

IEEE BDA Tutorial Series: Big Data & Analytics for Power Systems

Wind Variability and Impact on Markets

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(11:00 am - 12:15 pm, MST) (12:00 pm - 1:15 pm, CST) (1:00 pm - 2:15 pm, EST)

Abstract: We discuss the growth of wind in Texas and the challenges to electricity system operation under high levels of wind. We observe that Texas has, by far, the highest wind penetration of the three interconnections in the United States and the highest penetration of any balancing area, so that Texas is a microcosm of high wind challenges. To understand some of the challenges, we describe statistical modeling of wind power production. We utilize a so-called generalized dynamic factor model and investigate the characteristic Kolmogorov spectrum of wind power. This modeling allows understanding of the manner in which wind power and wind power variability will scale with increased capacity. We observe that aggregation of large amounts of wind capacity across large areas of the United States will mitigate short-term variability, but generally will not completely ameliorate intermittency over longer time scales. We then describe implications for the electricity system and for organized wholesale markets, including commitment of thermal resources to meet net load, and zero and negative wholesale prices.

Bio: Ross Baldick is Professor Emeritus in the Department of Electrical and Computer Engineering at The University of Texas at Austin. He has undergraduate degrees from the University of Sydney, Australia, and graduate degrees from the University of California, Berkeley. His current research involves optimization, economic theory, and statistical analysis applied to electric power systems, particularly in the context of increased renewables and transmission. Dr. Baldick is a Fellow of the IEEE and the recipient of the 2015 IEEE PES Outstanding Power Engineering Educator Award.

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