Stanford University

TomKat Center for Sustainable Energy
Precourt Institute for Energy
Energy and Environment Affiliates Program
Civil and Environmental Engineering
Department of Electrical Engineering

Stanford SmartGrid Seminar

Wind Aggregation via Risky Power Markets

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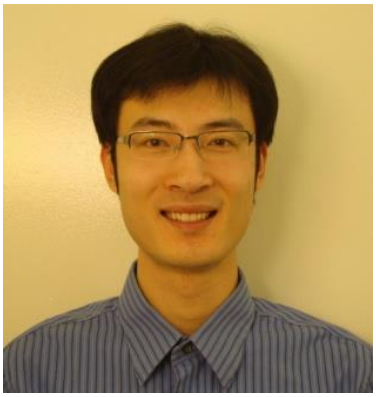
Stanford/Princeton



1pm-2pm, Thursday, Apr 17th, Y2E2 101

Abstract: Uncertainty and variability of renewable energy generation impose great challenges on reliable operation of the electricity grid with high renewable penetration. Aggregation of diverse renewable energy sources can effectively reduce their uncertainty and variability. We develop a new market mechanism for renewable energy producers to achieve flexible and distributed aggregation. In this market, we introduce a novel risky (in addition to riskless) power forward contract that allows renewable energy producers to trade uncertain power output, so that their own risks are reduced. We show that the risky power market has a unique competitive equilibrium, characterized in closed form. Moreover, the market equilibrium enjoys a number of efficiency, fairness and stability properties that make the risky power market very appealing.

Bio: Yue Zhao (S'06–M'11) received the B.E. degree in electronic engineering from Tsinghua University, Beijing, China, in 2006, and the M.S. and Ph.D. degrees in electrical engineering, both from the University of California, Los Angeles (UCLA), Los Angeles, in 2007 and 2011, respectively. He is currently a Postdoctoral Scholar with the Departments of Electrical Engineering at Stanford University and Princeton University. His research interests include sustainable energy system, smart grid, infrastructure resilience and security, optimization theory, signal processing, and information theory.