Member Activity Update for 2015

GENERAL PACIFIC WORKING GROUP COMMENTS

- Chris Campbell (MRC) and Scot Merriam (as MRC Board Member) both had follow-up communications with BC Ministry of Energy and Mines Innovative Clean Energy fund director Dan Green to find out why MRE was not selected to receive grants from the ICE fund (summary answer: we need previous ICE MRE projects to deliver before more $ will flow!)
- Scot Merriam (as MRC Board Member) met federal DFATD Minister Ed Fast for a photo op April 24, 2015 in Nanaimo to acknowledge GOA Funding award.
- Chris Campbell (MRC), Scot Merriam (SRM Projects) and Matt Taccogna (UBC IRES) staffed a Marine Renewables Canada booth at the Vancouver Island Sustainable Technology Association (VISTA) first ever conference in June 2015. Local interest in moving forward with renewables on Vancouver Island seems strong and this event is expected to reoccur in 2016. MRC should plan to attend to maintain a profile and network in search of synergistic initiatives and opportunities.
- Chris Campbell (MRC) prepared a MRE briefing for submission to the resurrected BC Climate Action Leadership team in July 2015.
- There were no general meetings of the Pacific Working Group during 2015 (normally the group has met twice per year). Some of the varied reasons for this are:
    - Some members have been fully occupied with existing marine renewables initiatives (such as WCWI);
    - Some members have been in action mode; pursuing specific BC sector opportunities identified in the previous two years of PWG strategy deliberations;
    - Some members have been focusing on activities elsewhere in Canada and the world where there is government support and/or a clear market signal and positive business case;
    - The lack of government/public agency/utility/investor support for new renewables technology in BC has made it difficult to keep up enthusiasm for pursuing initiatives here;
    - Resulting casualties in the BC scene (Clean Current, Hydrorun) were a blow to the sustained efforts of many who have worked to pioneer marine renewables in BC.
- There was no MRC sponsored 2015 regional event in BC. This was partly due to the reasons above and partly due to MRC staff needing to focus available resources on key initiatives and activities in eastern Canada. It was also because there were no new "in-water" activities to celebrate. However, there should be in-water activity by 2016 and along with that the regional event should be resurrected.
- PWG members who are leaving the MRC Board include Russell Stothers and Scot Merriam.
- PWG members who remain on the MRC Board include Don Bryan, Jessica McIlroy and Fabian Wolk

Member Activity Update for 2015

AXYS TECHNOLOGIES

1. **March 10, 2015** - AXYS Technologies deployed two dual-LiDAR WindSentinel floating LiDAR systems, utilising the Offshore Renewable Energy (ORE) Catapult's offshore anemometry mast. This will be the world's first deployment of a floating LiDAR system to feature two LiDARs, as each system has an additional ZephIR 300, AXYS' first deployment of this sensor. The WindSentinel systems will be deployed in the North Sea, three nautical miles off the coast of Blyth, Northumberland for a one month validation and research study at the ORE Catapult's National Renewable Energy Centre. They will then be moved to France for a 12-month campaign as part of a bankable energy assessment for two commercial wind farms.
2. **June22, 2015** - AXYS Technologies joined the Norwegian Centre for Offshore Wind Energy (NORCOWE) to further the shared goal of developing innovative and cost-efficient offshore wind solutions for deep waters and harsh offshore environments. AXYS deployed its' market leading dual LiDAR WindSentinel buoy next to the FINO1 standard mast to perform validation studies and learn more about wind/wave interactions, microwave temperature profilers, and O&M decision support applications over the next 4-6 months.
3. **September 3, 2015** - AXYS Technologies signed a definitive agreement to acquire 100% of the FLiDAR NV shares. In 2009, AXYS developed the WindSentinel™ floating LiDAR to meet the wind resource assessment needs of the offshore wind industry. Belgium-based FLiDAR was formed in 2011 as a joint venture between 3E and Offshore Wind Assistance (part of the DEME group) to become a world-leading provider of floating LiDAR offshore wind measurement technology. AXYS and FLiDAR share the vision of delivering the highest quality data to offshore wind developers of fixed and floating wind farms worldwide. By combining the strengths of both companies, this alliance will enable current and future clients to benefit from a deeper expertise in wind resource data collection, a wider offering of offshore measurement solutions, and an agile service team able to cover projects globally. Together, AXYS and FLiDAR are the leading supplier of floating LiDAR systems worldwide.

Member Activity Update for 2015

BC MINISTRY OF ENERGY AND MINES

July 21, 2015 10:09 AM

A renewed partnership between Nova Scotia and British Columbia will advance Canada's marine renewable energy industry.

A memorandum of understanding, signed by representatives from both provinces, outlines key priorities, including partnering on research and technology development, and sharing information and best practices in regulation and permitting.

"To advance Canada's position as a leader in marine renewable energy, we need a co-ordinated approach -- one that unites our country from coast to coast," said Energy Minister Michel Samson. "Nova Scotia's partnership with B.C. will do just that, providing access to more information and helping build our national expertise in marine renewable energy to maximize the opportunity for Canada."

The memorandum represents a commitment from both provinces to further develop the tidal resource in the Bay of Fundy and wave-generated energy on British Columbia's west coast.

"I am pleased that British Columbia and Nova Scotia will continue to work together to support marine renewable research and technology development," said B.C. Energy and Mines Minister Bill Bennett.

One immediate result of this agreement is to establish a council of senior government officials, which will bring together public and private sector interested parties to move ahead with priorities outlined in the memorandum and help ensure a consistent regulatory framework across Canada.

B.C. companies and universities are actively involved in Nova Scotia marine renewable energy research including a study that will look at the impact of turbulent marine environments on tidal technology. More information can be found here http://novascotia.ca/news/release/?id=20150720002 .

