways of Effects (PoE) diagrams (e.g., Fisheries and Oceans Canada has prepared Pathways of Effects for works proposed in the water). The PoEs are used to describe cause-and-effect relationships for the various project activities and their connections with different elements in the marine environment. Fisheries and Oceans Canada engaged Acadia University to prepare detailed pathways of effects for each form of marine renewable energy, including in-stream tidal power. These pathways identified six stressors (activities of the tidal power project that result in interactions with the environment), specifically:

- Release of contaminants
- Physical interactions with infrastructure
- Noise, vibrations, and light emitted from devices
- Electro-magnetic fields
- Effects of artificial structure
- Change in current or wave energy

The PoEs also identified a number of receptors including:

- Marine mammals and turtles
- Fish
- Marine plants and invertebrates
- Seabirds

Each pathway represents a potential interaction between the stressors and receptors. These interactions can be used to understand the location of regulatory decision points (application of specific permits).

At the present time there are gaps in knowledge regarding the outcome of many of the stressor/receptor interactions identified, as well as the effectiveness of mitigation, and the most appropriate approach to monitoring. These knowledge gaps represent uncertainty or risk for developers, regulators, and stakeholders.

Risk assessment is the process used to determine the level of uncertainty that residual effects (after mitigation) pose to the marine environment. Risk assessment is part of the environmental assessment process, a consideration in the environmental impact statement, and is used by regulators to determine if a specific approval will be required and, if so, the types of conditions that will be necessary. The Province of Nova Scotia, Offshore Energy Research Association (OERA) and Fisheries and Oceans Canada engaged the services of Acadia University to prepare a risk assessment framework specific to in-stream tidal power development.

References

A Framework for the Application of Precaution in Science-based Decision Making about Risk

Pathways of Effects for Offshore Renewable Energy in Canada

A Framework for Environmental Risk Assessment and Decision-Making for Tidal Energy Development in Canada

Developers are encouraged to adopt the following as best practices in the preparation of the environmental assessment / environmental impact statement.

7.1 Clearly define the scope of the review.

7.2 Review the Pathways of *Effects for Offshore Renewable Energy in Canada* and *A Framework for Environmental Risk Assessment and Decision Making for Tidal Energy Development in Canada* and demonstrate how the project's risk assessment has taken these documents into account.

7.3 Identify project alternatives, including potential use of different construction/ deployment methods, scheduling for in-water works, and preferred locations.

7.4 Recognize legal requirement thresholds and the associated depth of environmental review, evaluation, and assessment.

7.5 Identify the risk of interference with other human uses of the ecosystem, including nearby lands, watercourses, and marine areas identified as having ecological or conservation significance.

7.6 Categorize the overall risk of the proposed project and make a management decision.

7.7 Propose supplementary mitigation measures to reduce the overall risk of the project, when applicable.

7.8 Prepare the environmental monitoring and follow-up plans, and an adaptive management program for an approved project.

7.9 Construction/deployment schedule should recognize fishing seasons, high-use fishing areas, seasonal species distributions, and areas closed to fishing.

8.0 Monitoring

Background

The Province of Nova Scotia will be working through the Federal/Provincial One Window Committee on In-stream Tidal Energy to seek input from outside agencies, including the participating federal departments, regarding specific monitoring requirements. This will have implications on the scope of baseline surveys, methodologies to address adaptive management, and the magnitude/duration of follow-up programs, including environmental monitoring. As background and general guidance regarding monitoring and follow-up programs, the *CEAA's Operational Policy Statement: Follow-up Programs* under the Canadian Environmental Assessment Act (2011) may offer guidance.

Monitoring will apply to the life cycle of the project and will be proportionate to the potential risks the operation may have with specific elements of the environment. Regulators will require monitoring to assess environmental interactions of the in-stream tidal energy project, including potential for harm to terrestrial/marine organisms and their habitats, and in particular marine mammals, sea turtles, fish, and seabirds identified under the Species at Risk Act (2012) and/or recognized as being of special conservation concern by the Province of Nova Scotia.

