Marine Renewables Canada Project EIP2-REN-002

1. Description of the project

This Project has contributed to Canada maintaining a leadership position for the development of the IEC/T114 standards and has covered the expenses for volunteering Canadian experts participating in the standards development and attending international technical development meetings.

The project has enabled Canadian experts to participate in the development of IEC TC 114 standards, with the original objective of publishing six Technical Specifications over the project timeline. In addition, seven Project or Maintenance Teams were also established to develop Technical Specifications related to:

- Design
- Moorings
- Wave performance assessment
- Wave resource assessment
- Tidal performance assessment
- Tidal resource assessment
- Loads measurement

2. Background

Canada has world-class tidal current, river current, and wave energy resources. International standards accelerate safe, reliable, and economical domestic and international deployment of cleantech systems to generate power from these resources. The Canadian cleantech sector therefore has a vested interest in the development and adoption of industrial standards applicable to marine renewable energy.

The development of international standards for the marine renewable energy industry is overseen by the International Electrotechnical Commission's Technical Committee 114 (IEC TC 114). To ensure that Canada's input and needs are considered, the Standards Council of Canada formed a Mirror Committee to IEC TC 114 (SMC/IEC TC 114) in 2007.

3. Project objectives

The original project objective was to develop these six IECTC114 standards: Design, Moorings, Wave performance assessment, Wave resource assessment, Tidal performance assessment, Tidal resource assessment, Loads measurement. The IEC/TC114 Committee was able to develop a total of 17 International Standards during the project timeline which exceeds the original objective of the project.

The Canadian National Shadow Committee was also able to complete two additional research projects that allowed for the use of TS 62600-2 (Design

requirements for marine energy converters) and TS 62600-10 (Assessment of mooring system for marine energy converters (MECs)). The purpose of this research is to ensure safety at test centers, by having an independent third-party review of the tidal energy technology and their project construction plans before construction can begin in the test center area based on the requirements of IEC standards. Both research projects were completed on budget and on time and final reports have been submitted.

4. Partners, collaborators, stakeholder

The Committee is a volunteer group comprised of over 30 technical experts from industry, academia, and federal and provincial governments. IEC TC 114 develops standards for tidal, wave, and river resource assessments, device and mooring design, and energy converter performance evaluation. Our committee members are working diligently on these standards that will ultimately be used in the certification process for equipment and projects in the marine renewable energy industry.

Some of the organization contributing include:

- Dynamic Systems Analysis,
- BMT Canada,
- Blumara Consulting,
- QS Atlantic Inc.
- Dalhousie University,
- Glas Ocean Consulting,
- Nova Scotia Government,
- ORPC (Tidal Developer),
- Luna Consulting,
- National Research Council Canada
- University of Victoria,
- Marine Renewables Canada

5. Total project costs

$ 315,172.76

6. Description of results

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7. Benefits of the project (i.e. why it is important)

No industry thrives without a foundation of standards. The foundation of standards for marine renewable energy has reached a pivotal point, and with most of the standards now published as first or second edition technical standards, a good basis has been developed for this new and growing industry.

The growing contribution of marine energy to the Canadian energy mix continues to be a significant opportunity. With the need to find alternatives to fossil fuel and nuclear power and climate change concerns, marine energy can be a significant contributor to the future energy mix in Canada and Globally. An increase in the number of deployments will help build operational experience and further inform design requirements. With such additional experience and sharing of lessons learned, marine energy is steadily evolving and is approaching cost competitiveness in several commercial applications.

8. Key lessons or consideration

A significant number of demonstration projects involving a single ME device has occurred and deployment and testing of arrays is the next major step. Issues specific to the deployment and testing of arrays may stimulate the need for new standards.

Applications where marine renewable energy will find profitable commercial opportunities include, a) supplying power for islands and remote communities, b) producing hydrogen for energy storage or as an alternative transportation fuel, c) recharging autonomous underwater vehicles and ocean sensing and communications systems; d) providing power to offshore aquaculture farms, and e) supplying power to desalination systems that convert seawater into fresh water. New standards may be needed to ensure that marine energy technologies can be integrated into smart grids and thereby address many of the United Nations' 17 Sustainable Development Goals and contribute meaningfully to the development of the circular economy in Canada.

