

Robert W. Galvin Center for Electricity Innovation



The mission of the Robert W. Galvin Center for Electricity Innovation is to pursue groundbreaking work in the generation, transmission, distribution, management and consumption of electricity.

The Galvin Center is bringing together researchers, industry, government and innovators to “plug-in” to IIT’s smart microgrid, research laboratories and Technology Park, creating a hub – or sandbox – for new innovations in advanced grid technology.



State-of-the-Art Facility

The Galvin Center is designed to house microgrid research, demonstration and education activities. Located on the 16th floor of the IIT Tower, the 16,000-square-foot center contains offices, exhibition rooms, classrooms and student workrooms, acting as a hands-on experience center for Smart Grid, microgrid and energy technology and education. The \$3 million project was funded by the State of Illinois, U.S. Department of Energy and IIT.



Innovative Projects, Partnerships, and Research

Perfect Power Microgrid Project

The Galvin Center's premier project is the development of the nation's first Perfect Power microgrid at IIT. The \$14 million project has equipped IIT's microgrid with a high-reliability distribution system for enhancing reliability, new sustainable energy sources (roof-top solar panels, wind generation units, flow batteries and charging stations for electric vehicles), and smart building automation technology (building controllers, Zigbee sensors, controllable loads) for energy efficiency and demand response.



Wind Energy Consortium

The Galvin Center is leading the University-Industry Consortium for Wind Energy Research, Education, and Workforce Development. Funded through a \$9 million U.S. Department of Energy grant, the consortium's research and development objectives focus on addressing several challenges identified in the DOE's "20 Percent Wind Energy by 2030" report. The consortium consists of a diverse pool of public and private members working together to improve wind power reliability and performance, lower the price of wind energy, encourage greater integration into the utility grid, and build an educated workforce to drive the industry. Through the consortium, the Galvin Center is leading a number of groundbreaking research initiatives in all areas of wind energy.

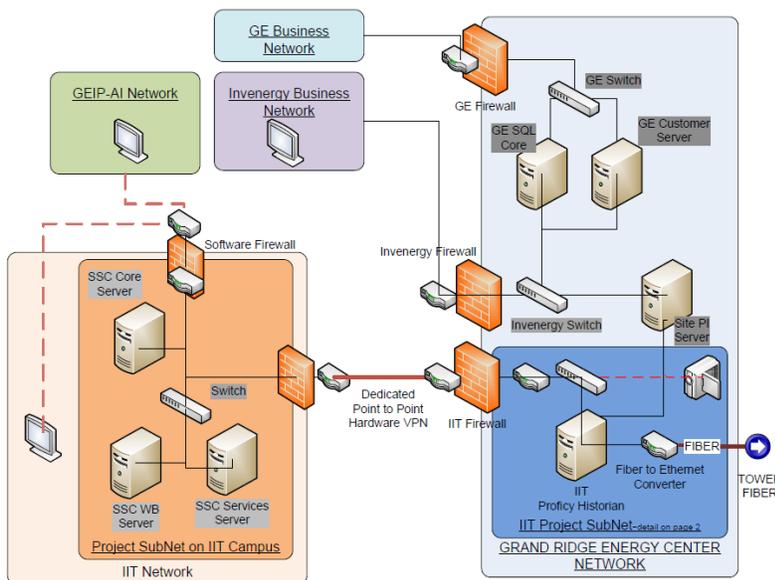
The Galvin Center's 8kW wind turbine located on IIT's Stuart Soccer Field is visible from four major transportation channels (the Dan Ryan Expressway, the CTA's green and red lines, and a Metra commuter rail line) as well as U.S. Cellular Field, the unit is the most visible wind turbine in the city of Chicago and is designed to increase public awareness of the possibility of wind power and continuing innovations in the field of wind energy. The advanced design of this turbine allows for more electricity generation by alleviating fatigue loads caused by wind gusts and operating efficiently in all wind conditions. Environmental conditions are gathered from the field turbine on the soccer field and then simulated on the lab turbine, located in Siegel Hall.



