

Introduction to the Complex Systems Track
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This track seeks to explore methods at the frontier of understanding complex system phenomena. Of special interest is the use of the electric power systems as a context for this exploration

This year is different in that there are three mini-tracks in this Track instead of the usual five. The first mini-track, entitled Security and Reliability of Complex Systems, focuses on topics related to the ability of complex systems such as power systems to survive disturbances with minimal impact on performance. Specific topics include steady-state and dynamic security assessment; Available Transfer Capability (ATC), state estimation, security-constrained optimal power flow, sensor applications, large-scale real-time control, and related technologies.

Critical infrastructures such as transportation systems, communication networks, electric power grids, and health delivery systems are highly networked and interdependent systems highlight the mini-track on Robust And Resilient Critical Infrastructure Systems. The Nation's security, and at a global level, our economy rely heavily on protection and reliable operation of these infrastructure systems. Such systems are usually characterized by complex nonlinear behavior, dynamic topology, and experience uncertainty both in their internal description and in the external environments/disturbances. The overall goal of this mini-track is the development of models, analysis tools, and simulation environments for the design of robust and resilient infrastructure systems. While there are certain common themes that will run through all the sessions in this mini-track, the focus on the interrelated topics of vulnerability and threat analysis and understanding low probability/high consequence events.

Finally, there are four sessions in the mini-track on Electricity Markets and Regulation. The aim of this mini-track is to explore the ability of commercial trading models to effectively represent the complex physical behavior of an electricity industry, an issue that is critical to the success of electricity industry restructuring. Important aspects of this issue include the design of efficient spot markets and ancillary service markets, and mechanisms to incorporate network effects in electricity trading models. Structuring efficient markets for electricity that facilitate both operating reliability and needed system expansion is an evolving art, as evidenced by the sequence of Federal Energy Regulatory Commission proceedings that weigh standardization with continued flexibility and improvements in market design. Traditional analytic methods have been only partially successful in fashioning improvements since system parameters routinely become choice variables in the interplay between buyers, sellers, operators and market overseers. Thus analytic, statistical, numerical and game-theoretic tools all have relevance. Papers are contained in this mini-track that address these and other aspects of this important problem.