Member Activity Update for 2015

CASCADIA COAST RESEARCH

In 2015 Cascadia Coast Research continued its involvement with the University of Victoria's West Coast Wave Initiative (WCWI). Cascadia is a founding partner in the WCWI and has directed the development of the group's wave resource modelling capacity. Work this year has focused on incremental improvements to the groups hind-cast and forecast models as well as value added analysis of the hind-cast data-set including extreme value analysis. Additionally, Cascadia has been working with UVic Masters student Ewelina Luzco to develop strategies for representing wave energy converter farms within resource models.

In this year Cascadia started working with Accumulated Ocean Energy Canada of Sooke, B.C. Cascadia was contracted to develop a computational model of their air pumping wave energy conversion technology and assess the performance and energy production potential of the device. Detailed device modelling has provided a wealth of information about the dynamics of the WEC. This new understanding is now being leveraged to adjust the design of the device for significantly greater efficiency.

Cascadia continues to provide subject matter expertise to the IEC technical committee 114 (TC114), a group developing standards for marine energy conversion systems. Cascadia staff are most actively involved in the *WEC performance assessment* standards project teams, but also provide support to the *wave and tidal resource assessment* project teams. In September, Cascadia staff attended a two day meeting of the *WEC performance at a 2nd site* project team in Nantes, France. This meeting addressed comments from a committee draft of the document which Cascadia was instrumental in preparing. Revisions to the document will be completed shortly, after which a finalized version will be presented to the committee for voting.

Cascadia, the University of Victoria and the University of Edinburgh together applied for, and were successful in attaining funding to conduct research supporting the activities of the TC114 *WEC performance assessment* standards project teams. The project addresses an acute unavailability of WEC performance data by using high fidelity computational models to simulate long term WEC deployments at four strategic locations in Canada and the UK. Preliminary results from this work were presented at the 2015 European Wave and Tidal Energy Conference. The project is now wrapping up with an expected completion date of January 2016. At that time the results from the simulated deployments will be publicly released along with a supporting technical report.

Member Activity Update for 2015
DYNAMIC SYSTEMS ANALYSIS
Most of the renewable work being done in BC by DSA is in partnership with UVIC. Our east coast office is doing lots of interesting things in the tidal sector. DSA is however leading a research project titled "*Tidal and River Energy Converter Debris Impact Load and Cable Snag Risk Quantification*" in collaboration with Mavi Innovations and industry sponsor SRM Projects. This cutting edge research work is supported by Marine Renewables Canada and the Standards Council of Canada Mirror Committee to IEC/TC114 through a grant from NRCan's EcoEnergy II program and is scheduled to be complete by March 31, 2016. The project will assess the impact of floating debris on hydrokinetic energy converters in oceans and rivers as well as the risk of snagging these devices with marine tow cables, both important issues to understand before deploying marine renewable energy systems. The study is expected to provide the basis for emerging marine renewable energy standards being developed by Canada and other members of the International Electrotechnical Committee.

Member Activity Update for 2015

INSTREAM ENERGY SYSTEMS

- Through an unprecedented Industrial Regional Benefits credit application; in exchange for comprehensive modeling and design innovations for Instream's turbine system plus transfer of resultant IP, BAE Systems received IRB (Industrial Regional Benefits) credit from the Canadian Government. Additional design work by BAE is ongoing.

- Instream's Marine Floating Platform Design Project in collaboration with UK based IT Power Consulting has received the European Union Eureka Label and NRC-IRAP funding.

- Instream has received approval by the US Bureau of Reclamation to extend its lease at the Roza Canal site in Washington. Instream plans on adding additional turbines as well as connecting to the grid.

Member Activity Update for 2015
JUPITER HYDRO
Jupiter's commercialization plan included testing of its proprietary and patented hydrokinetic turbine design at the Canadian Hydrokinetic Turbine Test Centre (CHTTC) The CHTTC testing program observed and reported on Phase 1 and Phase 2 prototype designs. Test results exceeded Jupiter's most optimistic expectations in terms of efficiency performance, as well as performance in slower water flows. The results experienced by Jupiter's two prototypes have cleared the path to commercialization. Jupiter is currently initiating a Front End Engineering Design study, as well as evaluating alternative deployment locations for the commercial demonstration unit.

Member Activity Update for 2015
MATT TACCOGNA, UBC IRES (STUDENT)

2015 has seen me wrapping up my 2 year MSc. program at UBC, at the Institute for Resources, Environment and Sustainability. My thesis is a Marine Spatial Planning and Risk and Benefits Study of SRM Projects' investigative sites at Campbell River, BC.

My Thesis will amount to some 125 pages and 3 substantive chapters of analysis as well as an introduction and conclusion. Chapter 1 contains some survey of renewable energy systems in general and within a BC context, and a subsequent focus on in-stream tidal energy. Chapter 2 looks specifically at the benefit and risk perceptions for the community, the results uncovered and further analysis of some of these results. Some of the identified benefits of tidal energy development in the area included possible water conservation in local hydroelectric watersheds due to significant levels of tidal energy penetration into the local grid, local economic development stemming from the developments and displacement of local off-grid diesel generation and development of more local generation sources. Risks identified included tidal energy operations interfering with local marine traffic, high costs, possible cumulative effects of too many turbines being installed, and the specific risks of tugboats snagging their towlines and sport fishers snagging their down rigger cables on teh underwater turbines. Chapter 3 examines the interactive marine spatial planning methodologies employed for the study and subsequent findings, including general locations of where marine user conflicts with tidal energy were likely to occur within the channel. The Thesis concludes by offering some possible mitigation measures for the conflicts as well as a prescriptive stakeholder engagement and site development approach for ocean renewable energy sites in general. Chapters 2 and 3 will be submitted for publication in scholarly journals within the coming months.

