



IEC TC114 Project

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Message from the Chair

Welcome to the Fall 2014 edition of the newsletter.

The fall has been a busy time for standards development. Over the last couple of months, 2 new work items have been approved by the National committees of TC114. Canada has been actively recruiting to ensure we have the appropriate experts representing us on these committees. I would like to welcome Melanie Austin and Joe Hood who will be representing Canada on the "Acoustic Characterization of Marine Energy Converters" project team and I would also like to thank Sue Malloy for stepping forward to convene the project team on "Power Performance Assessment of River Energy Converters" as well as Bill Rawlings and Jinxing Huang for volunteering to be the Canadian experts.

The final semi-annual face to face meeting of 2014 was held in conjunction with ICOE 2014 in Halifax. A total of 21 delegates attended the meeting. The meeting was hosted by the Marine Renewables Canada who organized the conference facilities and a great lunch.

The meeting provided the opportunity to highlight issues within each of the project teams. It also allowed for greater time to more fully discuss a couple of the following key issues:

- A better information package is required so that new members understand the the organizational structure of IEC and SCC as well as understand the responsibility and commitment associated with committee membership. Bill Rawlings will take a lead in this initiative.
- TC114 is in the process of updating its strategic business plan (SBP). A committee consisting of the heads of delegation of the US, UK, Ireland and Canada are involved. The Canadian committee highlighted the need to ensure that different standards (or additions to existing standards) will be required for community level (smaller size) projects. A list of higher priority standards was also reviewed.
- There will once again be research money available next year. Approximately \$80,000 will be distributed in a process very similar to last year. A request for proposals will be issued early in January 2015.
- There is the need to begin to look for alternative funding sources for the Canadian committee as the ecoEII funding program will finish as of March 31, 2016.

After lunch, several of the members took the opportunity to convene their respective project team for meetings. The following groups held meetings either before or after the ICOE conference:

- [Ocean Thermal Energy Conversion \(OTEC\) Systems](#)
- [Power Performance Assessment for River Energy Converters](#)

- PT62600-2 Design
- PT62600-10 Moorings
- PT62600-102 Wave Resource Assessment at a 2nd Site
 - PT62600-300 Power Performance of River Energy Converters



*Project Team 102, Halifax Face to Face Meeting, November 8th 2014.
From left: Bob Thresher (US), Kim Nielsen(DK), David Tietje (US), Tony Lewis(IE), Yukio Kamizuru (GE), Scott Beatty (CA), Clayton Hiles (CA)*

Quick Links

- [IEC TC114 Standards Website](#)
- [International Electrotechnical Commission \(IEC\)](#)
- [Marine Renewable Energy Technology Roadmap](#)

Our website (<http://tc114.oreg.ca/>) is continuously being updated with the latest information. Please feel free to contact me or Marine Renewables Canada directly for more information on how to get involved with this committee.

Cheers,
Russell Stothers
Chair, Canadian Mirror Committee to IEC TC114
PT62600-10 Moorings

Research Project Update 2014-15

Early this year a request for proposal was launched by SMC/IEC TC114 to solicit applications for funding of research activities related to the development of technical specifications and standards for marine energy conversion systems. The funding was made available through a contribution from Natural Resources Canada and administered by Marine Renewables Canada. Highlights of the research projects funded last year can be found in the "Research Projects" section of the SMC/IEC TC114 web site (<http://tc114.oreg.ca/>).

Progress Report - Impact of channel blockage and free-surface proximity on the performance of cross-flow hydrokinetic turbines

Laval University was awarded a contract to research the impact of channel blockage and free-surface proximity on the performance of cross-flow hydrokinetic turbines. The necessity for this research was based on the feedback from IEC TS 62600-200 that tidal energy converter (TEC) performances may vary depending on the degree of flow restrictions they experience at the deployment sites. This is referred to as blockage effects. There is always a certain level of blockage or confinement in practice, despite the idealization of uniform unconfined flow often used in theoretical studies. Very little is precisely known at the present on these effects, but it is expected that they differ significantly between technologies especially between axial-flow turbines (HAHT) and large-aspect-ratio cross-flow turbines. Vertical confinement versus lateral confinement may have to be discriminated in addition to considering the specific effect of water surface

Project Partners:

