

Environmental Monitoring Advisory Committee (EMAC)

EMAC Recommendations Regarding the FORCE Environmental Effects Monitoring Program (EEMP) for 2016 and Beyond

**Submitted March 11, 2016
Report to FORCE**

INTRODUCTION

An instream tidal turbine demonstration project proposed by the Fundy Ocean Research Centre for Energy (FORCE) to test the feasibility of producing electrical power from the tides of the Bay of Fundy (the “Project”) received Environmental Assessment Approval in September, 2009. In accordance with Section 3.0 of the Terms and Conditions of the Approval, an Environmental Monitoring Advisory Committee (EMAC) was established in October 2009. EMAC is comprised of independent scientific experts and representatives from First Nations and the local fishing industry. The Committee is tasked with providing advice on the adequacy of the Environmental Effects Monitoring Program (EEMP) that FORCE is required to develop and implement under the Environmental Assessment Approval. A list of EMAC members and the Committee’s Terms of Reference are available on the FORCE website: www.fundyforce.ca.

An EEMP essentially involves taking repeated measurements of specific environmental parameters, before and after a proposed development, to test assumptions or predictions made in an Environmental Assessment.

It was recognized by all parties involved, including the regulators, that the Minas Passage poses unique challenges for environmental monitoring, i.e., high currents and extreme tidal ranges, and that an “adaptive management” approach should be adopted in developing an EEMP. “Adaptive management” is an iterative process of planning, evaluation, implementation, analysis and evaluation then making adjustments as needed.

BACKGROUND

FORCE initiated environmental effects monitoring (EEM) at the test site in late September 2009 and continued with various programs until 2013; however, some limited related monitoring and research was undertaken by other organizations after that time. The first EEMP Report prepared by FORCE covered the time from September, 2009 to January, 2011, which included the period when the NSPI/Open Hydro turbine was deployed at the FORCE site (November 2009 to December 2010). Although, no turbines have since been deployed at the site, FORCE continued its EEM program to collect baseline data and to test monitoring methods and instrumentation. The second FORCE EEMP Report (2015) covered the period from 2011 to

2013. Both EEMP Reports, with full background study reports, are available on the FORCE website.

Throughout the above period, EMAC reviewed the ongoing specific EEM study reports and provided advice and recommendations to FORCE. Feedback on FORCE's EEMP was also provided by the Federal Department of Fisheries and Oceans (DFO).

Since no turbines were scheduled to be deployed at the FORCE test site in 2014, and likely not until the Fall of 2015, EMAC and FORCE agreed to temporarily suspend further EEMP studies and take the opportunity to review the information and lessons learned during the monitoring studies completed to 2013. To assist EMAC and FORCE in this review and evaluation, FORCE contracted with a consultant in 2014/15 to conduct an external third-party review and evaluation of the FORCE EEMP studies completed to date, including relevant international experience, and to provide advice on the design of the FORCE EEMP. It should be noted that the consultant's report will be included as an Appendix to FORCE's Final EEMP document and available on the FORCE website.

Although FORCE did not conduct any specific EEM studies in 2014 and 2015, FORCE did continue to do additional work related to the Fundy Advanced Sensor Technology (FAST) platform and data collection at the site (e.g. meteorological measurements, tidal gauge).

EMAC reviewed the consultant's proposed EEMP design report and, based on its own experience and evaluation of the previous FORCE EEM studies, developed recommendations to FORCE concerning priorities for an EEMP. A summary of EMAC's general observations, comments and recommendations is provided below.

It is important to note that FORCE is responsible for the EEMP in the mid-field area, i.e., >100 m from a turbine to the boundary of the FORCE Crown Lease Area (CLA). The berth holders are responsible for monitoring in the near-field (within 100 m of their respective turbines). In some cases, FORCE's EEMP will extend into the near field and beyond the CLA boundary.

GENERAL OBSERVATIONS

- The highest priority for monitoring, from regulatory and public perspectives, continues to be avoidance behavior of fish and their potential interaction with operating turbine. However, this has proven to be the most challenging undertaking from an operational perspective because of the high currents and turbulence in the Minas Passage.
- There is also concern related to potential marine mammal interaction with turbines. The monitoring technology for detecting harbour porpoise, the most commonly observed species of marine mammal at the FORCE site, is well known and has been successfully employed at the FORCE site and other areas in the world.

- Because of the relationship between the near-field and mid-field monitoring for fish and mammal interaction with the turbine, it is critical that FORCE and the berth holders cooperate closely in sharing the design of their respective EEMPs.
- The Committee also recognized that it may be very difficult to identify broader population impacts (if any) due to the large natural variability in the Minas Passage, and given the relatively small number of operating turbines that will be deployed at the FORCE test site.
- FORCE should utilize its FAST Platforms, if and where possible, to test various instruments for measuring ambient background marine noise and fish and mammal movements in the vicinity of turbines.
- An overarching issue is the management and interpretation of the large amounts of data that will be generated by the monitoring instruments used in the EEMP. EMAC strongly recommends that FORCE move forward in developing data management and analysis program.

