

Control of Complex Systems: An Integrated Perspective on Modern Power Grid Control American Control Conference Workshop

May 22-23, 2017

Sheraton Seattle Hotel, 1400 6th Avenue, Seattle, WA 98101

Redwood B Conference Room



Day 1

Monday, May 22, 2017

Session 1: Introduction and Keynote Presentation

Chair: Dr. Michael Brambley

8:15 – 8:30 a.m.

Workshop Welcome and Introductions

Dr. Michael Brambley, Pacific Northwest National Laboratory

8:30 – 9:00 a.m.

Keynote Presentation: Challenges and Perspectives

Dr. Sonja Glavaski, Advanced Research Projects Agency-Energy (ARPA-E)

Tutorial 1

Chair: Dr. Krishnamurthy Dvijotham

9:00 – 10:00 a.m.

Tutorial: The U.S. Electricity Industry in the 21st Century: Challenges and Opportunities

Prof. Dalia Patiño-Echeverri, Nicholas School of the Environment, Duke University

10:00 – 10:30 a.m.

Break

Session 2: Industry Perspectives

Chairs: Mr. Paul Ehrlich, Dr. Karanjit Kalsi

10:30 – 11:00 a.m.

Hawaii's Clean Energy Transformation: Future Opportunities and Challenges

Mr. Michael Champley, Former Commissioner, Hawaii Public Utilities Commission

11:00 – 11:30 a.m.

Challenges and Opportunities of Applying Optimization and Analytics for Managing Modern Power Systems

Dr. Kwok Cheung, GE Grid Solutions

11:30 a.m. – 1:00 p.m.

Lunch Break

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Session 2: Industry Perspectives (continued)

Chairs: Mr. Paul Ehrlich, Dr. Karanjit Kalsi

1:00 – 1:30 p.m.

To Distribute or to Centralize: Architectures for Control of Power Systems

Dr. Holger Kley, SPIRAE

1:30 – 2:00 p.m.

Challenges of Technology Transfer from Research to an Electric Distribution Utility

Ms. Uzma Siddiqi, PE, Seattle City Light

Tutorial 2

Chair: Dr. Krishnamurthy Dvijotham

2:00 – 3:00 p.m.

Tutorial: Modeling Frameworks to Enable New Opportunities in Grid Optimization and Control

Prof. Christopher DeMarco, Electrical and Computer Engineering, University of Wisconsin, Madison

3:00 – 3:30 p.m.

Break

Session 3: Lightning Talks

Chair: Mr. Thomas Edgar

3:30 – 3:45 p.m.

High Level Modeling Language for Developing Co-simulations of Complex Systems

Mr. Thomas Edgar, Pacific Northwest National Laboratory

3:45 – 4:00 p.m.

Control System Evaluation Through Large-Scale Complex Interconnected Energy System Simulations

Mr. Jacob Hansen, Pacific Northwest National Laboratory

4:00 – 4:15 p.m.

VOLTTRON™ - An Open Source Distributed Control and Sensing Platform for Buildings, the Grid and More

Mr. Jereme Haack, Pacific Northwest National Laboratory

4:15 – 4:30 p.m.

Optimal Energy Storage Sizing and Residential Load Scheduling to Improve Reliability in Islanded Operation of Distribution Grids

Mr. Abdulelah Habib, University of California, San Diego

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4:30 – 4:45 p.m.	Assessing Demand Flexibility in Uncertain Frequency Responsive Loads <i>Dr. Soumya Kundu, Pacific Northwest National Laboratory</i>
4:45 – 5:00 p.m.	Transactive Energy Systems Using Double-auction Market: Example and Analysis <i>Dr. Jianming Lian, Pacific Northwest National Laboratory</i>
5:00 – 5:15 p.m.	Integration of Retail and Wholesale Electricity Markets: Modeling and Stability Analysis <i>Dr. Thiagarajan Ramachandran, Pacific Northwest National Laboratory</i>
5:15 – 6:00 p.m.	Poster Viewing and Networking Time
6:00 p.m.	Adjourn

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Day 2

Tuesday, May 23, 2017

Introduction and Tutorial 3

Chair: Dr. Michael Brambley

8:00 – 8:05 a.m.