**Canadian Sub-Committee
(SMC/IEC TC114)**

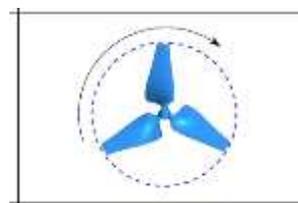
- Acadia University
- Akoostix Inc.
- AMEC Black & McDonald
- BC Hydro
- Bhuyan Consulting
- CanmetENERGY-NRCan
- Cascadia Coast Research
- Clean Current Power Systems
- CSA Group
- Dalhousie University
- Dynamic Systems Analysis
- Emera
- Glas Ocean Engineering Consulting
- Grantec Engineering
- JASCO Applied Sciences
- Mavi Innovations
- National Research Council Canada
- Rockland Scientific

proximity. It is thus necessary to address this knowledge gap in order to improve the current version of TS 62600-200 as well as to support the recent mandate of AHG2 (Power performance assessment of electricity producing River Energy Converters (REC)).

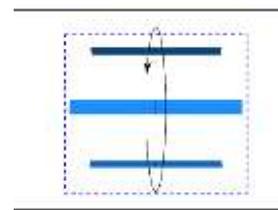
Objectives

The general objective of this research project is to quantify the impact of channel blockage and free-surface proximity on the performance of cross-flow hydrokinetic turbines. Specifically, we propose to use state-of-the-art CFD techniques (Computational Fluid Dynamics) to:

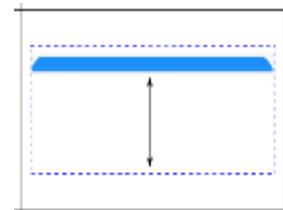
- Validate and complement the results reported by MAVI et al. for horizontal axis turbines (HAHT) and propose preliminary correction curves to account for blockage effect;
- Verify if correction formulae must be adapted to different technologies to properly take into account blockage effects;
- Investigate the need to discriminate between vertical and lateral confinements when considering blockage effects on axial-flow turbines (HAHT) and cross-flow turbines (VAHT and OFHT);
- Develop preliminary correction formulae to take into account blockage effects for cross-flow turbines (VAHT and OFHT) with and without inclusion of free-surface effects;
- Provide guidelines to support the current work of Ad Hoc Groups 2 and 4 (AHG2, AHG4) on River Energy Converters and to help improve future versions of TS 62600-200 for Tidal Energy Converters.



Horizontal Axis Turbine



Transverse Axis Turbine



Oscillating Foil Turbine

For each of these technologies, we consider a simplified turbine with only the basic rotor blade / oscillating-foil modeled. To consider only the active part of each turbine permits us to emphasize the basic confinement effects on the performance of these technologies. This should also permit the determination of correction formulae to account for variations in blockage effects between different types of technologies and if lateral versus vertical confinement have to be discriminated.

For each of the three technologies, we perform full unsteady 3D URANS CFD simulations at high Reynolds number (turbulent flow). We use CD-Adapco StarCCM+ finite-volume commercial code with overset mesh capabilities.

As stated in the objectives, the need to discriminate between lateral and vertical confinements should be investigated. Various confinement scenarios are thus computed for each technology.

Validation

Results provided by MAVI et al. for a HAHT turbine were reproduced at optimal performance, with results agreeing within 1% on mean power extracted and mean drag. Meshes were created for production runs for HAHT, VAHT and OFHT. The simulations are run for several rotations or cycles of the turbine in order to obtain proper statistical convergence.

Remaining steps

The project is progressing well in good agreement with the initial planning. The next steps to undertake in line with the current objectives are hereafter listed.

- University of Victoria

- To complete the campaign of simulations (early 2015).
- To quantify the effect of blockage ratio on the performance of each turbine technology and to propose correction curves of C_p (BR).
- To quantify the sensitivity of results regarding lateral and vertical confinements.
- To redo a few of the simulations with upper confinement provided by the presence of a free surface.
- To compare the results obtained with models based on actuator disk theories
- To produce the final report and formulate recommendations.

Members:

IEC-TC114

- Chair: Neil Rondorf
(USA)
- Secretary: Danny Peacock (UK)
- Technical Officer: Charles Jacquemart

Committee Updates & Initiatives

Update on the PT 62600-2 on Design Requirements for Marine Energy Systems

The first Committee Draft (CD) of the IEC TC 114 Design Project Team was released in last summer for review by the participating national committees. The scope of the CD provides essential design requirements to ensure the engineering integrity of wave, tidal current and river current energy conversion systems, including the primary support structures, for a specified design life. The scope of the CD includes requirements for subsystems of the marine energy conversion systems, such as, control & protection mechanisms, internal electrical and mechanical systems, as they pertain to the structural integrity of the system under the external environmental conditions. It is anticipated that a finalized technical specification from this project team will be used in the certification schemes for design conformity. General considerations of the requirements, defined in the CD, are based on safety philosophy and the load & resistance factor design (LFRD) approach.

