



Power Systems Engineering Research Center

The System Benefits of Managing Demand Flexibility and Storage Efficiently

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PSERC Public Webinar

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2:00-3:00 p.m. Eastern Time (11:00-12:00 p.m. Pacific)

Description: Pressing environmental issues and concerns over energy security are driving worldwide interest in renewable energy resources. Unlike conventional generation, however, power from wind and solar resources is inherently variable in its supply. It is non-dispatchable, highly intermittent, and difficult to forecast. This intrinsic variability in supply represents the most important obstacle to the large-scale grid integration of renewables.

The first part of this webinar will provide a system theoretic perspective of the critical challenges facing deep renewable energy integration and formally examine the role of energy storage in mitigating the attending costs of integration. In particular, we aim to quantify the value of energy storage capacity within existing market constructs. Going beyond numerical sensitivities, we derive explicit formulae that reveal a fundamental connection between the value derived from storage capacity and particular spectral properties of the random processes driving the system. These simple expressions not only shed light on the correct measure of statistical variation in quantifying the value of storage, but also provide a tractable empirical method for marginal value calculations from time series data -- requiring minimal to no prior distributional assumptions on the supply processes.

The second part of the webinar presents the results of an application of the Cornell SuperOPF to evaluating the system benefits of distributed storage for mitigating the uncertainty of wind generation. The type of storage considered is deferrable demand, in the form of electric vehicles and thermal storage, and the focus is on the potential benefits for customers if aggregators use the deferrable demand effectively to support operations on the grid. However, these benefits will not be realized unless the rates charged to customers reflect the true cost of supply. The results compare how the bills charged to different types of customers are affected by different rate structures, and they show that paying a standard flat rate for energy provides perverse economic incentives for customers with deferrable demand.

This research is one the PSERC projects coordinated by the Consortium for Electric Reliability Technology Solutions ([CERTS](#)) with funding provided by the U.S. DOE.

Biographies:

Eilyan Bitar is currently an Assistant Professor in the School of Electrical and Computer Engineering at Cornell University. His research interests include power systems, stochastic control, and mechanism design. Prior to joining Cornell in the Fall 2012, he was engaged as a Postdoctoral Fellow in the department of Computing and Mathematical Science (CMS) at the California Institute of Technology and at the University of California, Berkeley in Electrical Engineering and Computer Science during the 2011-12 academic year. A native Californian, he received both his Ph.D. (2011) and B.S. (2006) from the University of California, Berkeley.

Tim Mount is a Professor in the Dyson School of Applied Economics and Management at Cornell University. His research interests include econometric modeling and policy analysis relating to the use of fuels and electricity and their environmental consequences (acid rain, smog, and climate change). His current research focuses on the restructuring of markets for electricity and the implications for (1) price behavior in auctions for electricity, (2) the rates charged to customers, (3) investment decisions for maintaining system reliability, (4) the system effects of relying more on renewable sources of energy in the transition to a low-carbon economy, and (5) distributed energy systems and the smart grid.

Registration for Webinar Participation: None required. There is no charge for participating!

Participation by Webinar: There are several options for participating.

- Recommended option: We will be using the Adobe Connect 9 webinar platform. You will be able to watch the presentation slides on your computer from the designated site <https://connect.asu.edu/pserc> and listen to the webinar through your computer's speakers or headphones. To join the webinar, enter firstname lastname (organization). [Click here](#) for the connection details and instructions for testing your connection. If you cannot hear the presenter, check to make sure your speaker is not muted in Adobe Connect. It may also be possible to use the app "Adobe Connect™ Mobile" to participate via smartphone or tablet.
- You can also listen to the audio over the public phone bridge at 712-432-0800 (passcode: 937250#). Be sure to mute your phone (press *6) so sounds in your room do not go out to the phone bridge with other listeners. Should you not be able to connect to the webinar, you can also download the slides from the PSERC website and listen to the audio over the phone.
- You can watch the archived webinar at a different time by [clicking here](#) and then on the link for this webinar.

Asking Questions During the Webinar: You are invited to ask questions or make comments during the webinar using the Adobe Connect webconferencing platform. Just enter your question into the Q&A box.

Professional Development Hour Certification: PDH certification is available for PSERC members (only). Send an email requesting PDH certification to pserc@asu.edu with the subject "PDH". *Include the name and title of each participant.*

Assistance: If you have any questions, please call 480-965-1643 or email pserc@asu.edu.

PSERC's Webinar Coordinator: Venkataramana Ajjarapu, Iowa State University, vajjarap@iastate.edu.

Professor Ajjarapu welcomes feedback on the webinars and suggestions for future ones.