

Blue Power

The OREG Newsletter

Volume 4, Issue 1

April 2009

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Message from Executive Director Chris Campbell

The world of ocean energy is being tossed around by the economic storms, but I continue to argue that renewable ocean energy's already daunting challenges just got a bit harder while more established industries are now getting treated like *start-ups*.

The Obama administration has clearly upped focus on a renewed and renewable driven electricity system for the US. It was also clear that carbon will be priced and the Canadian Minister of Environment is suggesting Canada must follow. Surely these signals suggest that public and private investments will be coming.

Canada's Budget 2009 Clean Energy R&D fund will be alive in coming months, hopefully with some of its \$150m accessible to ocean energy. Sustainable Development Technology Canada has now invested in five ocean energy companies and is reviewing a sixth.

British Columbia's Innovative Clean Energy Fund has now backed two wave and one tidal project. This, on top of the Nova Scotia commitments, including the Nova Scotia Power leadership as investor and as a power project developer, is moving ocean energy into a place where government and the public now expect it to be part of the climate change and future energy solution.

So, how do we present this option at the cocktail party when the 70 year-old wonders why their investment advisor is

not offering them this *right* kind of investment opportunity?

We need to avoid putting ocean energy in the position of underperforming or disappointing, we need to reinforce inherent understanding about the resource attributes, but we must be open about the challenges that climbing that development curve presents.

We must see the full-scale demonstrations and pilot power plants in coming years. We also must reflect the phased and steady development, which we expect over the next 20+ years as ocean energy assumes a productive role in a diversified clean energy world.

Marginal energy costs will be increasing at the same time that costs of ocean energy get reduced through experience so that the market will take over from the early public support, to drive maturing ocean energy technologies forward.

The power density in waves and tidal flows are well understood by boaters, surfers and those who have walked the shoreline. We need to reinforce the understanding with examples like the thrust on Marine Current Turbines' SeaGen operating in Northern Ireland at the equivalent of a wind speed of 400km/h.

The implications of having higher power densities are that installations will be smaller than those for wind, solar and other opportunities. Yes, that may make them more acceptable, but

more importantly, it may ensure that cost/MW will drop competitively even if marine construction and operations costs are higher.

The predictability of tidal energy production is already being anticipated by some grid operators and utilities. The expectation is that, because wave energy delivers the impacts of winds over large areas, it will have good persistence and its forecastability will be well beyond 48 hours.

The winter peaking of wave energy resources is being seen as a good fit with seasonal heating demand and depleting hydro reservoirs. These are the attributes that will drive the adoption of marine energy.

But we must be honest about the effort to get there. Working through that development curve will take commitment from governments and ratepayers. It will take commitment and patience by motivated investors, and regulators must ensure that they do not get in the way, and that they also share in the learning experience.

As we work through the economic challenges and enter the true testing phases, we must support all of our pioneers and profile the learnings that come from even apparent setbacks.

Continued on next page.

Message from Executive Director Cont.

News stories of technical and financial challenges will likely miss the engineering, operational, business or regulatory experience that individual projects have contributed.

At this point, all knowledge gained is a step forward for the sector. Early investors have seen this and seem to recognize that they are

increasing the probability of their long-term success even if their early projects experience delays and other challenges typical of pioneer efforts.

So, despite a time of gloom, we salute those who are making the first full-scale projects happen. We urge you all to engage your friends, family and business circle in this learning experience.

We encourage you to launch discussions that inevitably lead to the realization that renewable ocean energy will be on the path to achieve its potential through the coming decade.



OREG Membership

In the last year, we have been able to brag that OREG is the largest dedicated ocean energy association in the world! When we visit with political senior staff, the 120 membership impresses.

When we lay out that it includes ocean energy-interested governments in Canada's three oceans, some of the regions blessed with in-stream currents, and their utilities, the reaction is essentially "We hadn't realised this was truly a national initiative!"

When we talk about some of the apparently unique aspects in some of the technologies being developed, and the involvement of the world-leading international technologies, we demonstrate that our members will be a part of the mature ocean energy industry.