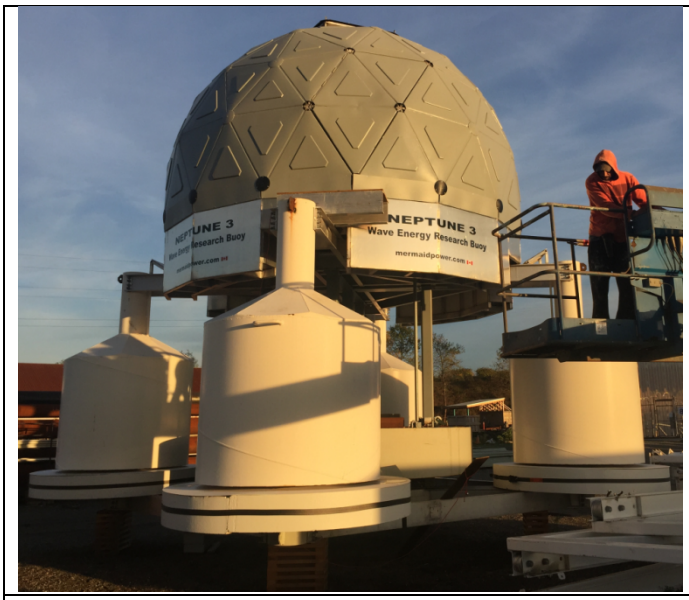
In addition to this, I have been working with Mavi Innovations Inc. since August under an NSERC Engage grant for the development of a oceanographic sensor buoy, as well as doing some additional consulting with the company. The aim of the grant is to develop a low cost sensor to measure tidal and river currents over sustained periods for resource assessment purposes.

Member Activity Update for 2015
NEW ENERGY CORPORATION
Over the past year, New Energy Corp has been moving forward in developing our second generation technology and in developing new markets for our products. New Energy has been successful in working with PWGSC (Public Works and Government Service Canada) in creating a successful project proposal through the BICP (Build In Canada Program). This program has allowed us to engage AANDC (Aboriginal Affairs and Northern Development Canada) to create a project in a First Nations community. The project will see the first deployment of our second generation 25 kw unit. New Energy has continued to work in Asia, doing follow work up with our second generation unit initially installed last year in Nepal. Two additional second generation 5kw units have recently been installed (Sept /Oct) in Myanmar The Canoe Pass Tidal Energy Project in British Columbia has seen construction of various civil works. New Energy has continued to work as a partner in the CHTTC (Canadian Hydrokinetic Turbine Test Centre) in Manitoba and has this year conducted testing programs with our second generation technology. The results of this testing has allowed to improve upon our products. These improvements have been integrated into the new systems now being deployed

Member Activity Update for 2015

MERMAID POWER CORPORATION

- Neptune 2 was professionally evaluated as a result of contacts made at ICOE 2014
- Neptune 2 was found to be lacking in survivability aspects and was abandoned
- Neptune 3, a 16 Ton WEC with 4 m point absorber was sea tested in August 2015, see mermaidpower.com home page for video of test
- Mermaid Power joined with Marine Renewables Canada in a booth at Vista Expo 2015 in Nainamo BC
- Mermaid Power presented a poster in the Canada Pavilion at the Renewable Energy India Expo 2015 in Delhi, India
- Neptune 3 has completed underwater video and lights tests
- Neptune is currently testing RBR Wave Sensor (Ottawa) with local made logic controllers & other moitoring devices
- PCT report on international patentability of PCT/CA2014/050206 has been received, report found all claims to comply with Article 33(2) or 33(3) of the PCT as each is "novel" and / or includes an "inventive step"
- Neptune 3 has received permission to moor at the Vancouver Maritime Museum while awaiting good weather for deployment at Keats Island, B.C. in November
- Charles Haynes will be giving a talk on wave energy at the Vancouver Maritime Museum in November
- Neptune 3 registered with Transport Canada as a commercial vessel -- research buoy
- Neptune 3 to be used for testing & verifying general WEC activities including grid tie in to BC Hydro via net metering
- Neptune 3 to be used for wave energy data gathering with respect to:
    - determining the actual vertical energy component in various waves acting on a point absorber (kW per sq. m)
    - determining the energy efficiency of this particular WEC (from wave energy input to electrical output)
    - enabling experiments with optimizing dampening loading amperage to various wave profiles
- Neptune 4 is expected to be deployed on the west coast of Vancouver Island in 2016 – we are looking for a deployment site in the Sooke--Shirley--Jordan River--Port Renfrew area , please contact mermaidpower.com for more informaion.

 NEPTUNE 3 Wave Energy Research Buoy mermaidpower.com	 NEPTUNE 3 Wave Energy Research Buoy mermaidpower.com

Member Activity Update for 2015

SEAWOOD DESIGNS

Seawood Designs Inc. is developing a point absorber WECS called SurfPower. Seawood is a participating member in the West Coast Wave Initiative led by the University of Victoria (Dr. Brad Buckham). The University research team, on Seawood's behalf, has successfully completed a SurfPower optimization program designed to evaluate a large number of different system configurations to realize the lowest capital cost/annual kWh for a 100 unit array. The positive results are as follows:

- Two configurations were identified to have significant potential with a similar minimum capital cost/kWh. One employs a "wide" buoyant wing 10.7 m wide by 24.4 m long and the other a "narrow" buoyant wing 6.75 m wide also 24.4 m long.
- For a site off Ucluelet -- the "wide wing" is estimated to deliver **1.8 GWh** annually and the "narrow wing" **1.1 GWh** before energy conversion losses are accounted for (expected to be about 25%).
- In the "wide wing" case the unit rated power would be in the **400 - 500 kW** range and the "narrow wing" case **250 -350 kW** range.
- Initial estimates of life cycle cost and energy recovery suggest the cost of energy in both scenarios could be comparable to that of off-shore wind. Seawood is therefore very encouraged.

