Electrical & Computer ENGINEERING

SEMINAR

THURSDAY
OCTOBER 16, 2008

Scaife Hall Auditorium
Room 125

4:30 p.m.
Refreshments—4:00 p.m.

Marija D. Ilić
PROFESSOR
CARNEGIE MELLON UNIVERSITY

Marija Ilić is Professor of Electrical & Computer Engineering and Engineering & Public Policy at Carnegie Mellon. Her fields of interest include electric power systems modeling, modeling and control of economic and technical interactions in large-scale dynamical systems with applications to competitive energy systems, and future electric power systems.

Dr. Ilić received her M.Sc. and D.Sc. degrees in Systems Science and Mathematics from Washington University in St. Louis and earned her MEE and Dip. Ing. at the University of Belgrade. She is an IEEE Fellow and an IEEE distinguished lecturer. From 1999-2001, Dr. Ilić was an NSF Program Director for Control, Networks and Computational Intelligence.

Previously, Dr. Ilić held positions of Visiting Associate Professor and Senior Research Scientist at MIT. She has also taught at UIUC, Cornell, and Drexel. She has worked as a visiting researcher at General Electric and as a principal research engineer in Belgrade. Dr. Ilić is Director of Carnegie Mellon's Electric Energy Systems Group (http://www.eesg.ece.cmu.edu).

The Key Role of Network Systems Engineering in Meeting the Energy and Environment Dream

Energy and the environment are once again on everyone's mind. The primary energy producers have entered a race for making the traditional energy resources cleaner and safer, as well as for developing scientific principles in support of entirely novel energy resources. At the same time, we do not have the infrastructure to transport the energy effectively. The infrastructure for converting our primary energy resources and delivering energy in the form required by the end users was designed with qualitatively different objectives from the functions of today; it is aging and far from what it should and could become.

This talk concerns the basic challenge of transforming today's passive electric power grids into active enablers of efficient and reliable utilization of emerging unconventional energy resources. I pose the problem of future electric energy systems as the problem of network design, monitoring, and control for enabling implementation of multiple objectives by the actors embedded at various network layers. Typical tradeoffs of interest are efficiency, cost, emissions, network congestion, profits, differentiated reliability, long-term sustainable services, etc. Our new cyber-physical modeling framework is a possible way to represent future electric energy systems. Finally, I describe the fundamental role of fast-switched electric network control for shaping effective system energy dynamics. While on the average no real work is done, very fast distributed switching of stored energy in wires (inductors and capacitors) enables stable delivery of energy which would otherwise be impossible. Such control may become key to balancing highly stochastic supply according to desired quality of service.

ECE Seminar Hosts:
Yi Luo,
y1827@andrew.cmu.edu

Marios Savvides,
marioss@andrew.cmu.edu

Bruno Sinopoli,
brunos@andrew.cmu.edu

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