



WESNet



NSERC
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WIND ENERGY STRATEGIC NETWORK NEWSLETTER



Issue 2 – September, 2010

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Message from one of our main Sponsors – CanWEA

Sean Whittaker,
CanWEA Vice President, Policy

***It gives me great pleasure
to welcome you to this second issue
of the WESNet newsletter.***

The Canadian Wind Energy Association (CanWEA) is a proud supporter of WESNet and I would like to commend all WESNet-affiliated administrators, researchers and students for the work you've done to advance wind research in Canada.

It was almost five years ago that Dr. Liuchen Chang and his colleagues approached CanWEA with the idea of launching WESNet as a catalyst for increased wind R&D work. I believe that the need for WESNet is as pressing now as it was then. With the wind industry's rapid growth there is a tremendous need for increased research capacity and a trained workforce that will build the country's wind foundation.

In CanWEA's WindVision we see a future where wind meets 20% of Canada's electricity demand by 2025, employing 52,000 people and spurring \$80 billion in investment. To make this a reality, it is imperative that our universities develop world-leading knowledge in wind R&D through research projects and collaborative efforts with leading industry players. It was with this in mind that CanWEA has provided \$250,000 in funding over five years to WESNet, and we continue to collaborate on a number of initiatives. I am particularly excited about our collaboration at CanWEA's upcoming annual conference (November 1 – 3 in Montreal) where WESNet-affiliated researchers will receive a discounted registration rate. I look forward to seeing you all at the conference, and at the WESNet student poster reception on the evening of Tuesday November 2nd.

STUDENT FOCUS

Torsten Broeer

Ph.D. Candidate under the supervision of Ned Djilali and Andrew Rowe at the Institute for Integrated Energy Systems (IESVic) at the University of Victoria

www.iesvic.uvic.ca

Member, Theme 4

Smart Grid and Wind Power: Opportunities and Challenges of Demand Response

Today's electricity system is not smart. Its design was not made to cope effectively with electricity generation that is increasingly coming from wind power and other variable and distributed energy resources. Expanding the power system and adding conventional generation (reserve capacity) has been the traditional way of dealing with the variability of wind power. However, this may counterbalance the economic and environmental benefits of wind power.

A smarter grid is required and with this as its goal, the U.S. Department of Energy's Pacific Northwest National Laboratory (PNNL - www.pnl.gov) has the mandate to redefine the electrical system of the future. A significant benefit of the prospective smart grid is the flexibility to incorporate distributed energy resources and demand response into the power system.

Under the guidance of David Chassin (Staff Scientist at PNNL) the collaborative research between PNNL and the Institute for Integrated Energy Systems at the University of Victoria (IESVic) has been established.

My research at PNNL focuses on the potential and impacts of "responsive loads" in supporting an increased deployment of wind power. The effects and the benefits of smart grid technologies are being modeled and simulated. This detailed power system model incorporates market, end-use and electric load models.

The research simulates and investigates the utilization of end-use appliances as dispatchable grid resources within smart grid architecture. The goal is to allow traditionally passive loads to become a resource which is actively involved in mitigating the consequences of wind's variability on the electrical power system.

Major residential loads, which are the preferred candidates for demand response strategies, are associated with heating and cooling appliances. These end-use appliances are usually thermostatically controlled loads and can maintain their services during power interruptions for a limited time. Examples are electric hot water heaters, space heater and refrigerators. Some of the important questions to answer are: To what extent are these appliances able to mitigate the variability of wind power? Will they be able to reduce reserve requirements associated with wind power? And what impact will responsive loads have on wind power curtailment?

It is expected that the ongoing research with PNNL will provide deep insights into recent developments of smart grid solutions and will enhance the knowledge of new approaches for integrating wind energy into Canada's electrical grid.