Member Activity Update for 2015

MAVI INNOVATIONS

Field Work at CHTTC

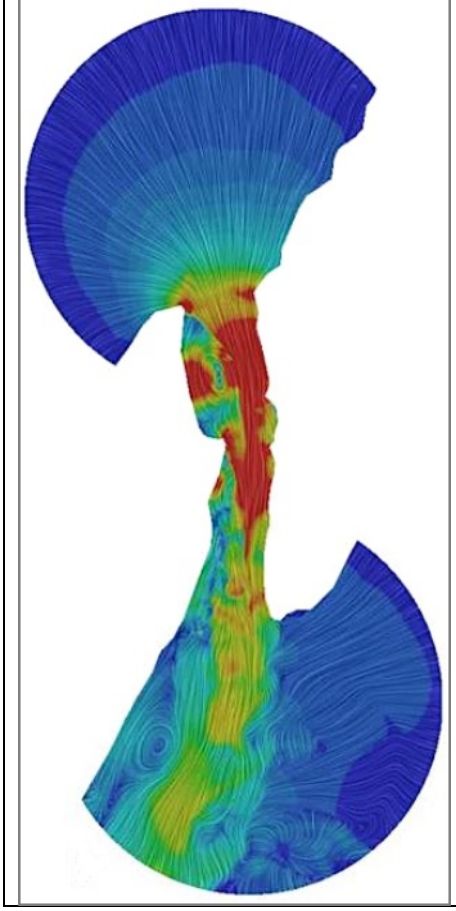
- Nov/Dec 2014
  - Launched Mi1 Turbine at CHTTC for 1 week of testing.
  - Learned about the challenges of operating in a Canadian winter environment (-30 deg C).
- Summer/Fall 2015
  - Measuring mooring loads in collaboration with DSA & CHTTC using a custom submersible 6mT load cell with a built in data logger we designed – the data collected is used to support the development of the IEC-TC114 Moorings standard and validate DSA's mooring simulations.
  - Performance measurements to validate the IEC-TC114 Turbine Performance standard in collaboration with CHTTC. This included taking both vertical and horizontal ADCP measurements from a secondary CHTTC platform moored upstream as well as from an ADCP boom secured to the Mi1 platform

Research

- Validating our CFD model of Petit Passage against ADCP and drifter data in collaboration with Acadia University and Fund Tidal
- Working with DSA and SRM to assess probability and impacts of tug-barge cable snagging on tidal turbines as well as the repercussions of log impacts on floating turbines.
- Working with U Laval, NRC, Lambda2 and CHTTC on modeling arrays of turbines in rivers.
- Working with UBC and GB Consulting to develop guidelines for reliability assessment and design parameters for River Current Energy Conversion Systems (RECs) for different safety levels
- Working with UBC on design and testing of a low cost current meter with built in data logger

Off-Grid Tidal demonstration project in BC – summer 2016

- In 2016, we will integrate the Mi1 along with batteries into an existing diesel grid to power a remote lodge in BC. The objective of this project, funded by the BC ICE Fund, is to assess the feasibility of using tidal power to offset the use of diesel for coastal off grid communities.



Update Since ICOE 2014

MAVI INNOVATIONS

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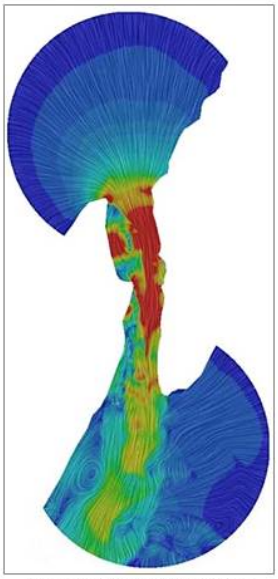