RECOMMENDATIONS

Fish - Interaction and Behaviour

EMAC accepts the consultant's advice regarding the proposed monitoring approach for fish. However, there were some reservations expressed regarding the application of vessel-mounted downward looking hydroacoustics in monitoring fish in the mid-field range.

Therefore, it is recommended that this method be tested as soon as possible to determine if it is a workable and applicable monitoring technology at the FORCE site (i.e. if possible, prior to the deployment of the next turbine).

It was also suggested that the use of fish encounter modeling should be investigated further as more data is collected in the mid-field and near-field range regarding fish behavior and turbine interaction. The Committee recognized that the models require good input data, but in the longer term it may offer the ability to scale-up potential effects of multiple turbines and different designs.

Marine Mammals – Interaction and Behaviour

Marine mammal interaction with the turbines is considered another key concern and will require monitoring surveys to further refine data on populations, and especially mammal interactions near, or at, the turbines (near-field). The prevalent species in the area is the harbour porpoise. Passive acoustic monitoring has been used at the FORCE site and other tidal developments around the world.

It is recommended that the approach using C-PODS as described in the consultant's report be used in mid-field monitoring. After assessing the data from the initial post-deployment surveys, the need for sampling redesign for future surveys should be evaluated.

EMAC also recommends that an “early warning” system for mammals might be employed based on drift modeling and shore-line surveys to detect stranded or dead mammals, plus continued contact with the Nova Scotia Marine Animal Response Society.

Acoustic Environment - Ambient Marine Noise

Establishing ambient marine background “noise” in the Minas Passage is considered a high priority, as operating turbine noise may potentially affect fish, mammals and lobster at the FORCE site. The objectives of the noise studies in the consultant’s report are:

- (i) to confirm and demonstrate the applicability of the proposed instrumentation;
- (ii) to account for the variation linked to tidal cycles, seasons and storm events; and,
- (iii) to ensure that the frequency range covered includes the frequencies of significance for marine mammals and fish.

This baseline data will be used to compare any measurable changes due to turbine operational noise.

It is recommended that FORCE undertake background ambient noise measurements at the FORCE site prior to deployment of the next turbine, and subsequently repeat ambient noise surveys after the turbine(s) is operational. A streamlined moored hydrophone system should be used at 1 or 2 sites in CLA and vicinity; and initially, undertake simultaneous drifting hydrophone measurement for comparison and validation purposes.

Background ambient noise levels and operational noise signatures need to be acquired. An acoustic noise model should then be developed and utilized to predict potential scale-up effects.

Lobster Fishery

The lobster fishery is the only commercially active fishery in the FORCE CLA, and therefore, it is imperative that potential changes to lobster catches are monitored as the project moves forward. Although, the proposed Safety Zone (500 metres around turbines and cables) is designed as a precautionary measure to minimize interaction and liability between the tidal turbine operations and fishers in the FORCE CLA, it is still important to determine if there are any measureable effects on lobsters in the near field. The modified “catchability” method used in 2009-2011 studies should be used as it provides some baseline data for comparison to future studies

It is recommended that the modified “catchability” method using standard lobster traps at fixed distances from operating turbines, be implemented as described in the consultant’s report.

Marine Seabirds

Although of a lower priority, because of the relatively low-to-moderate seabird abundance in the area, it is recognized that shore-based marine bird surveys will continue to add knowledge on bird populations in the area and assist in the future evaluation of possible

impacts of different turbine configurations and designs. Therefore, there is value in continuing this program

EMAC recommends continued shore-based surveys once a turbine(s) is deployed using the Canadian Wildlife standard survey protocols, based on identified sampling frequencies in the consultant's report.

It is also recommended that FORCE promote the reporting of any observed high concentration of marine seabirds in or near the FORCE marine site via its 24/7 1-888 number (or identified FORCE contact) by all marine users and the general public, as it may be an indication of a fish kill due to turbine(s) operation. FORCE should develop and implement a protocol to investigate and record all such reported incidents.

Benthic Habitat and Scour

Generally, there was consensus that there is sufficient information available regarding benthos at the FORCE site. The benthos was determined to be of low abundance and low diversity due to the high currents and prevalence of bedrock in the FORCE CLA.

EMAC recommends that the focus of further seafloor studies in the CLA be on the "scour" impacts associated with operational turbines. This work (using side-scan and multi-beam) should be undertaken by the berth holders after a year of turbine operation. Monitoring at future intervals needs to be determined. In those areas where benthos information is considered to be limited, drop-down video and photographic surveys should be used to characterize/confirm local conditions.