From left to right: Jason Fuller, Torsten Broeer, David Chassin

(PNNL, Richland, WA)

Exploring Blades Fit for Extreme Canadian Conditions

By Dr. Curran Crawford – Director, Sustainable Systems Design Lab (SSDL) – University of Victoria Researcher, Theme 2
<http://www.ssd1.uvic.ca>

Currently, wind energy supplies approximately one percent of Canada's electricity production, however the Canadian Wind Association is advocating strategies to increase that amount to 25% by 2025. Additionally, several provinces and electric utility companies have outlined future plans to significantly increase wind energy generation. To accomplish these goals, wind turbines will be erected throughout Canada in cold regions that experience extreme conditions in comparison with other cold climate areas already having successful experiences in wind energy, such as Scandinavian countries.

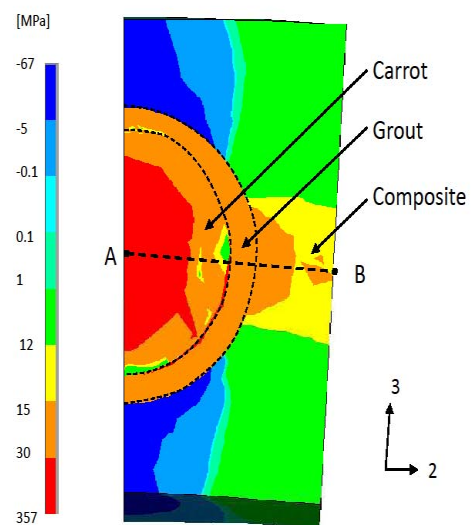
Patricio Lillo working in Dr. Curran Crawford's Sustainable Systems Design Lab (SSDL) at the University of Victoria has started to answer some of the questions surrounding installing conventionally designed turbine blades in Canada's harsh winter environments. Patricio's work started by determining the relevant parameters to define extreme cold conditions in Canada's distinctive regions. A series of weather parameters were identified as relevant in affecting the static and aerodynamic loads of blades, as well as material structural behaviour:

- a) minimum daily winter temperature;
- b) number of freeze-thaw cycles per season;
- c) temperature gradient associated to daily temperature variation;
- d) relative humidity;
- e) icing events per year;
- f) wind velocity characteristics varying with season.

Based on this data, the initial research direction has been towards studying thermal stresses that develop as the blades go from 23°C in the summer down to -40° C in the winter. The potential for significant periods of icing to occur was also noted in a number of geographical regions, and this will be looked at in future work to

ascertain the structural response of the blades using aerodynamic data from other researchers in WESNet studying icing of blade sections.

Collaborating researchers at ETS supplied material test data for the composite materials used in conventional wind turbine blades at the extremes of temperature identified. Patricio used this material data to construct numerical models of the critical details at the root of the blades where steel inserts (called carrots) or T-bolts are typically used to connect the composite blade to metal bearings at the base of each blade. Because the steel and composite materials expand and contract at different rates, stresses develop in this part of the blade. Using the numerical models, he has been able to identify areas of the concern in conventional blade design when blades are used in very cold regions of Canada. Initially he only examined stresses in the root of the blade in extreme wind conditions, but he is currently constructing and running new models of the entire blade using loading predictions over the entire operating range of the turbine. The ultimate culmination of the work over the duration of the WESNet project will be modified blade designs suitable for Canada's harsh climatic conditions that can be used by manufacturers and wind farm developers to ensure their machines are able to perform wherever in Canada they are installed.



ADMIN UPDATES

SNEI Update

Our Strategic Network Enhancement Initiative (SNEI) proposal submitted to NSERC late last year was well received and in February 2010 the network was awarded an additional \$484,200 over the remaining three years of the project. The funding will support new opportunities for student enhancement, international collaboration and acceleration of technology transfer.

Launch of student internship program

Industry and International Student Internship programs were launched in spring of 2010. These programs are funded by the Strategic Network Enhancement Initiative (SNEI) funding and programs provide a great opportunity for students to gain hands-on experience and develop international collaborations.