CFD model of Petit Passage

Mi1 testing at CHTTC 2014

ADCP Boom on Mi1 Platform

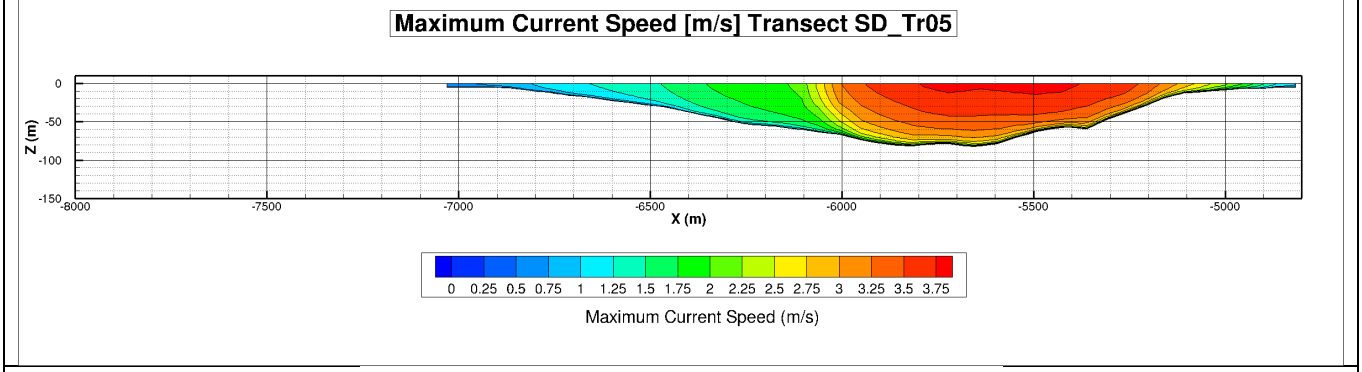
Mi1 testing at CHTTC 2015

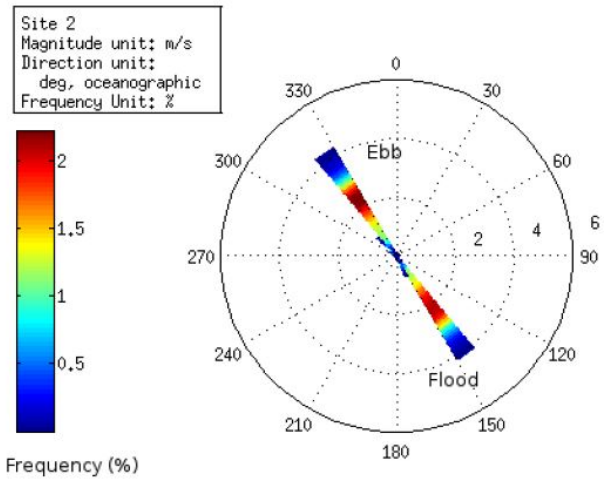
Mooring load monitoring

Member Activity Update for 2015

SRM PROJECTS LTD

- Investigative activities for SRM's two ocean energy sites in Discovery Passage near Campbell River continued with the submission of a marine spatial planning (MSP) assessment report.
- Stemming from the MSP findings, SRM Projects is also industry sponsor of a research and development project being completed by BC technology firms Dynamic Systems Analysis and Mavi Innovations and supported by Marine Renewables Canada and the Standards Council of Canada Mirror Committee to IEC/TC114 through a grant from NRCan's EcoEnergy II program. Titled "*Tidal and River Energy Converter Debris Impact Load and Cable Snag Risk Quantification*", the project will assess the impact of floating debris on hydrokinetic energy converters in oceans and rivers as well as the risk of snagging these devices with marine tow cables, both important issues to understand before deploying marine renewable energy systems. To be completed by March 2016, the work is expected to provide the basis for emerging marine renewable energy standards being developed by Canada and other members of the International Electrotechnical Committee.
- Acted as reviewer to provide support for Matt Taccogna's MRE thesis.



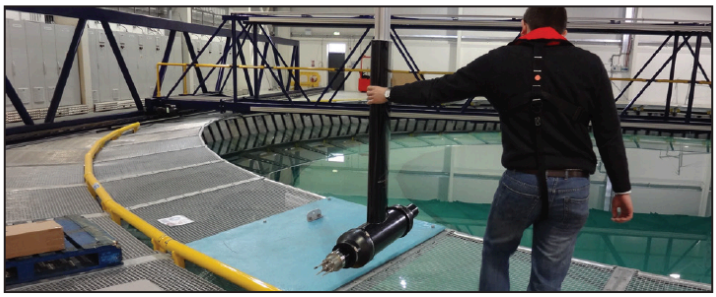


Member Activity Update for 2015

ROCKLAND SCIENTIFIC

- Rockland has been very actively engaging the European TEC market by participating in several direct marketing missions (e.g., Ocean Business 2015 in Southampton UK), or embedded in MRC-led delegation (e.g., EWTECH 2015, Nantes, France).
- Rockland worked with UK-based Partrac Inc, Rockland's strategic partner in the UK TEC sector, on formulating industry recommendations and methodology for turbulence characterization under the TiME project (Turbulence in the Marine Environment), funded through the Crown Estate.
- Rockland has secured R&D funding under the Canada-UK Research Call "Environmental Monitoring, Sensing and Instrumentation Technologies for High Flow Marine Environments" and is leading a team of six academic and commercial entities from Canada and the UK in developing laboratory and field equipment for continuous turbulence observations at TEC sites. The project is co-funded by OERA, InnovateUK, and IRAP. The project has received the prestigious EUREKA label from the European Commission, certifying that our project has passed the stringent EUREKA assessment procedures.

LABORATORY TIME-SERIES MEASUREMENTS



RSI and the **FloWave Ocean Energy Research Facility** are developing technologies and methodologies for "real-world" field measurements to be down-translated to tank-scale measurements and vice-versa, providing developers and manufacturers the ability to evaluate dynamic behaviour of sites and turbine designs at model scale and full scale.

Miniaturized single and multi-point time-series turbulence measurements systems are now available for laboratories.

Member Activity Update for 2015

UVIC – WEST COAST WAVE INITIATIVE

Wave Resource Assessments:

- WCWI maintains and operates 4 (four) offshore wave measurement buoys to collect wave, wind and current data. Variety of depths and wave energy level deployment locations.
- Buoys can be coupled with load cells to capture mooring loads.
- WCWI SWAN model now features an 11.5 yr hindcast of wave conditions (2004 – July 2015)
- Initial work to extend SWAN model domain along entire BC coastline is beginning
- Application of Spectral Partitioning Algorithm to wave data has significant reduced uncertainty in wave resource assessments.
- Uncertainties in both SWAN and buoy measurements have been quantified and used to improve predictive abilities of both tools.
- Sensitivity study of SWAN model boundary conditions, internal computational resolution and spatial distribution provides quantitative measure of SWAN model uncertainties and resulted in a recommendation for standard baseline model run setup.

Technology Modelling:

- $1/25^{th}$ physical modelling of a two-body point absorber and $1/40^{th}$ scale a surging flap. Tested at Memorial University Newfoundland and UVic.
- 6 DOF numerical models of a Oscillating Floating Water Column (OWC), a Surging Flap, and a number of differing Point Absorbers. Fully coupled device mechanics, hydrodynamics, and PTO dynamics.
- Development of device independent numerical 'Plug-and Play' PTO models.
- Development of WEC farm model simulator to allow for calculation of intra-farm power variability and far field effects on wave fields.
- Stochastic models for WEC farms – allow for simple scaling of future wave farm and ability to predict short term power time-series statistics.