At this time, there is no single tool to integrate all of the monitoring instruments into a single, stand-alone unit. Developers will need a site-specific monitoring strategy, will need to clearly state the objectives and the hypotheses being tested, and will need to articulate how the results will be interpreted and reported.

References

Developing Environmental Protocols and Modeling Tools to Support Ocean Renewable Energy and Stewardship, National Oceanographic Partnership Program OCS Study

The Marine Scotland Licensing and Consents Manual: Covering Marine Renewables and Offshore Wind Energy Development

Ocean Renewable Power Company (ORPC), Cobscook Bay Tidal Energy Project 2013 Environmental Monitoring Results

Marine Current Turbine's SeaGen Demonstration Project in Strangford Lough, Ireland

Verdant Power's Roosevelt Island Tidal Energy (RITE) Project in Eastport River, New York

Developers are encouraged to adopt the following as best practices for monitoring.

8.1 The rationale for the monitoring activity must be clearly articulated.

8.2 The objectives or hypotheses to be tested must be cross-referenced with permit conditions.

8.3 A clear outline of the monitoring methodology, including equipment used, should be developed.

8.4 The level of predicted impact and the receptor(s) should be identified.

8.5 The spatial and temporal scales should be appropriate to detect change.

8.6 Developers must understand if the results are intended to inform/reduce uncertainty or address a specific permit condition.

8.7 Data collected must allow for statistical analysis to validate the findings.

8.8 Where applicable, comply with industry standard methodologies and equipment.

8.9 Appropriate authorities will be advised if unforeseen interactions are detected, and, if required, there may be a need to revisit the monitoring framework.

8.10 Include an allowance for Quality Analysis / Quality Control in the overall monitoring strategy.

9.0 Regulatory Matters / Adaptive Management / Oversight

Background

The larger the degree of uncertainty, the greater the potential risk to regulators, and this has direct implications for developers. Regulators have a hierarchy of options to address risk, including the provision of more mitigation, closer monitoring, and the frequency of reporting. In some circumstances, regulators may also require a financial security to ensure that the necessary measures are implemented. The determination of acceptable risk considers the nature / magnitude / duration of the impact, as well as the sensitivity of the components of the marine environment likely to be impacted.

For the foreseeable future, all in-stream tidal power projects will require a site-specific review. Developers will be informed by regulators regarding potential permit requirements and/or expert advice, including follow-up monitoring.

One of the key steps to satisfy in the review/approval process will be the application of the Fisheries Act, and sections of the Species at Risk Act (2002), administered by the Fisheries and Oceans Canada. If it is determined that a Fisheries Act Section 35(2) Authorization is required, Fisheries and Oceans Canada must consider 4 factors: (1) the contribution of the relevant fish to the ongoing productivity of commercial, recreational, and Mi'kmaq fisheries; (2) fisheries management objectives; (3) measures and standards to avoid, mitigate, or offset serious harm; (4) the public interest.

Recent documents from the Fisheries and Oceans Canada *Fisheries Protection Policy Statement,* Department of Fisheries and Oceans, *Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting*, and *The Fisheries Protection Program Operational Approach* provide general guidance.

To ensure the protection of species at risk, a species that is listed on Schedule 1 of the Species At Risk Act as endangered, threatened, or extirpated is subject to prohibitions that make it an offence, among other things, to kill, harm, harass, capture, or take an individual of the species; damage or destroy a residence of one or more individuals; or destroy any part of the critical habitat of the species that is protected by a Ministerial Order. Some activities may be exempted from some or all of the prohibitions, if they meet the conditions for the issuance of a permit or exemption under The Species At Risk Act (SARA). These conditions are outlined in sections 73 and 83 of the Act. Proposed activities will be considered on a case-by-case basis to determine if an interaction with a SARA-listed endangered, threatened, or extirpated species, its residence, or its critical habitat is likely, and whether or not a permit or exemption can be issued for the activity.