When we point to the first sales of small scale generators or the engagement of OREG members in international site and resource investigations, we demonstrate that our membership will be a part of growing the renewable ocean energy business.

When OREG is asked to speak representing a Canadian ocean energy focus, we are now asked to give a perspective from Canada on the world development of the ocean energy business.

We do all of this based on the strengths inherent in each of our members and the collective strength they confer through their membership. We are happy that those capabilities and numbers have grown each year since OREG's formation, with 12 new members even in the tough world of 2009.

What can OREG do for these members? At this point OREG offers you a louder voice, visibility and a network to reinforce your involvement in ocean energy. We have influenced fiscal, planning and other initiatives by the federal and provincial governments. We have influenced funding for ocean energy innovation. We have stimulated government and academic research in support of ocean energy.

We profile members through the website and any news through OREG Bi-Weekly News

- these communication initiatives being continuously recognised for their international leadership.

We organise two events each year, specifically working to bring members together to expand their team expertise and share news of their achievements.

We perform introductions and recommend contacts across the membership. We arrange meetings with appropriate utility and government agencies, and we advise members on our assessment of the state of play regionally, nationally and internationally.

We currently offer members web listing, a member newsletter, our services, and special rates at events. We welcome thoughts from existing or potential members looking for further value.

Thanks for the endorsement by the new members. Thank you to those who renewed so promptly for 2009. Thanks for your attention to settling your account if you are one of those who have been tardy!



OREG Member Updates

Roper Resources Ltd. is a provider of underwater ROV, AUV and sonar systems used for seafloor mapping and underwater construction activities.

In the past 36 months Roper Resources Ltd. has delivered the following hardware to North American operators and academic institutes involved in the marine industry:

- 21 Remotely Operated Vehicle systems
- 3 Autonomous Underwater Vehicles systems
- 17 Sea Floor Profiling and Side Scan Sonar Systems

Roper Resources can provide the full complement of ocean mapping hardware.

Maritime Tidal Energy Corp (MTEC) is a strong advocate for an Ocean Energy Economic Opportunity Study brought forward by OREG to the Province of Nova Scotia. In recent discussions with Minas Basin Pulp and Power and Nova Scotia Power, local companies planning tidal demonstrations in the Bay of Fundy, all three organizations agreed on the need for such a study.

The study would identify the broad economic opportunities, develop strategies to realize them, and lay the groundwork for the development of the ocean energy industry in Nova Scotia.

“If we create the right environment, we have an opportunity to build on our capabilities and develop the Province into THE major source of ocean energy research expertise, manufacturing and operational capability - for the east coast of North and South

America and beyond.”

They see this study as a logical follow-on from the Strategic Environmental Assessment (SEA), and propose that, like the SEA, it incorporate broad stakeholder involvement so that all parties develop the vision and strategy together.

Garrad Hassan (GH) is supporting Tidal Generation Limited (TGL) in a five-year development programme to deliver a 1MW tidal turbine suitable for use in deep waters.

The modelling and simulation capabilities in GH’s tidal turbine design software – GH Tidal Bladed, allowed TGL to explore a wide range of design options and subject them to the normal operation and failure scenarios required by the draft Germanischer Lloyd design guidelines.

Besides the control algorithm itself, GH has provided all of the software for both the local device controller and the shore station maintenance interface and data collection. The approach to the control system software borrows heavily from the consultancy’s longstanding activity in the wind energy sector.

TGL’s 500kW demonstrator will be tested at the European Marine Energy Centre, with plans for initial dunk-testing imminent.

The development of the 1MW commercial turbine is ongoing with deployment scheduled for 2010.

Garrad Hassan presented initial findings from its study to identify Chile’s potential for wave and tidal energy projects to the Chilean government.

Initial findings from the study estimate Chile’s raw offshore wave power at 164GW - about 12 times the total capacity of the electrical system in Chile. The Chacao Channel was found to have the largest potential for exploitation of tidal currents, estimated at up to 500MW.