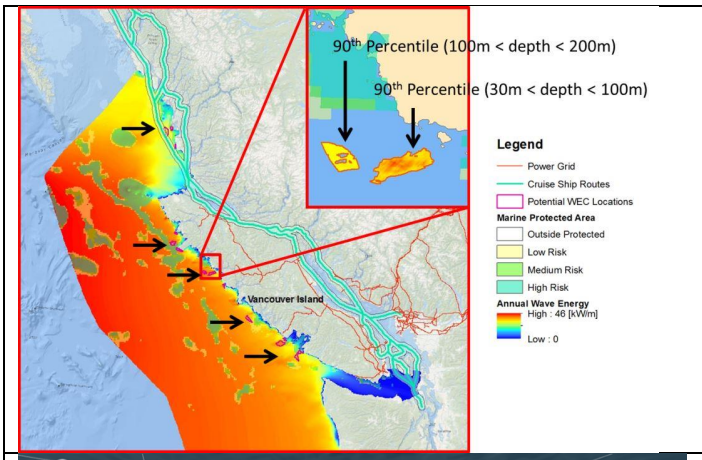
Grid Integration:

Remote Communities:

- Wave power integration costs, fuel reductions and operation impacts for a representative BC remote community are being quantified. Provides a bench mark for future wave power development.
- Combined heat-and-power, with wave as an intermittent generation source, is investigated for 40 community buildings in 3 separate BC remote communities. Allows for an assessment of the impacts on community fuel and CO2 reductions.

Large Scale Integration:

- GIS Marine Spatial Planning identifying possible conflicts with other ocean users, extend of develop-able area, and WEC specific development zones
- Investigated the impact of integration 500MW of wave energy integration into the Vancouver Island grid and noted a 14% decrease in net demand from the lower mainland.
- Mean peak demand reduction of ~10% over the 2007 – 2014 period due to wave energy integration
- Identified Vancouver Island transmission lines which limit the ability to integrate additional wave generation into the electrical gird.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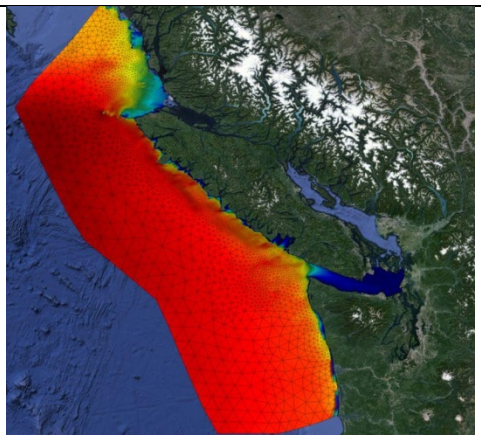
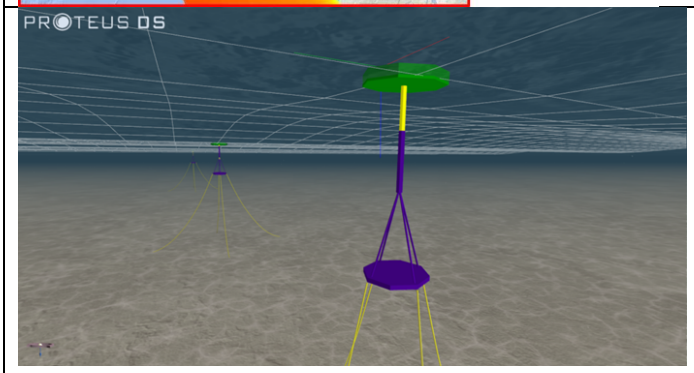
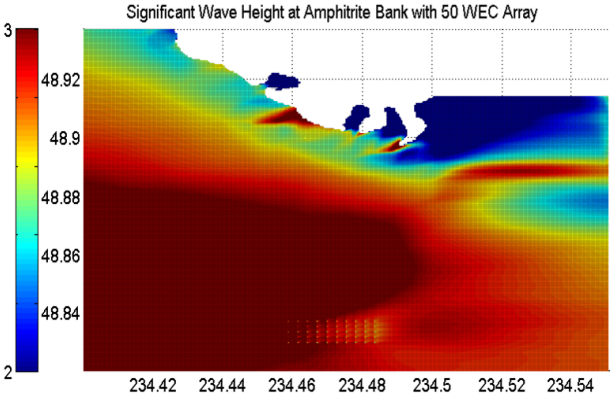
90th Percentile (30m < depth < 100m)
Legend
Power Grid
Cruise Ship Routes
Potential WEC Locations
Marine Protected Area
Outside Protected
Low Risk
Medium Risk
High Risk
Annual Wave Energy
High : 46 [kW/m]
Low : 0
Vancouver Island