Adaptive management

In the context of in-stream tidal energy technologies, adaptive management is a systematic process by which the potential environmental impacts of installation and operation are evaluated against quantified environmental performance goals. Management changes can be facilitated to ensure that outcomes are met or re-evaluated as required.

Management actions could include a hierarchy of options, such as additional monitoring, more frequent reporting, re-orientation, removal and/or relocation of individual devices, cessation of operation at specific times, and, if no alternatives are available, termination of the overall project. Assuming that project effects prove to be reversible (after site restoration), adaptive management may offer a means to address the unknowns in a methodical manner, provide the basis for management actions, and allow the evolution of policy based on experience.

For general background, The Canadian Environmental Assessment Agency, *Operational Policy Statement: Adaptive Management Measures under the Canadian Environmental Assessment Act,* may offer guidance.

At this time, there are no established empirical criteria or regulatory thresholds to trigger adaptive management actions or a clear hierarchy of options. It is anticipated that the priorities requiring adaptive management will be based on the regulatory risks and an understanding of the interactions with marine life (including fish, marine mammals, and possibly seabirds).

Given the above uncertainties and other challenges, it is unrealistic to expect developers to provide all of the monitoring answers regarding the potential effects of their projects on the environment.

Planning a Cooperative Approach

There are three tiers of monitoring: compliance, effects, and effectiveness. Developers, regulators, and scientists can be involved in each. At this time, there is limited regulatory experience to help inform the exact requirements of monitoring needs, and the supporting science is still in progress.

For the interim, it is important for industry to be directly involved in identifying the objectives of all monitoring, as well as understanding the assumptions. Wherever possible, monitoring efforts of developers, researchers, and government should be integrated. This would prevent the potential duplication of efforts, increase efficiency, and help inform conclusions. To this end, all levels of government will need to collaborate with industry to ensure the appropriate monitoring framework is implemented for each project.

References

Review of environmental data associated with post-consent monitoring of licence conditions of offshore wind farms

ORPC Adaptive Management Plan, Cobscook Bay Tidal Energy Project, FERC Project NO. P-12711

Transport Canada, *Navigable Waters Protection Program Overview*

Developers are encouraged to adopt the following as best practices in the addressing regulatory matters.

9.1 Where terms and conditions are not currently standardized, developers can offer to participate in preparing draft terms and conditions of regulatory approvals.

9.2 Identify an industry champion[1] to help facilitate sharing of information and regulatory experience among developers.

9.3 Identify an industry champion to work with regulators to prepare guidelines for the deployment and operation of different types of in-stream tidal power devices, as well as to provide input for the continual improvement of regulations governing in-stream tidal energy.

9.4 As conditions of permits, recognize the need to include adaptive management as a means to modify the terms and conditions based on the results of monitoring and observation.

9.5 In an effort to ensure a strategic approach to development, reduce overall costs and efforts, and address risk through science-based monitoring results. Wherever possible industry should work in partnership with other developers, all levels of government, and stakeholders.

9.5.1 Where possible, industry should work in partnership with Fisheries and Oceans Canada, Marine Renewables Canada, and the Nova Scotia Department of Energy to address research/policy needs related to interactions between fisheries resources, to species at risk and special areas, and to the deployment/operation of in-stream tidal devices. This may include participation in one or more Fisheries and Oceans Canada working groups.

9.5.2 Where possible, industry should work in partnership with Transport Canada, Marine Renewables Canada, and the Nova Scotia Department of Energy to address policy needs to ensure safe navigation during the deployment/operation of in-stream tidal devices.

[1]An industry champion would be a neutral third party that represents industry interests as a whole and not one particular company (e.g., Marine Renewables Canada, FORCE).

