

SEMINAR NOTICE

Department of Electrical and Systems Engineering

Dynamic Monitoring and Decision Systems (DYMONDS) and Smart Grids: One and the Same

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Abstract: In this talk we put forward a vision for Dynamic Monitoring and Decision Systems (DYMONDS) as the key enablers of achieving smart grid functionalities. We propose that it is fundamentally impossible to meet the energy and environment objectives set by the society without transforming the current operating and planning industry practices based on top-down hierarchical management to practices which enable just-in-context (JIC), just-in-time (JIT) and just-in-place (JIP) actions. A JIC-JIT-JIP paradigm will require much embedded intelligence at different industry layers and communications among the layers for cooperation and/or coordination. This is dictated by the very nature of new resources which are highly variable, and spread across vast geographical and electrical distances; how effectively they are utilized will be determined by how correlated they are in time and space and how capable they are of providing the best context-dependent functionality. Functionality and goals depend on the context determined by the organizational rules, rights and regulations (3Rs) as well as by the constantly evolving system conditions. Once this is understood, the need for paradigm shift becomes clear and the design takes place. In this paper we describe the basic vision for DYMONDS design in support of planning and operations of future energy systems. We explain how the need for JIT, JIP and JIC defines the basic DYMONDS architecture. Adaptive Load Management (ALM), interactive- multi-layered integration of renewable resources, coordination of transmission and distribution, efficient management of loop flows, automatic voltage control, automatic flow control, system-wide storage dynamics and management at value, ancillary services, embedded intelligence for security, and Phasor Measurement Units (PMUs) and Advanced Metering Infrastructures (AMIs) all become integral parts of the smart grid abilities. Examples of the dependence of achievable performance on the type and rate of information exchange are highlighted and referred to the on-going research at Carnegie Mellon University's Electric Energy Systems Group which is home to DYMONDS design. We claim that the envisioned shift of paradigm, most generally, leads to a distributed risk management at value over time, space and different entities. This is perhaps the only plausible mechanism for ensuring resilient and robust performance without sacrificing the short-, mid-and long-term efficiency objectives. These objectives are directly related to the overall societal goals toward sustainable energy and environment.

Tuesday, November 3, 2009

1:30 – 2:30 p.m.

Bryan Hall 305

Host: Arye Nehorai

Short Bio: Marija D. Ilic received her Doctor of Science degree in Systems Science at Washington University in St. Louis, MO in 1980. She is currently a Professor at Carnegie Mellon University, Pittsburgh, PA, with a joint appointment in the Electrical and Computer Engineering and Engineering and Public Policy Departments. She is also the Honorary Chaired Professor for Control of Future Electricity Network Operations at Delft University of Technology in Delft, The Netherlands. She was an Assistant Professor at Cornell University, Ithaca, NY, and tenured Associate Professor at the University of Illinois at Urbana-Champaign. She was then a Senior Research Scientist in Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology, Cambridge, from 1987 to 2002. She has 30 years of experience in teaching and research in the area of electrical power system modeling and control. Her main interest is in the systems aspects of operations, planning, and economics of the electric power industry. She has co-authored several books in her field of interest. Prof. Ilic is an IEEE Fellow.