

July 28, 2011

Re: Illinois Institute of Technology – Perfect Power

To Whom it May Concern,

Illinois Institute of Technology launched its Perfect Power initiative in 2008 in order to design and build the world's first self-healing and efficient smart microgrid distribution system that would not fail the user, maximize efficiency, and minimize carbon emissions. The goals of the Perfect Power system are to achieve (1) system-wide Perfect Power and demonstration of its technological viability; (2) 50% peak on-demand reduction capability; (3) 20% permanent peak demand reduction from the 2007 annual peak demand; (4) deferral of planned substation upgrades due to demand reduction; and (5) a microgrid design that can be operated in an island mode. Now fully-functional, the Perfect Power system is a scalable, replicable model for effective smart microgrid deployment across the country.

The Perfect Power project has gained significant attention and interest from communities, utility commissions, the Department of Defense, corporate campuses, hospitals, and other institutions seeking to implement smart microgrid systems to ensure 100% reliability, increase efficiency and reduce their carbon footprints. The Perfect Power system, as pioneered by Illinois Institute of Technology, has the potential to be the most immediately-effective and widely impactful comprehensive smart grid demonstration in the country.

Illinois Institute of Technology, the U.S. Department of Energy, and its private industry partners have invested \$18.5 million in the Perfect Power system, a significant financial investment for any university research and demonstration project. Key elements of the Perfect Power smart microgrid installed at IIT include:

- A High-Reliability Distribution System (HRDS) design and installation on IIT's main campus in Chicago. The HRDS replaces the old radial distribution system with a new redundant looped system, with automated distribution system breakers and switches, to ensure power to all in the event of a failure.
- A retrofit to 2 4MW-Allison Turbines to achieve fast-start capability for peaking service and islanding.
- The Intelligent Perfect Power System Controller (IPPSC), designed to interface, coordinate, and control the actions of building controllers, HRDS controllers and distributed generation controllers.
- Substation automation at IIT's two Substations to make them compatible with the HRDS and the IPPSC.
- An advanced system for sensing distribution system conditions and automatically reconfiguring the system to respond to disturbances, provide volt/VAR management; service restoration; emergency response; and integration of distributed generation resources.
- Advanced Metering Infrastructure with smart meters installed in every building for demand response.

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- Advanced ZigBee wireless technology for implementing energy efficiency programs.
- Large-scale battery storage systems for daily peak load shaving and load-shifting, the integration of intermittent wind and solar energy resources, and to allow for peak-time EV charging.
- Electric vehicle charging stations integrated with the battery systems, and coordinated for demand-response.
- A wind turbine unit that demonstrates the integration of distributed small wind generation into a microgrid.

The IIT Perfect Power project serves as a living laboratory for researchers, corporations, innovators, and entrepreneurs to use IIT's strong smart grid and microgrid infrastructure to speed the development of new innovation in the generation, transmission, distribution, consumption and storage of electricity. The Perfect Power system allows innovators to "plug-in" to IIT's functioning smart grid to use it as a test bed for new technology research and smart grid systems evaluation and a demonstration center for new technology products. Access to this real world "sandbox" provides technology developers with an unrivaled ability to pursue advances in the smart grid more efficiently, effectively, and collaboratively. More 100 researchers and industry projects are using the Perfect Power system for research and development projects.

The Perfect Power system is the most innovative and complete public-private partnership for the advancement of smart grid and advanced grid technology in the country, and I support its submission for STARS Innovation Credit.

Sincerely,



Mohammad Shahidehpour, Fellow IEEE

**About:** Dr. Mohammad Shahidehpour is Bodine Chair Professor in the Electrical and Computer Engineering Department and Director of the Galvin Center for Electricity Innovation at Illinois Institute of Technology. He is currently the Principal Investigator of over \$40 million projects on smart grid research and development. He serves on the Governing Board of the IEEE Power and Energy Society as the VP of Publications and is the Editor-in-Chief of the IEEE Transactions on Smart Grid. He is the Chair of the 2012 IEEE Innovative Smart Grid Technologies Conference (ISGT) in Washington DC. Dr. Shahidehpour is the recipient of the 2011 Innovation Award from the Association of Electrical Engineering Department Heads. He was the recipient of 2009 Honorary Doctorate from the Polytechnic University of Bucharest, 2008 IEEE/PES Best Transactions Paper Award, and 2007 IEEE Burke Hayes Award for his research on hydrokinetics. He is an Honorary Professor at North China Electric Power University in Beijing and Sharif University of Technology in Tehran. Dr. Shahidehpour is the author of 6 books and 400 papers on electric power systems including a book published in 2003 on communication and control in electric power systems. As an IEEE Distinguished Lecturer, he has lectured in several countries on electricity restructuring issues. He is an IEEE Fellow.