Program guidelines and application can be found on the network website

<http://www.wesnet.ca/index.php/students/student-research-exchanges>



Jonathon Sumner, a PhD student working with Christian Masson in Theme 2 being hosted at CENER in Madrid, Spain

Student Listserv

We have compiled a mailing list for WESNet students for email communications with our students. The list is derived primarily on emails provided in project progress reports. Additions, changes or deletions can be made by contacting Robin Devine at wesnet.ece@mcgill.ca, or on our website at <http://www.wesnet.ca/index.php/students>

NSERC reporting

As the network is nearing the mid-way point of its 5-year grant, we are required to submit a mid-term progress report to NSERC for December 31, 2010. The report will be reviewed by members of the original Site Visit Committee and appropriate members of the NSERC evaluation committee. Continuation of funding for the network is contingent upon satisfactory progress.

Change in NSERC Officer

As part of a workload reallocation exercise, Réginald Thériault will replace Robert Therrien as our primary contact person at NSERC. Réginald Thériault is not unknown to WESNet. He was the NSERC Officer who oversaw the review of the original WESNet grant application back in 2007. Robert asked me to extend his best wishes to everyone in the Network. He enjoyed working with us and wishes us “tremendous success” as we move forward.

WESNet Demonstration Project

Development of a complete small wind turbine (10kW) integrating the innovative technologies developed by WESNet is being funded under the Strategic Network Enhancement Initiative (SNEI) program. This turn-key turbine will be prototyped and demonstrated for performance evaluation under grid-connected operation at WEICan, our industry partner. A Steering Committee for the project has been established and design specification is underway.

In the upcoming months we will be reporting on the demonstration project as well as highlighting advanced results from network researchers in the interest of accelerating knowledge and technology transfer.

IEA Wind Energy Annual Report 2009

WESNet is highlighted in the IEA Wind Energy Annual Report 2009, published in July 2010, under the Canadian wind energy R, D&D. To view the full report visit: http://www.ieawind.org/AnnualReports_PDF/2009.html. IEA Wind Executive Committee – Canada: Simone Lalande, Antoine Lacroix, - Natural Resources Canada (<http://canmetenergy-canmetenergie.nrcan-rncan.gc.ca/>) WESNet Partner.

Event Updates

Theme 1 and 2 Workshop Highlights

A joint workshop was held for the projects of Themes 1 and 2 of WESNet at Ecole de Technologie Supérieure in Montréal, Qc. The objectives of the workshop were to provide an opportunity to present the general status of the research programs of the WESNet projects in Themes 1 and 2, create synergies between the WESNet projects, between the researchers and with the industrial partners as well as plan future network activities related to Themes 1 and 2.

The Workshop was attended by over 60 participants including researchers and students involved in the projects of Themes 1 and 2, as well as several industrial partners from Enercon, Environment Canada, Hydro Quebec and WEICan. Bouaziz Ait-Driss, VP Project Development, GL Garrad Hassan (formerly Helimax Energy Inc.), was the keynote speaker.

To view full details and the presentations visit the website at www.wesnet.ca/index.php/publications/presentations

CanWEA's Annual Conference and Exhibition



The conference is taking place in Montréal at the Palais des Congrès, November 1-3, 2010. Themes covered in the conference program will include project financing and economics, business development, small wind energy, project development, technical issues, and much more. The following 5 tracks are scheduled:

- Track 1: Project Assessment
- Track 2: Project Development
- Track 3: Business Development
- Track 4: Technical
- Track 5: Research & Development, Small Wind, and Wind-Diesel

The Preliminary program is available at:

www.canwea.ca/events/conference2010/program_e.php

Several WESNet researchers will be presenting at the conference. Liuchen Chang and Christian Masson have been selected to chair two sessions. Track 5: Research & Development: Wind Resource and Integration, Wind Energy Extraction and Production.