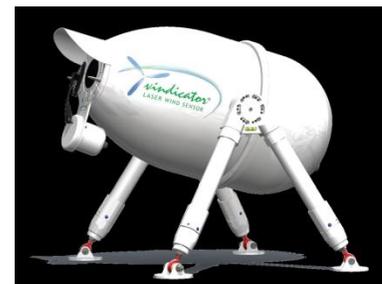
A wind energy laboratory with a n 8kW Viryd lab turbine allows researchers to pinpoint areas of stress on the turbine to gain insight as they work to find solutions to reduce the wear-and-tear of turbine components.



The Galvin Center's 1.5MW GE wind turbine, located in LaSalle County, is outfitted with high-performing technology designed to increase its output and reduce wear and tear of components, which will ultimately increase the lifespan of the structure. The technology is designed to detect problems within components before there is major damage to the wind turbine using vibration sensors, oil particulate sensors, temperature sensors, noise identification technology and other advanced detection hardware and software.



The turbine also features an innovative Laser Wind Sensor to determine wind speed and direction in the undisturbed air 300 meters in front of the turbine. As a result, it gives the control system a predictive, three-dimensional view of actual conditions which allows for optimum wind turbine performance, reducing yaw error that can reduce performance and avoid unnecessary wear-and-tear.

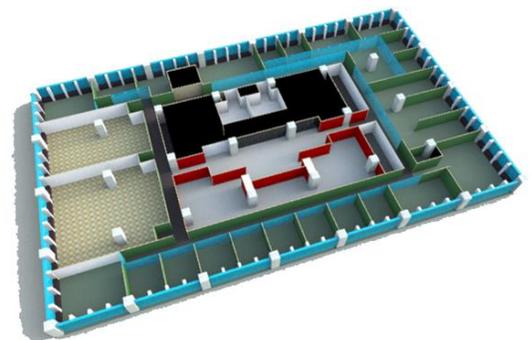


Decreasing turbine noise is also important for the quality of life of residents and wildlife. As turbine noise decreases, more communities will be open to these energy generation structures. To address this critical issue, the Galvin Center is leading the IIT Acoustic Measurement Project (using phased arrays).



Workforce Training and Education

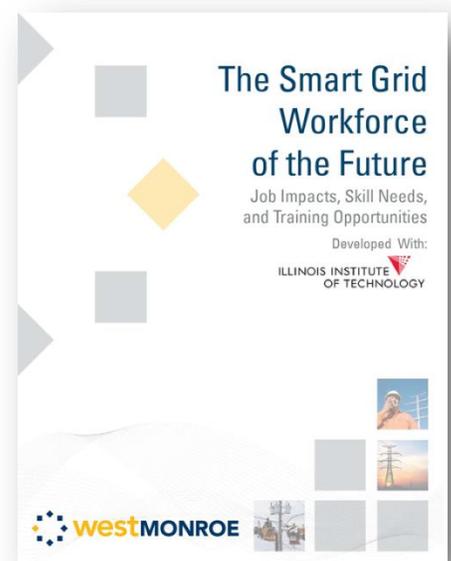
The Galvin Center is home to the Smart Grid Workforce Education and Training Center - a \$12.6 million project, supported by the U.S. Department of Energy and the State of Illinois, to educate and train the nation's workforce to meet the global challenges and opportunities of the Smart Grid. This initiative will work to educate and train more than 49,000 people on Smart Grid and new energy topics over the course of three years, developing new curriculum through a network of partners, from K-12 programs to community colleges, university degree programs, and industry professional development short courses. A schedule of short courses is available at www.iit.edu/galvin_center/.