PROTEUS DS


Significant Wave Height at Amphitrite Bank with 50 WEC Array
3
2
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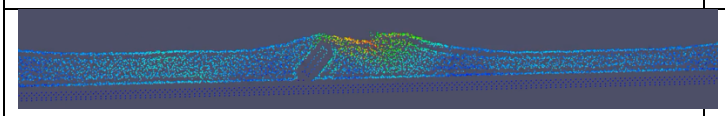
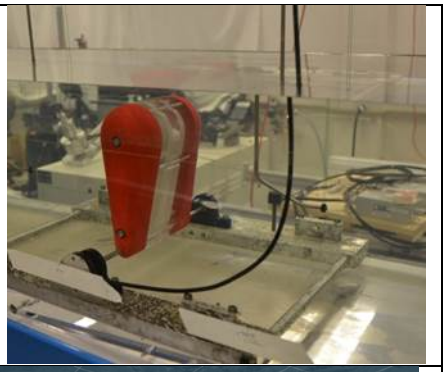
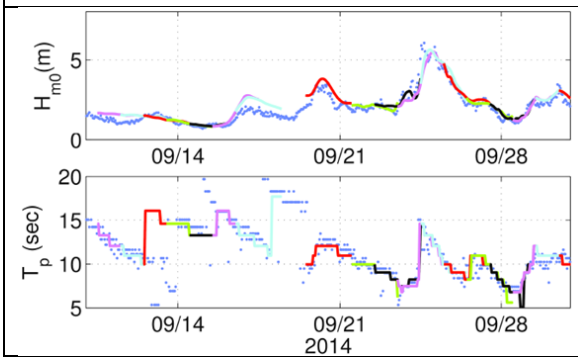
234.5
234.52
234.54






H_{m0} (m)
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0
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09/21
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20
15
10
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T_p (sec)
09/14
09/21
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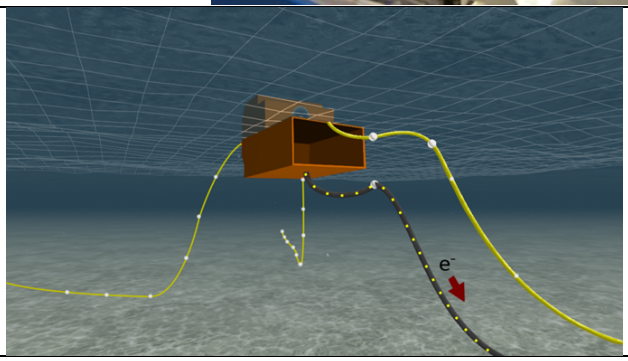
2014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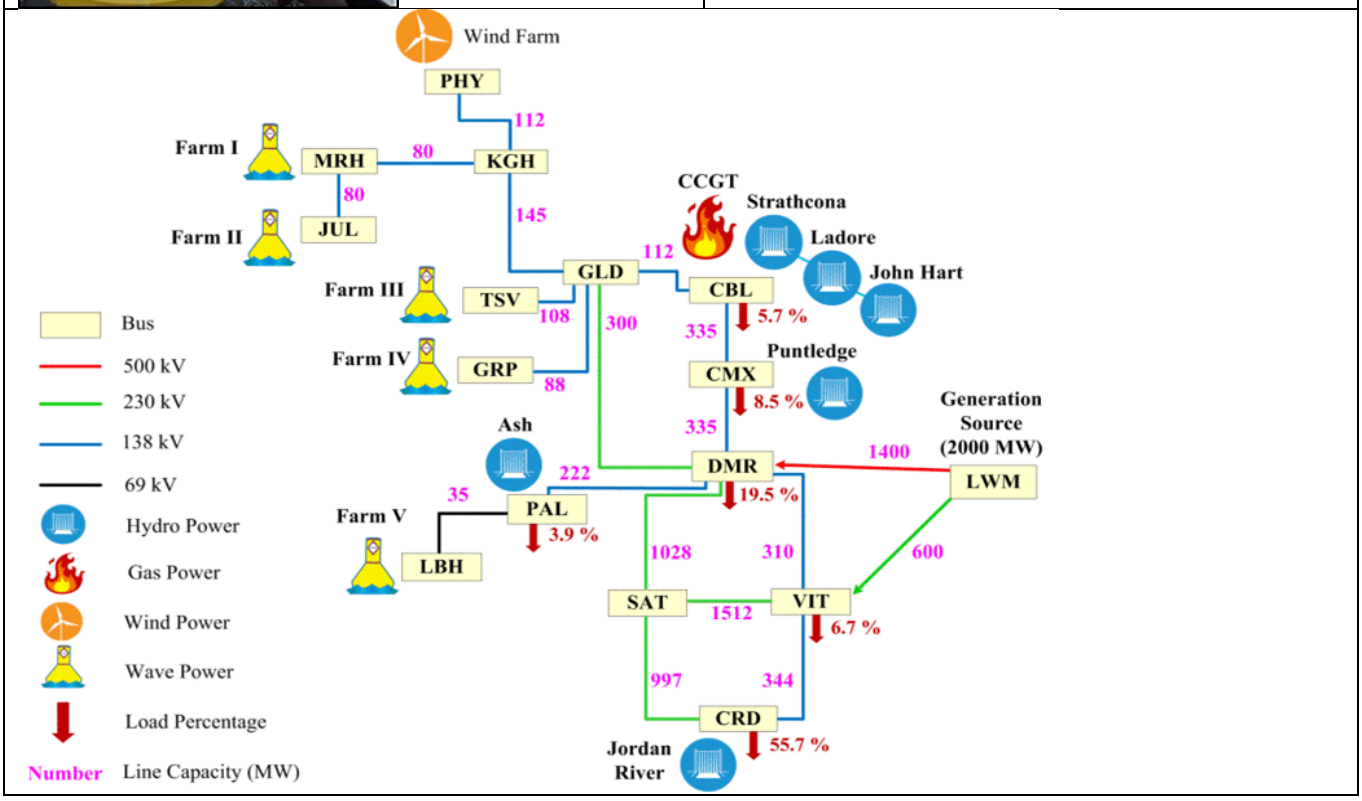
Wind Farm
PHY
112
Farm I
MRH
80
KGH
80
Farm II
JUL
145
CCGT
Strathcona
Ladore
John Hart
112
GLD
CBL
5.7 %
Farm III
TSV
108
300
335
Farm IV
GRP
88
Puntledge
CMX
8.5 %
Generation Source (2000 MW)
Ash
335
1400
DMR
LWM
222
35
PAL
19.5 %
Farm V
3.9 %
LBH
1028
310
600
SAT
1512
VIT
6.7 %
997
344
CRD
55.7 %
Jordan River
Bus
500 kV
230 kV
138 kV
69 kV
Hydro Power
Gas Power
Wind Power
Wave Power
Load Percentage
Number
Line Capacity (MW)

