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

Stanford University

Stanford SmartGrid Seminar

Key Issues and Challenges in the Deepening Penetration of Demand Response Resources

George Gross

University of Illinois at Urbana–Champaign

1:15pm-2:15pm, Thursday, Feb 19th, Y2E2 270

Abstract: We focus on the key developments in the implementation of demand response resources or *DRR*s, with special attention on their economics and policy aspects. The *Federal Energy Regulatory Commission* (*FERC*) forecasts an achievable 2019 *DRR* penetration range of 4 – 14 % of system peak load in the various *ISO/RTO*s under its jurisdiction. We discuss the three key factors driving the rapid growth in the *DRR* implementation: the rollout of the smart grid, the emergence of curtailment service providers or aggregators, and the developments on the demand response policy front. The large-scale implementation of advanced metering solutions to replace the legacy metering infrastructure and the deployment of appropriate technologies, devices, and services to access and leverage energy usage information are direct outcomes of the smart grid advancements. The creation of an important new class of market participants – the load aggregators – makes possible the deeper penetration of *DRR*s as viable competitors to supply-side resources. Recent policies, starting with the Energy Policy Act of 2005 and followed by *FERC* Order Nos. 719 and 745, and the various state-level initiatives have been instrumental in the removal of barriers to *DRR* participation and in bringing about the persistent deepening of *DRR* penetrations. We highlight some of the unintended consequences of *FERC* Order No. 745 and the challenges that deepening *DRR* penetrations present. While *DRR* curtailments result in lower loads, which reduce prices and emissions at specific nodes in the system during the curtailment hours, some portion of the curtailed energy is recovered in subsequent hours, resulting in impacts on prices and emissions in those hours — the so-called *DRR payback effects*. The recovery severely affects the economic benefits and emission reductions. Such outcomes underline the importance of the formulation and implementation of effective *DRR* policies.

Bio: George Gross is Professor of Electrical and Computer Engineering and Professor, Institute of Government and Public Affairs, at the University of Illinois at Urbana-Champaign. His research and teaching activities are in the areas of power system analysis, economics and operations, utility regulatory policy and industry restructuring. He was formerly with the Pacific Gas and Electric Company, where, Dr. Gross founded the company's Management Science Department and held other key management, technical and policy positions. During 1992-93, Dr. Gross was at the Electric Research Power Institute to develop research directions on open access transmission. George Gross is a co-founder of POWERWORLD and served on its Board of Directors from 1996 – 2001. A Fellow of IEEE, Dr. Gross received the *Franz Edelman Management Science Achievement Award* by the Institute of Management Science. Dr. Gross is the author of a large number of publications and book chapters. He was a Visiting Professor at the Politecnico di Milano, University of Pavia and the Politecnico di Torino during the academic year 1999 – 2000. George Gross earned his undergraduate degree at McGill University in Montreal, Canada, and he did his graduate studies at the University of California, Berkeley.