

NSERC Energy Storage Technology Network

Technical Conference

June 22–23, 2016

George Vari Engineering and
Computing Centre

 #NESTNet

Welcome

It is with great excitement that we welcome you to the first NSERC Energy Storage Technology Network (NESTNet) Technical Conference. We would like to offer our sincere thanks to you for joining us today and gratefully acknowledge the support from our partners, without whom this event would not have been possible.

As we move towards cleaner energy systems, demand for innovative energy storage solutions is rising. NESTNet brings together leaders from the academic community, industry, utilities and government. Over the next two days, we are happy to be providing them with a stage to discuss the progress made so far and to share their outlooks for the future.

Ryerson
University

Centre for
Urban Energy



**NSERC
CRSNG**

Agenda - Day 1

Wednesday, June 22, 2016

8:30am	Registration and coffee (served in Sears Atrium)
9:30	Welcome and opening remarks (Room ENG-LG6) Bala Venkatesh, Academic Director, Centre for Urban Energy at Ryerson University
9:45	Theme 1: Energy storage technologies F. Handan Tezel, University of Ottawa
10:15	Project 1.1: Hybrid multi-level grid-scale battery thermal management system Majid Bahrami, Simon Fraser University
10:30	Project 1.2: Fabrication, mathematical modelling, design and testing of flywheels for grid-scale energy storage Marc Secanell Gallart, University of Alberta
10:45	Project 1.3: Design and testing of an innovative energy accumulator for underwater CAES Haoyang Cen on behalf of Rupp Carriveau, University of Windsor
11:00	Project 1.4: Thermal energy storage in adsorbent beds for space heating and cooling applications F. Handan Tezel, University of Ottawa
11:15	Project 1.5: Hybrid energy storage system designs Mohamed Awadallah on behalf of Bala Venkatesh, Ryerson University
11:30	Project 1.6: Design of pole-top energy storage Mohamed Awadallah on behalf of Bala Venkatesh, Ryerson University
11:45	Lunch (served in Sears Atrium)
12:45pm	Theme 2: Power electronics converters (Room ENG-LG6) Liuchen Chang, University of New Brunswick
1:15	Project 2.1: Modular architecture and functionality of energy storage power converters Liuchen Chang, University of New Brunswick
1:30	Project 2.2: Digital control systems of power converters for energy storage Vijay Sood, University of Ontario Institute of Technology
1:45	Project 2.3: Coordinated operation of multiple storage units and technologies Reza Iravani, University of Toronto
2:00	Project 2.4: SCADA interface for energy storage systems Tariq Iqbal, Memorial University
2:15	Project 2.5: Control systems for second-life batteries for grid-scale energy storage Lukas Swan, Dalhousie University
2:30	Break and networking (coffee served in Sears Atrium)
2:45	Theme 3: Power systems integration (Room ENG-LG6) Bala Venkatesh, Ryerson University, on behalf of Claudio Cañizares, University of Waterloo
3:15	Project 3.1: Optimal planning for energy storage facilities in transmission systems Hamid Zareipour, University of Calgary
3:30	Project 3.2: Optimal planning for energy storage in distribution systems considering feeder investment model Peng Yu on behalf of Bala Venkatesh, Ryerson University
3:45	Project 3.3 Energy storage device protection Saleh Saleh, University of New Brunswick

Agenda - Day 1

Wednesday, June 22, 2016

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| 4:00 | Project 3.4: Integration of energy storage for improving power quality of smart distribution systems
Magdy Salama, University of Waterloo |
| 4:15 | Project 3.5: Operation and control of power systems with energy storage systems
Mariano Arriaga on behalf of Claudio Cañizares, University of Waterloo |
| 4:30 | Project 3.6: Reliability modeling and assessment of power systems with energy storage systems
Rajesh Karki, University of Saskatchewan |
| 4:45–5:00 | Project 3.7: Capacity markets for energy storage - design and Implementation
Bhanu Opathella on behalf of Bala Venkatesh, Ryerson University |

Agenda - Day 2

Thursday, June 23, 2016

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| 8:30am | Registration and breakfast (served in Sears Atrium) |
| 9:30 | Welcome and opening remarks (Room ENG-LG6)
Bala Venkatesh, Academic Director, Centre for Urban Energy at Ryerson University |
| 9:45 | Theme 4: Economics and policy
Hamid Zareipour, University of Calgary, on behalf of Miguel Anjos, École Polytechnique de Montréal |
| 10:15 | Project 4.1: Development of life cycle net energy ratio of energy storage technologies
Amit Kumar, University of Alberta |
| 10:30 | Project 4.2: Modelling electricity market prices considering large-scale energy storage penetration
Hamid Zareipour on behalf of Miguel Anjos, École Polytechnique de Montréal |
| 10:45 | Project 4.3: Provision of ancillary services by energy storage systems
Mohamed Ahmed on behalf of Kankar Bhattacharya, University of Waterloo |
| 11:00 | Project 4.4: Optimal brokerage models for the grid integration of energy storage
Juan Gomez on behalf of Miguel Anjos, École Polytechnique de Montréal |
| 11:15 | Project 4.5: Towards federal and provincial energy storage policy frameworks for Canada
Mark Winfield, York University |
| 11:30 | Project 4.6: Social acceptance of energy storage systems
Ian Rowlands, University of Waterloo |
| 11:45 | Lunch (served in Sears Atrium) |
| 12:45pm | Research Steering Committee meeting (Room ENG-358) |
| 2:45 | Break |
| 3:00–5:30 | Board of Directors meeting (Room ENG-358) |

Theme 1: Energy storage technologies

Theme Leader: **Dr. F. Handan Tezel, University of Ottawa**

In this theme, research is focused on batteries (thermal management systems and innovative housing designs), flywheels (designs and modeling), compressed air energy storage (CAES; enhanced underwater designs and operation), thermal storage (materials and system designs), and hybrid energy storage models.

Theme 2: Power electronics converters

Theme Leader: **Dr. Liuchen Chang, University of New Brunswick**

Research in this theme focuses on power electronic converters, including modular converters, digital controllers, supervisory controllers, supervisory control and data acquisition (SCADA) systems, and power electronics for repurposed electric vehicle batteries.

Theme 3: Power systems integration

Theme Leader: **Dr. Claudio Cañizares, University of Waterloo**

Research in this theme will enable the seamless integration of energy storage into power systems by developing planning tools, operational tools, protection systems, power quality mitigation solutions, and reliability benchmarks.

Theme 4: Economics and policy

Theme Leader: **Dr. Miguel Anjos, École Polytechnique de Montréal**

This theme investigates and provides solutions for techno-economic challenges in the successful integration of energy storage into power systems. In addition, it examines policy, regulatory and social challenges faced by storage solutions to enable successful uptake by utilities and societies.



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