Power Systems Engineering Research Center (PSERC)

Cornell University, Arizona State University,
University of California - Berkeley, Carnegie Mellon University,
Colorado School of Mines, Georgia Institute of Technology,
Howard University, University of Illinois at Urbana-Champaign,
Iowa State University, Texas A&M University,
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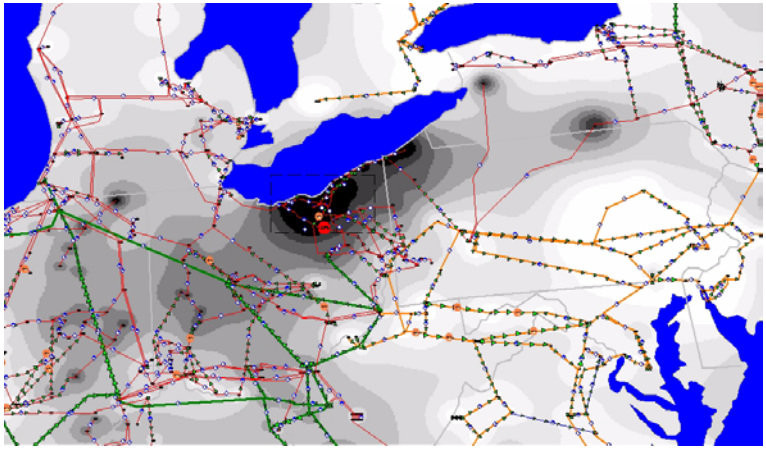
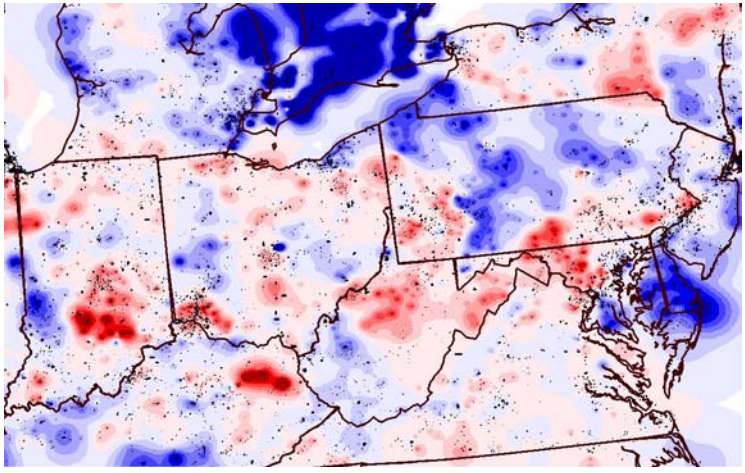
Responding to the Blackout of 2003



PSERC has made significant contributions to understanding and developing solutions to electric power system reliability issues. Researchers from the thirteen-university Power Systems Engineering Research Center (PSERC) are supporting analysis of the Blackout of 2003. PSERC's Director at Cornell University was on leave to the U.S. Department of Energy's new Office of Electric Transmission and Distribution, where he provided technical briefings and materials to investigators and helped to establish priorities for the office, including research priorities. PSERC researchers, working through the Consortium for Electric Reliability Technology Solutions, are developing solutions to transmission reliability concerns and are assisting the U.S. DOE in the blackout investigation. Interviews with PSERC researchers have appeared in news media around the world. The center is providing resources to help people understand the blackout. For example, PSERC created the "Blackout of 2003" web page, which has become a recognized portal to information about the blackout, ongoing investigations, and power systems in general. For more information, contact Robert J. Thomas, 607-255-5083; e-mail: rjt1@cornell.edu.

Image on previous page: Using power system visualization tools, PSERC helped promote a better understanding of the blackout. This picture illustrates the seriousness of the system condition before the final cascading outages began. This visualization is based on 1998 data.

Advanced Power System Visualization Tools



PSERC research has integrated new visualization techniques with power system modeling methods to create visual insights for the user into the condition of power systems. With visualization tools, industry can "see" what is happening without disruption of the actual energy production. Using two- and three-dimensional plotting capabilities coupled with power system animation, the technology gives the user a picture of the power system that synthesizes thousands of pieces of information. Coupling economic data with engineering data allows not only the display of important data for economic and reliable power system operation, but also visualization of the data in the form of plots, contours and animations. The technology shortens the time between observing power system problems and identifying appropriate corrective actions, thereby making power systems more reliable. Furthermore, it integrates visualization of economic and engineering data, thereby informing decision-making for economic and reliable power system operation. The technology enables power systems engineers and operators to better communicate with non-technical audiences that often include business and regulatory policy-makers. And it serves as a training tool for technical and non-technical audiences. The technology has been successfully commercialized, and is being used in software that is sold worldwide. The technology has also been installed in several utility control centers. The graphic figure contours the normalized voltage levels at about 8000 different 100 kV to 300 kV power system "buses" (nodes where two or more electric devices join together) in the eastern portion of North America for a hot summer afternoon. Such figures could be used to allow power system operators to quickly monitor the voltage levels over a wide geographic area. In the figure areas shaded red indicate locations of potential voltage problems. For more information, contact Tom Overbye, overbye@ece.uiuc.edu.

Methods to Test Power Market Designs and Policies

PSERC has successfully been using the institutional concept of testing electric power market designs and policies to verify and validate that anticipated market outcomes would be consistent with policy objectives. In the past, industry and regulatory policy-makers largely believed that it was not possible to test, verify, and validate specific market designs. As a result, market designs with unappreciated or unknown weaknesses were introduced as an "experiment of the whole." This posed high risks to consumers and sellers of electric services. PSERC's ability to demonstrate the power of experimental economics, integrating economic and engineering knowledge, could be applied to complex electricity market design has contributed to new methods for market design policy development that is beginning to influence decision- making in the industry. PSERC has used this approach to help policymakers test market policies, to illuminate reasons for markets failures such as in California, and to develop and test innovative approaches for solving difficult market design issues unique to power systems. In so doing, PSERC has had an influenced on regulatory agency decision-making. For more information, contact Robert J. Thomas, 607-255-5083, e-mail: rjt1@cornell.edu.

Improvements in Power System Reliability

Power system reliability is increasingly a concern to the power industry and society at-large. PSERC researchers have played leading roles in studying reliability problems and suggesting solutions. PSERC researchers contributed to an important study that was published in May, 2002 for the U.S. Department of Energy, entitled the "National Transmission Grid Study." PSERC researchers contributed to this DOE report prepared in response to the President's National Energy Policy directive to the Secretary of Energy to study the Nation's transmission system, identify transmission bottlenecks, and identify measures to eliminate those bottlenecks. They also played an important role in an earlier report from DOE entitled "Report of the Department of Energy's Power Outage Study Team." This report provided findings and recommendations to enhance reliability after a team of experts (including PSERC researchers) who studied power outages and other system disturbances that occurred in the summer of 1999. Finally, PSERC helped the U.S. DOE establish the Consortium for Electric Reliability Technology Solutions (CERTS), formed in 1998 to research, develop, and commercialize new methods, tools, and technologies to protect and enhance the reliability of the U.S. electric power system. CERTS is conducting research for the U.S. Department of Energy's Transmission Reliability Program and for the California Energy Commission's Public Interest Energy Research Program. PSERC faculty are working with researchers at Lawrence Berkeley National Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, Sandia National Laboratories and several energy businesses. For more information, contact Robert J. Thomas, 607-255-5083; e-mail: rjt1@cornell.edu.