In June 2011, the Galvin Center released a report outlining the skill deficiencies of the existing workforce to meet the demands and needs of the Smart Grid economy of the future. The technologies and systems introduced through Smart Grid initiatives will require a new, highly-trained and flexible workforce to fully realize the smart grid promise. The future workforce will be vital to deploying and maintaining this national clean-energy smart grid infrastructure. Growing and training the smart grid workforce will only be possible if the industry commits to intensive, sophisticated, and integrated workforce-development initiatives.

To help address this critical issue, the Galvin Center, in collaboration with West Monroe Partners, commissioned and released a report as an initial step toward addressing the national workforce challenge. The research performed was able to:

- Identify the jobs impacted by the smart grid

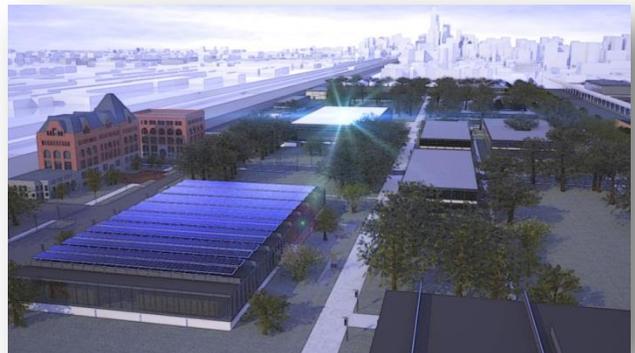


- Capture the level of smart grid impact on these jobs
- Define critical smart grid skills requirements
- Evaluate current training opportunities available to address smart grid skill requirements

The resulting report was released last summer and provided critical insight to the specific job impacts, skill competencies, and current training landscape associated with the introduction of smart grid technologies. The report can be found at www.iit.edu/galvin_center/.

Solar Innovation at IIT

The Galvin Center has also begun the planning phases for a next-generation smart solar installation on IIT microgrid test bed. The solar array and corresponding battery system will serve as a laboratory for new smart solar control technologies. The \$500 project is funded by the U.S. Department of Energy, the Illinois Department of Commerce and Economic Opportunity and IIT.



Conferences and Symposia

ISGT Conference

In 2012, Galvin Center sponsored the third IEEE PES Conference on Innovative Smart Grid Technologies (ISGT) in Washington D.C. The conference attracted thousands of attendees from throughout the world and served as a premier forum for discussion of state-of-the-art innovations in smart grid technologies.



Great Lakes Symposium

In 2011 the Galvin Center held the first annual Great Lakes Symposium on Smart Grid and the New Energy Economy. This one-of-a-kind event broke new ground in Smart Grid design and development, attracting more than 400 attendees to IIT's campus for the two-day conference.

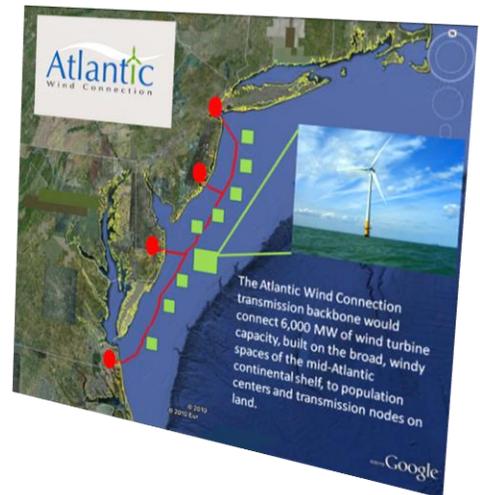


The event showcased Smart Grid best practices from around the country along with innovative technologies and ideas that are spurring innovation, growing economies, reducing emissions and empowering consumers to conserve and save. Participants engaged thought leaders on key policy questions, identified investment and job creation opportunities, and learned about projects already underway.