10.0 Construction / Deployment

Background

There is a depth of knowledge and references regarding general works in the water that will be transferable to the construction/deployment of in-stream tidal devices. All persons engaged in in-stream tidal energy development will be required to adhere to all relevant Occupational Health and Safety standards.

References

Nova Scotia Occupational Safety General Regulations

Nova Scotia Watercourse Alteration Activity Standards

Nova Scotia Department of Environment Guidance Document, *"So You Need to Alter a Wetland"*

Nova Scotia Department of Natural Resources, *Before You Build A Wharf Or Do Other Work On The Shore Of Your Coastal Waterfront Property*

Nova Scotia Department of Natural Resources, *Wharf, Skidways, Boat Ramp: Permit - Submerged Crown Land (Excluding Bodies of Fresh Water)*; and Nova Scotia Department of Natural Resources, *Mooring Permit - Submerged Crown Land (Excluding Bodies of Fresh Water)*

Nova Scotia Department of Natural Resources, *Frequently asked questions about crown lands*

Best Practice Report - Installation Procedures Deliverable 3.6.2 from the MERiFIC Project, A report prepared as part of the MERiFIC Project "Marine Energy in Far Peripheral and Island Communities" March 2014

Best Practice Report – Operation and Maintenance Requirements Deliverable 3.6.3 from the MERiFIC Project, A report prepared as part of the MERiFIC Project "Marine Energy in Far Peripheral and Island Communities" March 2014

Developers are encouraged to adopt the following as best practices for construction or deployment.

Land based elements of the project

10.1 All works in support of construction or deployment must be undertaken in accordance with applicable permits, approvals, and conditions obtained for the project and will adhere to all relevant sections of Nova Scotia's Occupational Health and Safety Act and Regulations.

10.2 Developers conducting a project near water are responsible to ensure serious harm to fish is avoided, in compliance with the Fisheries Act. Fisheries and Oceans Canada's *Measures to Avoid Causing Harm to Fish and Fish Habitat* provides guidance on this matter.

10.3 The developer must clearly define the working area and limits to ensure the contractor's activities are contained and limited to within approved areas.

10.4 Construction activities must minimize the size of the disturbed area (e.g., project footprint), maximize retention of natural vegetation cover, and, where possible, maintain natural buffers near water.

10.5 Surface water perimeter controls and other measures must be installed prior to disturbance of work areas; these must be monitored and maintained on a regular basis, and in particular before, during, and after forecast precipitation events.

10.6 All activities and equipment related to the project must be carried out/maintained in proper running order to prevent leaking or spilling of potentially hazardous or toxic products.

10.6.1 Storage of fuels and petroleum products must comply with safe operating procedures, including containment facilities in case of a spill.

10.6.2 Non-toxic lubricants (such as vegetable-based oils) will be considered whenever possible, particularly for work conducted in or near the water.

10.6.3 Contractors must have emergency spill equipment available whenever working near or on the water.

10.7 The contractor responsible for the construction or deployment must be advised of special considerations, such as species at risk or conservation concerns, within the project area and understand the sensitivity of both floral and faunal species. In the event that such species are encountered, the developer shall contact appropriate regulatory authorities to discuss mitigation measures.

10.8 All construction wastes must be transported for disposal on a regular basis in order to minimize the accumulation of wastes to the extent practical.

10.9 Wastes considered hazardous will be collected and disposed of in accordance with applicable provincial and municipal requirements.

10.10 Construction work should be scheduled to avoid sensitive periods in the life cycle of wildlife using the area.

General works in or near the water/wetland

10.11 All works associated with the project will adhere to all relevant sections of Nova Scotia's Occupational Health and Safety Act and Regulations.

10.12 If applicable, construction work should be scheduled, where possible, to avoid sensitive periods in the life cycle of wildlife frequenting the wetland area.

10.13 Hydraulic, fuel, and lubrication systems of equipment used during construction in wetlands and watercourse crossings will be inspected to ensure that systems are in good working order and free from leaks, prior to entering the watercourse or wetland.