The Canadian shadow committee for the Design Project team (Gouri Bhuyan, Sue Molloy, Mo El-Hawary, Ricardo Foschi, Pierre Sullivan, Richard Grant, Clayton Bear and Bill Rawlings) reviewed the first committee draft (114/138/CD) during the past summer and provided comments on the CD. Compiled comments, received on the CD from various national committees including Canada, were released by the IEC secretariat in September 2014.

A brief meeting among Gouri Bhuyan, Sue Molloy and Mo El-Hawary was held on November 7th in Halifax, just prior to the meeting of the national committee, to discuss the Canadian comments on the CD. The Canadian committee has identified some key technical issues and has recommended on the need for a thorough technical & editorial revision of the CD. It is expected that the CD will be revised in the early part of 2015.

An Update from Project Team 102 - Wave Energy Converter Power Performance Assessment at a Second Location Using Measured Assessment Data

Nov, 28, 2014
 Scott Beatty, Senior Researcher, West Coast Wave Initiative (WCWI)
 Institute for Integrated Energy Systems (IESVic)
 University of Victoria

The IEC TC114 Project Team 102 (PT102) was formed to develop a technical specification (IEC62600-102) for a reliable and transparent methodology to calculate the power performance of a wave energy converter (WEC) at a proposed ocean deployment site using measured data from another site. This effort reflects the current needs of the wave energy industry as there are many proposed projects but few are fully developed. A standardized approach

Sponsors:



to assessing the performance of WECs at prospective locations is welcomed by an industry that is looking to gain trust; and to an investment community who is looking to mitigate risk. PT102 is in its third year of existence and is very close to a major milestone toward its final goal.

Stimulated by the donation of over a year of detailed wave power production and concurrent wave measurement data from the WaveStar device (wavestarenergy.com) deployed at Hantsholm Denmark, the group has experienced a break through. In advance of an upcoming PT102 face to face meeting, Clayton Hiles from Cascadia Coastal Research (Canada), developed a significant and comprehensive set of example calculations using the WaveStar data. The calculations highlighted the ranges for applicability, and some of the key issues in the proposed -102 methodology using a number of case study calculations.

On November 7-8th, 2014, six experts convened a day and a half long meeting in Halifax just after the ICOE conference. The meeting was attended by Kim Nielsen (Denmark), Tony Lewis (Ireland), Scott Beatty (Canada), Clayton Hiles (Canada), David Tietje (USA), Yukio Kamizuru (Germany), Yasutaka Imai (Japan) and two additional observers from the US were in attendance: Bob Thresher of NREL, Alison LaBonte from US DOE. On day 1, Clayton presented his calculations on the Wave Star data using the proposed 62600-102 methodology. The group arrived at short list of key issues that need resolution in order to move forward. On day 2, the key issues were discussed in detail and resolutions were agreed upon for each one by the group. Given the recent advancements and agreements achieved in Halifax, the PT102 is targeting a draft technical specification to be completed by April 2015. Stay tuned.

Upcoming Meetings

The SMC to TC114 meets on a monthly basis via teleconference to provide updates on all current activities. The subcommittee also plans for two face-to-face meetings, one typically in the spring and one in the fall to make more progress on significant issues. The meeting in the spring is focused on ensuring all committee members are in agreement with the Canadian position on all issues to be discussed at the annual TC114 plenary meeting. The meeting in the fall is focused on assessing the current and projected needs for the upcoming year.

For 2014-2015, the meeting schedule is as follows:

December 17, 2014	Conference Call 10:00 AM PST
January 21, 2015	Conference Call 10:00 AM PST
February 18, 2015	Conference Call 10:00 AM PST
March 18, 2015	Conference Call 10:00 AM PDT
April 15, 2015	Conference Call 10:00 AM PDT
April 27- May 01, 2015	TC114 Plenary – Dublin, Ireland
May 20, 2015	Conference Call 10:00 AM PDT
June 17, 2015 (In person)	Meeting in East
August 26, 2015	Conference Call 10:00 AM PDT
September 16, 2015	Conference Call 10:00 AM PDT

October 14, 2015

Conference Call 10:00 AM PDT

November 20, 2015 (In person)

Meeting in Vancouver
2015 MRC Annual Conference

December 16, 2015

Conference Call 10:00 AM PST

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