Stanford University

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 SmartGrid Seminar

The Future Electric Power System- Developments and New Analysis Tools

Göran Andersson

ETH Zürich

1:00pm-2:00pm, Monday, Jan 12th, Y2E2 270

Abstract: An effective and sustainable energy system is a fundamental prerequisite for the development of the society. In many parts of the world, the electric power system has over the last 100 years developed to be the backbone of the energy system. Due to a number of new requirements, i.e. environmental, political, and economical, the electric power system is today facing a number of challenges and problems, whose solutions require joint efforts from engineers, environmental scientists, economists, social scientists, etc. There are many indications that the future power and energy systems will be more diverse as compared with the ones of today and yesterday. Non-dispatchable generators, energy storage, and consumers with load management schemes are examples of new system components. Further, the electric power system will interact more with other energy carrier systems, such as gas and heating systems, and with other infrastructure systems such as transportation systems, e.g. electric vehicles of different types. This lecture will give an overview and background of these challenges and current developments, particularly in Europe.

The above changes imply that the traditional ways of operating and planning the power systems are not always appropriate and new models and analysis tools are needed. In order to meet these new modelling demands novel concepts for system-level considerations have been developed, which concepts allows the modelling of technologically diverse unit portfolios in a unified approach, e.g. the energy hub and the power node approaches. These frameworks are used for designing operational strategies, especially in the presence of non-dispatchable generation and significant storage capacities, as well as for evaluation of operational performance in terms of energy efficiency, reliability, environmental impact, and cost. This lecture will also discuss these models and tools, and their application to system studies will be demonstrated.

Bio: Göran Andersson obtained his M.S. (1975) and Ph.D. (1980) degrees from the University of Lund, Sweden. In 1980 he joined ASEA's, now ABB's, HVDC division in Ludvika, Sweden, and in 1986 he was appointed full professor in electric power systems at KTH (Royal Institute of Technology), Stockholm, Sweden. Since 2000 he is full professor in electric power systems at ETH Zürich (Swiss Federal Institute of Technology), where he also heads the powers system laboratory. His research interests include power systems dynamics and control, power markets, and future energy systems.

Göran Andersson is a Fellow of IEEE, a Fellow of the Royal Swedish Academy of Sciences and of the Royal Swedish Academy of Engineering Sciences. He was the recipient of the IEEE PES Outstanding Power Educator Award 2007 and of the George Montefiore International Award 2010.