Welcome to Day 2

Dr. Michael Brambley, Pacific Northwest National Laboratory

8:05 – 9:00 a.m.

Tutorial: Optimization and Control of Energy Systems

Prof. Pascal Van Hentenryck, Industrial and Operations Engineering, University of Michigan, Ann Arbor

Session 4: Dynamics and Control 1

Chairs: Prof. Enrique Mallada, Dr. Soumya Kundu

9:00 – 9:30 a.m.

Design, Stability and Control of Ad-hoc Microgrids

Prof. Konstantin Turitsyn, Department of Mechanical Engineering, MIT

9:30 – 10:00 a.m.

Performance Tradeoffs of Dynamically Controlled Grid-connected Inverters in Low Inertia Power Systems

Prof. Enrique Mallada, Department of Electrical and Computer Engineering, Johns Hopkins University

10:00 – 10:30 a.m.

Break

Session 5: Dynamics and Control 2

Chairs: Prof. Enrique Mallada, Dr. Soumya Kundu

10:30 – 11:00 a.m.

Realizing Virtual Power Plants

Dr. Changhong Zhao, National Renewable Energy Laboratory

11:00 – 11:30 a.m.

Predictive Dispatch and Demand Response for Commercial Buildings

Prof. Colin Jones, École polytechnique fédérale de Lausanne

11:30 am – 12:00 p.m.

UTRC Buildings to Grid Research

Dr. Veronica Adetola, United Technologies Research Center

12:00 pm – 1:30 p.m.

Lunch Break

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Session 6: Optimization and Analytics

Chairs: Prof. Pascal Van Hentenryck, Dr. Draguna Vrabie

- 1:30 – 2:00 p.m. **Optimal Control of Battery Storage Under Cycle-based Degradation Models**
Prof. Baosen Zhang, Department of Electrical Engineering, University of Washington, Seattle
- 2:00 – 2:30 p.m. **Chance-constrained AC OPF with Probabilistic Guarantees and Scalable Performance**
Dr. Maria Vrakopoulou, Electrical and Computer Engineering, University of Michigan, Ann Arbor

Session 7: Economics and Market Design

Chairs: Prof. Subhonmesh Bose, Dr. Draguna Vrabie

- 2:30 – 3:00 p.m. **Competition in Electricity Markets: Equilibria, Paradoxes, and Biases**
Prof. Eilyan Bitar, Electrical and Computer Engineering, Cornell University
- 3:00 – 3:30 p.m. **Break**
- 3:30 – 4:00 p.m. **Call-options for Wholesale Electricity Markets**
Prof. Subhonmesh Bose, Electrical and Computer Engineering, University of Illinois, Urbana-Champaign
- 4:00 – 4:30 p.m. **DER Coordination at Large Scales: From Mean-Field Games to Social Welfare Optimization**
Prof. Wei Zhang, Electrical and Computer Engineering, Ohio State University

Session 8: Lightning Talks - Control and Optimization Under Uncertainty

Chairs: Dr. Draguna Vrabie, Prof. Wei Zhang

- 4:30 – 4:45 p.m. **Model Decomposition Methods for Cyber-Physical Infrastructure Systems**
Dr. Enoch Yeung, Pacific Northwest National Laboratory
- 4:45 – 5:00 p.m. **Robust Optimization of Infrastructure Systems**
Dr. Krishnamurthy Dvijotham, Pacific Northwest National Laboratory

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5:00 – 5:15 p.m.

**Submodular Optimization for Discovery of Key Entities in
Complex Systems**

Dr. Arun Sathanur, Pacific Northwest National Laboratory

Session 9: Workshop Closing

5:15 – 5:30 p.m.

Workshop Closing Remarks

Dr. Michael Brambley, Pacific Northwest National Laboratory

5:30 p.m.

Adjourn

7:00 p.m.

OPTIONAL: No-host Dinner

Cheesecake Factory

700 Pike St, Seattle, WA 98101