Chilean Government Minister of Energy, Marcelo Tokman, explained that conducting research into the best prospective locations at this relatively early stage in the marine renewables sector meant that, when the technology became more advanced, Chile would be in a strong competitive position.

Hatch Ltd. Joins Verdant Power Canada’s CORE Project Team

Verdant Power Canada is taking another step towards establishing its renewable energy technology for commercial application.

The CORE project is a fresh water, continuous-flow river application of Verdant’s horizontal-axis turbine technology. The project will be conducted in the St. Lawrence River near Cornwall. Phase 1 will consist of a pilot installation of the latest generation of Verdant’s technology, followed by a Phase 2 commercial build-out of the project to up to 15 MW of installed capacity.

The first task for Hatch is the engineering design of an updated mounting system for the turbines. Using investigations and analysis of water flow and geotechnical ground conditions, Hatch will engineer an integrated system that can be easily deployed and retrieved in the fast flowing waters of the St. Lawrence River.



**Roper Resources Ltd.
Cougar ROV**



The Verdant Power turbine.

Member Updates Continued

SMRU Ltd, part of the Scottish Oceans Institute based at St Andrews University, and the European Marine Energy Centre (EMEC) Ltd, Orkney, are working to develop hydroacoustic systems and methodologies for the detection and monitoring of marine mammals and diving birds and potential interactions with Ocean Renewable Energy devices.

This project is an important undertaking that will help to prioritize marine areas for use as potential Ocean Renewable Energy project locations and will help project developers and device manufacturers address permitting issues and concerns over turbines placed in marine habitat areas.

The hydroacoustic, or SONAR, systems used for this project will be provided by Seattle based **BioSonics, Inc.** After an intensive evaluation process by a panel of UK experts, BioSonics and their DT-X digital echosounder technology were selected based on their unique capabilities and potentially "mammal friendly" characteristics.

Their systems are capable of three-dimensional tracking and classification of marine mammals, fish, and diving birds at long ranges and operate at

frequencies and energy levels above the hearing ranges of marine life.

Work began in early April at EMEC in Orkney. BioSonics and SMRU Ltd technical teams worked in tandem on initial field trials and data collection.

ORPC Alaska, an affiliate of the **Ocean Renewable Power Co.**, filed a draft license application with the FERC for a Hydrokinetic Pilot Project License.

On April 17, 2007, ORPC Alaska was issued a preliminary permit for the Cook Inlet OCGen™ Power Project located in the Knik Arm and Upper Cook Inlet.

The pilot project will consist of deployment and operation of five OCGen™ modules. Each module has an estimated capacity of 1MW and consists of 4 Turbine-Generator Units.

During the first phase, one OCGen™ module will be deployed during May/July of 2011, for an initial one year of environmental testing and monitoring along with an overall technological performance analysis.

During the second phase of the pilot project deployment, ORPC will install four additional OCGen™ modules for a total

pilot license capacity of 5 MW.

The purpose of the Pilot License is to allow project developers to place a relatively small scale hydrokinetic project in operation while simultaneously performing the environmental monitoring, sampling and analysis required to support a full scale commercial project licensing process and eventual build-out within the larger project area.

An **AXYS Technologies TRIAXYS™** Directional wave buoy was recently deployed in 50 metre waters off the west coast of Norway. This buoy will support a major EU renewable energy company in their wave energy site assessments, with the eventual goal to provide marine energy plants along various locations off Norway's coast.

This buoy replaces a competitor's buoy and was chosen based on its ability to survive extreme weather conditions and high latitudes while using little power.

The buoy uses VHF radio to send hourly data to an onshore receiving station. Users can also monitor the buoy's position and health online at any time through the use of satellite telemetry.

Ocean Energy RFPs

Yukon River Hydrokinetic Project: Delivery of Hydrokinetic Turbine and Auxiliary Equipment. The Yukon River Hydrokinetic Project is a pilot project that AP&T is performing to study the application of a hydrokinetic turbine as a renewable energy resource for an isolated [off-grid] electrical system.