10.14 Construction/placement of the sea cable should be done in a manner that minimizes the amount of excavation in the intertidal zone.

10.15 Construction work should be scheduled to avoid sensitive periods in the life cycle of marine life using the area and should minimize disruption to other users, including fisheries and/or aquaculture operations.

10.16 All vehicles and equipment working near a body of water must be clean and in good repair, free of mud and oil or other harmful substances that could impair water quality, and be maintained to minimize air pollution and unnecessary noise.

10.17 If pile driving is a requirement, specific mitigation may be required to prevent or reduce the effect of a pressure wave on marine life, as well as follow-up monitoring.

10.18 Construction will normally be limited to daylight hours, and local residents shall be advised of the work schedule well in advance of commencement.

10.19 Noise levels in the vicinity of the work site, particularly if pile driving will be required, must not exceed the regulatory threshold established for harassment of wildlife, including marine mammals.

10.20 In the event that drilling or pile driving is required, a safety zone may be established so as to surround operations.

10.21 Cables shall be installed in such a way as to minimize negative impacts on the surrounding environment.

11.0 Operations and Maintenance

Background

In-stream tidal power projects may result in impacts to established fishing activities during construction and operation, including loss of access to fishing grounds, damaged or lost fishing gear, decreased catch ability during construction, changes in species distribution, and increased transit time to avoid devices and/or power cables. Operations may also potentially result in adverse interactions with aquaculture operations, marine traffic, and other established uses. Developers will be expected to adhere to all relevant Occupational Health and Safety standards.

Some of the recent experiences with offshore wind developments in the UK, Europe, and the USA, in particular the approaches to mitigation, may be applicable to in-stream tidal power developments in Nova Scotia.

References

Marine Scotland Licensing and Consents Manual: Covering Marine Renewables and Offshore Wind Energy Development

Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW): Recommendations for Fisheries Liaison, Best Practice guidance for offshore renewables developers

Development of Mitigation Measures to Address Potential Use Conflicts between Commercial Wind Energy Lessees/Grantees and Commercial Fishers on the Atlantic Outer Continental Shelf: Report on Best Management Practices and Mitigation Measures

Transport Canada, *An Owner's Guide to Private Buoys*

Transport Canada, *Marine Safety*

Nova Scotia Department of Natural Resources, *Forest Protection from Wildfires*

Developers are encouraged to adopt the following as best practices for protection of fisheries/aquaculture and for safe navigation in relation to operation and maintenance.

11.1 Transport Canada and the Canadian Coast Guard will be formally advised of the coordinates of the lease site and the exact location of the turbines and subsea cable routes, as well as the duration of the project.

11.2 Appoint a Community Fisheries Liaison(s) to ensure effective communications among multiple fishing fleets and gear sectors.

11.3 Local fishermen will be informed of the timing, locations and expected vessel movements required for operations and maintenance activities. If fishing gear must be relocated and/or fishing vessel movement restricted, then a mutually acceptable plan will be developed prior to the maintenance work proceeding, as the situation allows.

11.4 Mitigation measures to address potential conflicts with other marine interests, including fisheries, aquaculture, and other interests, could include the following:

11.4.1 Early and ongoing engagement with local fisheries, aquaculture, and other stakeholders

11.4.2 To avoid conflict with fishing access rights, the following examples of mitigation measures are provided:

11.4.2.1 Cabling could be oriented parallel to rock ledges, or other features, to the greatest extent practicable.

11.4.2.2 Cable crossings within a designated transit/fishing corridor should be minimized; turbine foundations should be set back from a known/utilized fishing feature.

11.4.2.3 Establishment of clear visual indicators for dedicated transit and/or fishing locations within the facility.

11.4.2.4 Communication procedures to advise fishers prior to construction, regarding navigational safety zones to allow routine inspections, maintenance, repairs, and environmental monitoring works.

