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# Stanford SmartGrid Seminar

# The Smart Grid Opportunity: from Automation to Autonomy

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1:15pm-2:15pm, Thursday, Nov 13th, Y2E2 101

**Abstract:** The electric power system has been recognized as one of the critical infrastructures that are paramount to the economic activity of any country. The electric power grid is a large heterogeneous system, with many interdependencies on other infrastructures (fuel supply), subject to weather effects (weather related failures and weather sensitive electric load), exhibits complex dynamic interactions and it is controlled with humans in the loop. It is certain renewables (wind, photovoltaics, etc.), distributed generation, storage, PHEVs and other distributed resources will be integrated in larger quantities with the national power grid. These resources exhibit high levels of availability uncertainty and interface with power electronic devices (inverters). To fully realize the advantages of these technologies and to make their economics attractive, it will be necessary to invent new ways of monitoring, controlling, optimizing and protecting this integrated system. The term smart grid (or grid of the future) captures the expectation for the development of these technologies which may comprise development of two-way interfaces with intelligent control, plug and play operation, re-configurability, survivability, self-healing capability, efficiency and ability to support the national grid in case of emergencies or to use stored energy to ride through disturbances. The end result is that the electric power system of the future will be a more complex but more controllable system. We discuss key issues of smart grid technologies, the technological infrastructure needed to integrate and automate multiple and diverse energy resources, the case for

the electrification of the transportation sector, the impact on power system engineering curricula and the opportunities and challenges that generates for the next generation of power engineers.

**Bio:** Sakis (A. P.) Meliopoulos was born on March 19, 1949 in Katerini, Greece. He obtained a Diploma in Electrical and Mechanical Engineering from the National Technical University in Athens, Greece in 1972 and a Master in EE (1974) and a Ph.D. degree (1976) from the Georgia Institute of Technology in Atlanta, Georgia, USA. Dr. Meliopoulos' first professional association was with Western Electric (1971) in Atlanta, Georgia. After receiving a PhD degree in 1976, he joined the faculty of the Georgia Institute of Technology as an Assistant Professor (1976), Associate Professor (1982-88) and full professor (1989-present). In 2006 Dr. Meliopoulos was named the Georgia Power Distinguished Professor. He is actively involved in education and research for improved safety and electromagnetic compatibility of electric power installations, protection and control of power systems and the application of new technology in these areas. Since 1999 he is the Georgia Tech site Director of PSERC, an NSF I/URC. Dr. Meliopoulos has pioneered several new analysis and design techniques for bulk power reliability analysis, safety, protection and electromagnetic compatibility of electric power systems. Most well known is the EPRI transmission reliability program TRELLS (now renamed TransCARE), the GPS-synchronized harmonic state measurement system for transmission systems (first (1993) wide area measurement system on NYPA and still operational), the distributed dynamic state estimation method (SuperCalibrator), his invention of the Smart Ground Multimeter, the EPRI grounding analysis programs, the WinIGS (Integrated Grounding System analysis and design), the GEMI (Grounding and ElectroMagnetic Interference) computer code, and the mGrid computer code – a methodology and implementation for precise analysis of multi-wire power systems with distributed energy resources. Dr. Meliopoulos has modernized many power system courses at Georgia Tech, introduced new courses, initiated the power system certificate program for practicing engineers and most importantly he has introduced visualization and animation methodologies that dramatically increase the teaching efficiency of complex power system concepts. Dr. Meliopoulos is a Fellow of the IEEE. He holds 3 patents, he has published two books, a chapter in the Standard Handbook for Electrical Engineers and over 250 technical papers. He has received a number of awards, including the Sigma Xi Young Faculty award (1981), the outstanding Continuing Education Award, Georgia Institute of Technology (2002), three of his papers have received the best paper award (IEEE-PES-SC-1984, IEEE-PES-EC-1987, and IEEE-CSS-HICSS 2002), he received the 2005 IEEE Richard Kaufman Award and the 2010 George Montefiore international award.