The pilot project hydrokinetic generator output is expected to be between 25kW to 40kW.

Deadline: April 30th.

Wave Energy Infrastructure Assessment in Oregon

The purpose of this project is to assess the infrastructure needs of ocean renewable energy and compare those needs against the

existing available infrastructure. The "gaps" will be presented as a set of recommendations for infrastructure additions or improvements to support the growth of Oregon's wave energy industry.

Deadline: May 13th.

Contact OREG for info.

Triton Consultants Korean Resource Assessment

In April 2008, Triton Consultants Ltd. (Vancouver, BC) was asked by KOMIPO, one of five Korean electricity companies, and Lunar Energy (UK), to undertake a detailed evaluation of the tidal energy potential in Hoenggan Sudo a 3 km wide channel near the southern limit of the Korean peninsula.

Mike Tarbotton of Triton visited Korea in April 2008 and again in February 2009 to report the results of the tidal modeling studies.

At full build-out KOMIPO, Lunar and partner Hyundai

plan to install a tidal farm with a mean power output of about 300 MW. The initial installation includes a 1MW demonstration turbine.

The tidal modeling program started with the development of an unstructured bathymetric (depth) grid of south-western Korean waters including Cheju-Do Island to the south, Mokpo in the north (west) and Goheug to the east.

A detailed unstructured computation (model) grid was constructed over the bathymetric grid region including 20m detail in the area of Hoenggan Sudo. The model had 130,000 calculation nodes and 250,000 elements.

Triton's tidal model software is RiCOM (River and Coastal Ocean Model) developed by Dr. Roy Walters formerly of NIWA New Zealand and the US Geological Service who is now a consultant with Triton.

RiCOM is a time stepping 2D/3D finite element model formulated on the RANS equations time averaged over turbulent timescales. The program is robust, accurate and fast to run.

The initial model results were used to select the locations for three ADCP current meter deployments in the Channel (Nov-Dec 2008).

The tidal model was then run for the full 6 weeks of current meter data. This verification gave real confidence that the model was providing a very accurate simulation of current speeds and patterns despite the presence of numerous large and small-scale eddies.

From the model results Triton selected the optimum location for the 1MW demonstration unit and the power potential of the full tidal farm in Hoenggan Sudo Channel.



AXYS TRIAXYS
wave buoy deployed
in Norway.

Canoe Pass Receives BC ICE Funding

The Canoe Pass Tidal Energy Commercialization project has received a \$2 million award from the Innovative Clean Energy Fund.

The project involves the installation of 2 – 250 kW EnCurrent turbines, designed by New Energy Corp of Calgary Alberta, at Canoe Pass adjacent to the foot of Seymour Narrows north of Campbell River.

Chris Knight is president of Canoe Pass Tidal Energy Corp. "Our project has four objectives: to model a project review and permitting process for tidal energy projects; to demonstrate the feasibility of grid connection and address any issues related to power quality and reliability; to validate our assumptions with respect to environmental

interface between the equipment and marine resources and to validate the EnCurrent turbine in a marine environment."

Canoe Pass and their project partners, New Energy and Rivercorp, Campbell River's economic development Corporation, hope to have the turbines installed and operating before the end of 2010.

Thor Peterson, Canoe Pass Director, "One of the key goals of this project is to build a Vancouver Island supply chain for ocean energy projects that can build on this project and export ocean energy solutions to other parts of Canada and the world. We expect to utilize the technical and professional resources in and around Campbell River to handle the various parts of the project."

"We have already designed and built EnCurrent systems at 5, 10 and 25 kW" said Clayton Bear, CEO of New Energy. "We have units grid connected and off grid. We now need to shift our focus to a marine environment as opposed to fresh water and address the issues related to scale up. Big challenges, but I'm confident that we have the team to do it."

Canoe Pass and New Energy will initiate three parallel processes: project review and environmental assessment, detailed civil engineering for the site Infrastructure, and engineering associated with the scale up of the EnCurrent turbine to 250 kW. Detailed design and project review are expected to be completed by the end of the calendar year 2009.