11.4.2.5 When unavoidable conflicts are anticipated between tidal power facilities and established fishing/aquaculture interests, as a last resort, developers should recognize the provision of compensation. If damage does occur, it will be incumbent on the gear owner to demonstrate a loss of gear, following international protocols. Procedures for handling compensation to fishermen for the loss or reduction of income should be communicated early in the project planning. A joint industry compensation framework would consider

- historical fishing activities on the proposed project sites
- temporal and spatial restriction on fishing caused by the project
- amount of fishing that would continue on the site once it is constructed
- pressure on other fishing grounds by displaced fishermen
- types of fishing methods employed at the project site
- species of fish caught
- estimated value of the catch from the project site

11.5 Compensation measures could take the form of habitat creation (fishing reefs), common infrastructure in local ports, support of fishing organization, and direct financial compensation.

General navigation

11.6 Mitigation to address potential conflicts with other marine interests, including fisheries, aquaculture, and other interests.

11.6.1 The developer must prepare procedures to minimize the likelihood of a vessel collision in the marine environment. These procedures would include, but not be limited to, the following:

11.6.1.1 Floating devices and/or surface piercing structures associated with the project will be marked in accordance with Canadian Coast Guard regulations and must contain navigational aids and anti-collision radar.

11.6.1.2 A precautionary vessel safety zone will be established, surrounding the turbines or array of turbines.

11.6.1.3 All vessels and their crews will be subject to the standards and regulations made under the applicable legislation, including the Occupational Health and Safety Act and Regulations, and will have the necessary safety equipment available at all times.

Contingency, emergency response measures

11.7 **Contractors:** Contractors must have a response plan in place to respond to land-based and/or marine spills of fuel or hazardous materials. As a minimum, the plan must address the emergency containment and clean-up procedures, disposal, and reporting to appropriate authorities.

11.8 **Fires:** The developer and their contractors must take all necessary precautions to prevent fire hazards when working on the project. Basic firefighting equipment, sufficient to address onsite fire hazards, will be maintained in proper operating condition.

11.9 **Archaeological Contingency Plan:** There is the potential that unforeseen heritage and archaeological resources may be disturbed, destroyed, or discovered during construction. In the event that a heritage or archaeological resource is encountered, work will be suspended in the immediate area of the discovery and the Nova Scotia Department of Communities, Culture, and Heritage will be notified. In consultation with the Nova Scotia Museum, an appropriate buffer zone surrounding the discovery will be flagged for protection.

11.10 **Severe Weather, Storm Surge Tides, and Ice** Developers must recognize the possibility of a catastrophic failure and must develop contingency plans to deal with such circumstances.

12.0 Decommissioning

Developers are encouraged to adopt the following as best practices in the addressing matters related to decommissioning.

12.1 The proponent will ensure that all required federal, provincial, and municipal permits and approvals have been obtained prior to decommissioning and that all activities are undertaken in accordance with applicable permits, approvals, and conditions obtained for the project.

12.2 As required, erosion and sediment control structures will be installed prior to the start of decommissioning activities and will remain in place until the work has been completed.

12.3 The use of heavy equipment in the intertidal zone will be limited to only those areas where excavation is required.

12.4 The operation of heavy equipment below the mean high-water mark will be minimized to prevent adverse impacts on the marine environment.

12.5 Any materials inadvertently released during the decommissioning will be collected for appropriate disposal.

12.6 For surface-based devices, the entire device as well as all of the mooring lines, shall be removed upon completion of the project. As appropriate, cables and any other related infrastructure shall be removed.

12.7 For bottom-mounted devices, the entire device, as well as all of the mooring lines, shall be removed upon completion of the project. As appropriate, cables and any other related infrastructure shall be removed.

12.8 The entire project area, including the location of the land-based components, intertidal zone, and subtidal area, as well as the seabed, will be restored as per the requirements of the regulatory authorities.

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