

# Information Management and Visualization in Electric Power Systems

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As the electricity industry becomes increasingly competitive, knowledge concerning the capacity, constraints and reliability of the electric system will become a commodity of great value. Electricity markets can be fast changing; understanding the implications of these changes before others can give an important competitive advantage. Power systems, however, are characterized by extremely large sets of data that cover spatial, temporal and contingent dimensions. Therefore the focus of this mini-track is on the management and visualization of the information associated with power markets and power systems. This year there were four accepted papers.

The first paper, "Visualization and Animation of Inverter-Driven Induction Motor Operations" addresses power system visualization at the component level. Power systems are characterized by devices with many different characteristics and widely varying time frames of response. In some situations, understanding the response of the entire system requires having a detailed knowledge of the individual components. The first paper presents an overview of a component-based virtual power system simulation and visualization environment. The paper then demonstrates these concepts with the example of an inverter-driven induction motor.

The second paper, "Real-time Data Retrieval and New Visualization Techniques for the Energy Industry", moves from a micro to a macro view of the power system. Rather than providing detailed visualizations of the individual components, the second paper presents some innovative methods for providing a visualization of the high level operation of the power grid. The paper makes a very useful contribution in providing some case study results

showing how these visualizations are actually being applied in several utility control centers.

The third paper in the mini-track, "Human Factors Aspects of Power System Voltage Visualizations," builds upon the second paper by describing an experimental approach to formally testing the usability of different power system visualizations. Power systems are in need of new visualization techniques and, as presented in the second paper, such new techniques are emerging. But hand in hand with this work there must be formal testing and documentation of whether these new visualizations are actually helpful. The ultimate goal of visualization research is to help individuals better process and interpret information. However, given the varying backgrounds and preferences of the users, visualizations are inherently subjective. Nevertheless, formal testing can help to discern those techniques which are more helpful for the vast majority of users. The third paper in the mini-track presents results of experiments looking into the effectiveness of using color contours to visualization power system voltage information.

The last paper in the mini-track, "Building Plug & Play Applications using Abstract Object Modeling," looks at the important issue of software management in a large energy control center environment. Traditionally, these systems have been developed by a single manufacturer using a proprietary approach. Such a closed system made it well-nigh impossible for outside vendors to supply software components for the system. The last paper describes recent work in the development and testing of more flexible, open "plug compatible" power system applications.