Member Activity Update for 2015

WATERWALL TURBINE

- A full size demonstration turbine will be undergoing testing in the Fraser River at Vancouver in December 2015 before its ultimate demonstration deployment at the Dent Island test site.
- Design and construction of components for the associated microgrid is underway. Testing of the microgrid components is scheduled for January 2016 in parallel with the commissioning of the turbine at Dent Island.

SHIPYARDS

Progress update

Power plant vessel in the final stages

One visit to Meridian's yard on the North Fraser River and it quickly becomes apparent that the team has been extremely busy.

Photo by Dave Reid (www.davereidc.com)

Mehran Zargham , Jim McFadden and Andrea Baldini stand in front of the hull of the Turbine Tidal Power Generation vessel.

When *BC Shipping News* first reported on the Dent Island Tidal Power Generation project at the beginning of this year, the team at Water Wall Turbine Inc. (WWT) had just contracted Meridian Marine as the shipbuilder of record for the innovative, self-floating power plant. Fast forward seven months and the WWT Turbine Tidal Power Generation vessel is past the halfway mark and visibly taking shape.

With over 4,000 parts to assemble, Jim McFadden, President, Meridian Marine Industries Inc., has a crew of about 50, split between day and night shifts, working to join the pieces together in modules which will then be constructed into one complete vessel.

Refresher

The WWT Turbine Tidal Power Generation vessel is not only the first new-build hull for Meridian Marine but is also the first of its kind in the world. The vessel is a 17-by-28-metre catamaran-type barge housing a turbine that will use river currents to generate power for small coastal communities — this first, full-scale model is being used to power a family-owned Dent Island Lodge.

The brainchild of Marek Sredzki and Lodewyk Botha — partners of Water Wall Turbine Inc., the vessel is the culmination of over 10 years' worth or research into power generation from water currents and tidal energy. Small-scale testing, which began in 2004, showed the viability of extracting large energies from currents. Following the success of initial testing, Sredzki and Botha secured patents, conducted proto tests and finally, building a definitive scaled turbine model that verified the efficiency of the energy harvesting method. Russ Baker, who is looking after business expansion, is hoping to introduce WWT projects to First Nations remote communities.

By installing rotating turbine components within a specially built barge, the self-floating power plant can operate in shallow waters — a minimum of a four-to-five-metre draft — with tidal or river currents in remote areas to generate up to five MW of electricity with different turbine sizes and powertrains at a competitive cost that is more predictable and efficient than solar or wind. A Tesla battery energy storage system will be used in this full-scale plant with WWT innovative microgrid to store energy to allow for consistent delivery of power.

Designed by Ivan Erdevicki, President, ER Yacht Design, the barge will have a high degree of stability through the addition of multiple tanks that allow the vessel to meet the requirement for minimal movement despite constantly changing flow and velocity. The Switch, a Finnish company that is a pioneer in advanced power conversion technology, will supply the converter; and Brevini Gear Systems has designed a totally integrated mechanical and electrical drivetrain which includes cooling and lubricating systems. Prime Engineering of Victoria has developed unique controls systems for powertrain and first of the kind ocean energy microgrid.

Visible progress

One visit to Meridian's yard on the North Fraser River and it quickly becomes apparent that the team has been extremely busy. Already, the pre-cut, pre-formed pieces of steel are taking shape into the barge walls and the superstructure which will cover the turbine. When complete, the vessel will weigh in excess of 500 tonnes.

To assist in the project, McFadden has brought in engineers-in-training Mehran

Zargham and Andrea Baldini. "Providing this kind of hands-on training gives them knowledge they wouldn't get from books ," said McFadden. "It will really help them progress as good, experienced engineers."

Zargham, recently graduated with a degree from BCIT for Mechanical Engineering, and who will be joining UBC's Naval Architecture and Marine Engineering program this fall, has been managing the project on a daily basis and working with shop staff to ensure scheduling and progress is kept on track. In addition, Zargham has also taken on the weekly progress reports that are submitted to WWT and federal government partners within Natural Resources Canada and the ecoEnergy Innovation Initiative and Clean Energy Fund.

Using the CAD software program Rhino, Zargham has broken down the complicated design drawings to identify plate numbers by colour, making it much easier for shop staff to follow instructions. Zargham noted that the project involved a lot of welding and the Rhino program was useful in finding ways to minimize the welding for the turbine "to avoid undue distortion of the shaft," he said.

Photo by Dave Boyd (wwtdevonsite.com)

The superstructure that will house the turbine will be fitted to the hull (below).

Working with Andrea Baldini, who has worked around the world on engineering projects with an environmental aspect, the next step will be to bring the hull and superstructure together. "We'll have to take it out of the shop to be able to bring the two pieces together," said McFadden, noting that the final height of the vessel will exceed the clearance in their building. "We'll transport the hull to our dry-dock and floating it alongside so we can finish off the outfitting."

Following testing at Meridian Marine's dock, the vessel will be shipped up to Dent Island where it will be secured to the seabed with cables before final testing and initiating power generation. "This part of the process should take about one month," said Andrea Baldini who has been working with WWT to prepare the site at Dent Island. "We should be ready to begin supplying power for the 2016 season at the Lodge," he continued.

Stay tuned for more updates!