Power Systems Engineering Research Center

Managing Wind Variability with Self-Reserves and Responsive Demand

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PSERC Public Webinar
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2-3 PM Eastern Time (11 AM-Noon Pacific Time)

Description

Using wind power to supply up to 20%, or more, of electrical demand is increasingly popular in policy mandates, yet is relatively untested in terms of actual system and market operations. This presentation will investigate the concept of self-reserves, wherein wind generators withhold a portion of forecasted energy production, via their hour-ahead schedule, in order to minimize dispatch deviations in real-time. This approach takes advantage of the natural hedge available in correlation between wind forecast level and error. The wind energy withheld from the hour-ahead schedule can be used to mitigate a shortfall in wind production in real-time (measured in relation to the hour-ahead schedule). Alternatively, if the real-time wind generation is greater than the scheduled amount, the reserved wind energy is available to the system for ancillary services.

Power system simulations use an integrated modeling framework based on optimal power flow modeling with Monte Carlo simulation, that captures the uncertainty in wind generation and demand. Simulation results quantify power system performance parameters in terms of cost, price, losses, generator dispatch patterns, amount of wind energy spilled, demand response and CO_2 emissions. Initial results with the use of wind self-reserves show that use of this approach can be effective in increasing the amount of wind power the system uses, by reducing the overall amount of wind energy spilled. When used in conjunction with demand response, wind self-reserves can be effective in reducing negative system impacts of wind variability.

Biographies and Contact Email

C. Lindsay Anderson received B.Sc. (Eng) and M.Sc. degrees in Environmental Engineering from the University of Guelph (Canada) in 1994 and 1997, respectively. She received a PhD in Applied Mathematics from Western University (Canada) in 2004. She is currently an Assistant Professor in the Department of Biological and Environmental Engineering at Cornell University.

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Judith B. Cardell received BSEE and AB degrees from Cornell University in 1989 in electrical engineering and government. She received MS and PhD degrees in TPP/EECS from MIT in 1994 and 1997. She is currently an Associate Professor in engineering and computer science at Smith College, Northampton MA. Previously she worked at the Federal Energy Regulatory Commission in Washington, DC and as a consultant to the electric power industry with TCA in Cambridge, MA. Her research interests include the integration of renewable and distributed resources into power system and market operations, and electricity market design.
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