The conference featured a number of leaders from across the energy industry, including: Rahm Emanuel, Mayor, City of Chicago; Michael Niggli, President and CEO, San Diego Gas & Electric; Anne Pramaggiore, President and COO, ComEd; Teri Ivaniszyn, Senior Director of Corporate Excellence, Florida Power & Light; Doug Scott, Chairman, Illinois Commerce Commission; Ellen Alberding, President, Joyce Foundation; Scott Lang, President and CEO, Silver Spring Networks; Luke Clemente, General Manager of Metering & Sensing Systems, GE Energy; Philip Moeller, Commissioner, Federal Energy Regulatory Commission; David Kolata, Executive Director, Citizens Utility Board; Matthew Summy, President, Illinois Science and Technology Coalition; and Miriam Horn, Director, Smart Grid Initiative, Environmental Defense Fund.

Wind Consortium Conference

On July 20, 2011, the Galvin Center hosted the annual meeting of the University-Industry Consortium for Wind Energy Research, Education and Workforce Development. The meeting attracted wind experts from throughout the nation and included discussions of wind energy integration in the Eastern Interconnection, wind energy research, education and workforce development.



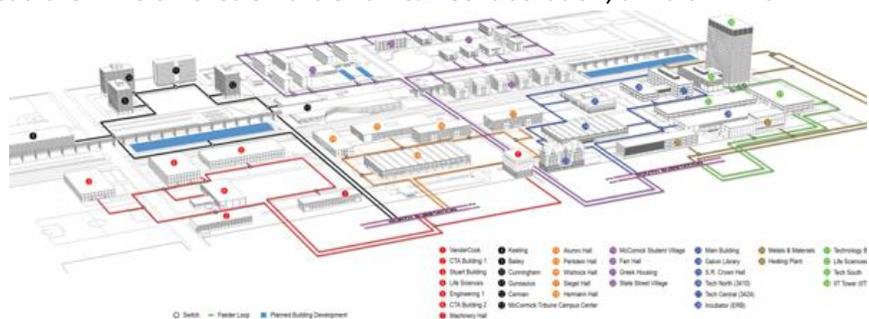
Advancing Wind Power in Illinois Conference

On July 21-22, 2011, the Galvin Center partnered with Illinois State University to host the Illinois Wind Working Group’s annual “Advancing Wind Power in Illinois” conference. The two-day event covered issues related to wind energy research, deployment and policy issues. The event brought nationally-recognized experts and local policymakers to Illinois to discuss wind energy.

Collaborative Research and Development

Korea Smart Grid Partnership

The Galvin Center is helping to lead the Illinois-Korea Smart Grid R&D Collaboration, a multi-million dollar international public-private partnership to accelerate the development of smart grid-supporting technology.



As part of this Collaboration, IIT has launched a project to deploy Phasor Measurement Unit (PMU) technology on its Perfect Power Microgrid. The \$3 million project, funded by the Republic of Korea and private industry partner ProCom, is installing 12 PMUs on the IIT microgrid to create a Local Area Monitoring System (LAMS) for microgrids.

The Galvin Center is working with partners throughout the electricity industry on R&D projects, including:

- Distributed Energy Resource Integration
- Building Energy Management Systems
- Demand Response
- Electricity Markets
- New Transmission Infrastructure
- Plug-in Vehicles and Charging



Affiliated Organizations

Perfect Power Institute

The Perfect Power Institute is transforming the way power systems are designed and operated, creating space for engaging consumers and communities in a safe, reliable, clean, and affordable electricity system.

The Institute administers the Perfect Power Seal of Approval (PPSoA) program, a rating system for the grid that establishes much-needed metrics to empower consumers, businesses, communities and regulators to create dramatically better performance from the power system.

As the U.S. moves toward a more intelligent, cleaner electricity system, a growing number of consumers are demanding improvements in power delivery as well as greater choice in the type of power they use and how they use it. The PPSoA program provides much-needed metrics and design criteria that help industry stakeholders.



By looking at power systems across four key consumer-focused categories—Reliability, Cost, Efficiency and Environment, and Consumer Empowerment—the PPSoA allows consumers, communities, regulators, vendors, utilities, policymakers and others to both evaluate and set the standard for system performance that best meets our 21st century power needs.