The rapidly growing floating offshore wind and PV sectors will create multiple opportunities for productive collaborations with the marine energy sector and the ME-SWG's efforts to establish stakeholder groups will provide incentives for various

end-user groups, e.g., manufacturers, insurers, and financiers, to actively participate in the advancement of the marine energy industry.

The lack of infrastructure necessary to connect ME systems to electrical grids may be a limiting factor to ME growth but may, at the same time, represent a commercial opportunity to serve remote and off-grid communities and enterprises in Canada. A growing trend towards locating energy generation assets much closer to sources of energy demand may spur growth of the ME industry because a great percentage of Canada's population lives within 50 km of a coastline.

Questions around the effects of marine energy devices on the environment are beginning to be definitively answered and research results are becoming more widely available. The skills, techniques and equipment needed for accurate environmental monitoring are steadily improving and the evidence to date is that there are negligible environment effects associated with the deployment and operation of single devices or a small number of separate single devices deployed in certain areas. Additional studies are on-going at sites where arrays are deployed and TC114 may consider developing standardized measurement methodologies for relevant physical and operational parameters of marine energy devices to support these studies.

9. Next steps

It is imperative that the work of the TC114 Canadian Mirror Committee continue and expand to include the development of the IECRE Certification process in Canada. We are a country that is rich in marine renewable energy (MRE) expertise and resources. The expertise will allow for national and international involvement in the MRE industry. The MRE resources in Canada are some of the best in the world. We have the ability to develop an industry in Canada that will have a major impact on climate change and with the continued development of Canadian expertise and MRE projects we will be able to export knowledge and products developed in Canada that will have a positive impact on climate change in Canada and globally. We will need funding support from the federal government to continue the work we have started through this project.

This funding would support the further development of additional standards proposed in the 2022 IEC TC114 Strategic Business Plan which are listed below by priority levels.

2021 RANKINGS	2021 POLL TITLES	ABBREVIATED TITLE	PRIORITY	LIAISONS
1	Guidelines - I,O&M procedures	IO&M	HIGH	ISO TC 207; MT62600-2, -10
2	O&M principles			
6	Commissioning/decommissioning procedures			
NEW	Life Cycle Assessment			
NEW	Health & Safety			
NEW	Technical Safety			
3	Design guideines - connections to mini grids	Interconnection	HIGH	IEC SC 8A, 8B, 8C; TC 88; TC 82
NEW	Evaluation of Hybrid Systems e.g. wind/wave, wave/solar			
NEW	Technical requirements for marine energy system grid-connection to power system			
4	Design guidelines - subsea cables	Cables	HIGH	TC 88
5	Cable Lay Guidelines			
NEW	Biofouling mitigation PART OF DESIGN/RESOURCE/IO&M	Extreme Conditions	HIGH	MT 62600-2, -10, -101, -201, -301, AG 2, ahG 14
NEW	Heavy weather and climatic impacts (storms, ice, etc.) PART OF DESIGN/RESOURCE/IO&M			
7	Array performance	Arrays	MED	
NEW	Manufacturing	Manufacturing	MED	
8	Classification of devices/resources	Classification	MED	AG 2
NEW	Cyber security	Cyber Security	MED	
NEW	Harmonization amongst the TC-114 standards suite	Standards Improvement	MED	AG 2
NEW	Standards implementation guidelines			
9	Measurement methodologies inc;/ physical parameters	Measurements	LOW	
10	Cost analysis	Cost	LOW	
11	Data acquisition and communications	SCADA	LOW	

	OUT OF SCOPE [SEEK ALTERNATIVE FORUMS]
NEW	Fish safety (tidal stream turbines)
NEW	Environmental monitoring
NEW	Consent principles for coastal and ocean area utilization by marine energy
NEW	Guidelines for marine environmental impact assessment

For Canadian Experts to continue to be leaders in the development of the IEC TC114 standards and to contribute to the proposed standards listed above, funds will need to be allocated for travel to international meetings to maintain our involvement and ability to influence the future development of these standards which will have a significate impact on the industry as it develops in Canada.