CanWEA has offered the opportunity to WESNet students to volunteer during the conference in exchange for a free half or full day access to the conference. For more details visit the website:

www.wesnet.ca/index.php/news/worskshops-conferences

WESNet Annual General Meeting

WESNet's Annual General Meeting will take place in Montréal, Qc on November 3-4, 2010, at the Palais des Congrès, (www.congresmtl.com) in conjunction with the CanWEA Annual Conference, (www.canwea.ca). A full day is planned for November 3 resuming with a half day for November 4.

Researcher presentations are scheduled for the 4 themes:

- Theme 1: Wind Resource Assessment
- Theme 2: Wind Energy Extraction
- Theme 3: Wind Power Engineering
- Theme 4: Techno-Economic Modeling and Optimization of Wind Energy Systems.

A panel discussion with invited related speakers is planned for the first day, November 3, 2010.

More details will be communicated in the coming weeks and will be found on our website www.wesnet.ca.



Student Poster Session/Competition & Reception

Leading up to the AGM, the Outreach Committee has planned a student poster session & competition followed by an evening reception on Tuesday, November 2, 2010. We have received a total of 32 poster submissions. The poster session will take place in the tradeshow area of the Palais des Congrès within the CanWEA poster session. The evening reception will be attended by researchers, industry partners and the students whose posters will be judged by our industry partners and researchers. Monetary prizes will be awarded to the top three posters. A poster template has been designed and circulated to all students and researchers and can be found on our website at: <http://www.wesnet.ca/index.php/students>

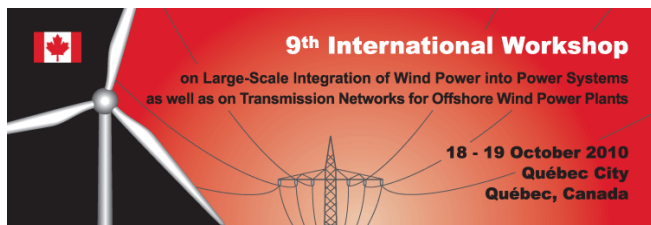
Theme 3 and 4 Workshop

A joint workshop is being planned for all projects in Themes 3 and 4. The workshop will be held at Ryerson University on February 24 and 25, 2011.

More information will be communicated as planning gets underway and detailed on our website

www.wesnet.ca/index.php/new/workshops-conferences

Wind Integration Workshop – WESNet role



www.windintegrationworkshop.org

The 9th Wind Integration Workshop is taking place in Québec City, October 18-19, 2010 at the LOEWS Hotel Le Concord Québec (www.loewshotels.com/en/Quebec-City-Hotel).

WESNet is a supporter of this event. Liuchen Chang has organized the session on Canadian University Research (WESNet) with 5 presentations, for Monday, October 18, 2010:

1. Research on Wind Resources Assessment, Robert Benoit, École de technologie supérieure.
2. Wind Production Assessment for Cold Climates, Christian Masson, École de technologie supérieure.
3. WindEEE Dome – Unique Wind Energy Research Facility, Horia Hangan, University of Western Ontario
4. Overview of WESNet and Grid Integration Research for Distributed Wind Generators, Liuchen Chang, University of New Brunswick
5. Wind Integration in Power Systems, Reza Iravani, University of Toronto

Looking for Volunteers

Preceding this event is the UWIG Fall Technical Workshop (<http://www.uwig.org/falltechworkshop2010.html>) at the same venue, Palais des Congrès, Montréal, from October 13-15, 2010. An opportunity was offered by Thomas Ackermann of the Wind Integration Workshop and Sandy Smith of UWIG to WESNet students to volunteer as rapporteurs for the sessions. In return for working one day, students would be granted free access to one day of the conference. For more information please visit our website: <http://www.wesnet.ca>

Tutorials

Tutorials are being offered at the Wind Integration Workshop. For more information and to register, please visit: www.windintegrationworkshop.org/tutorials.html

