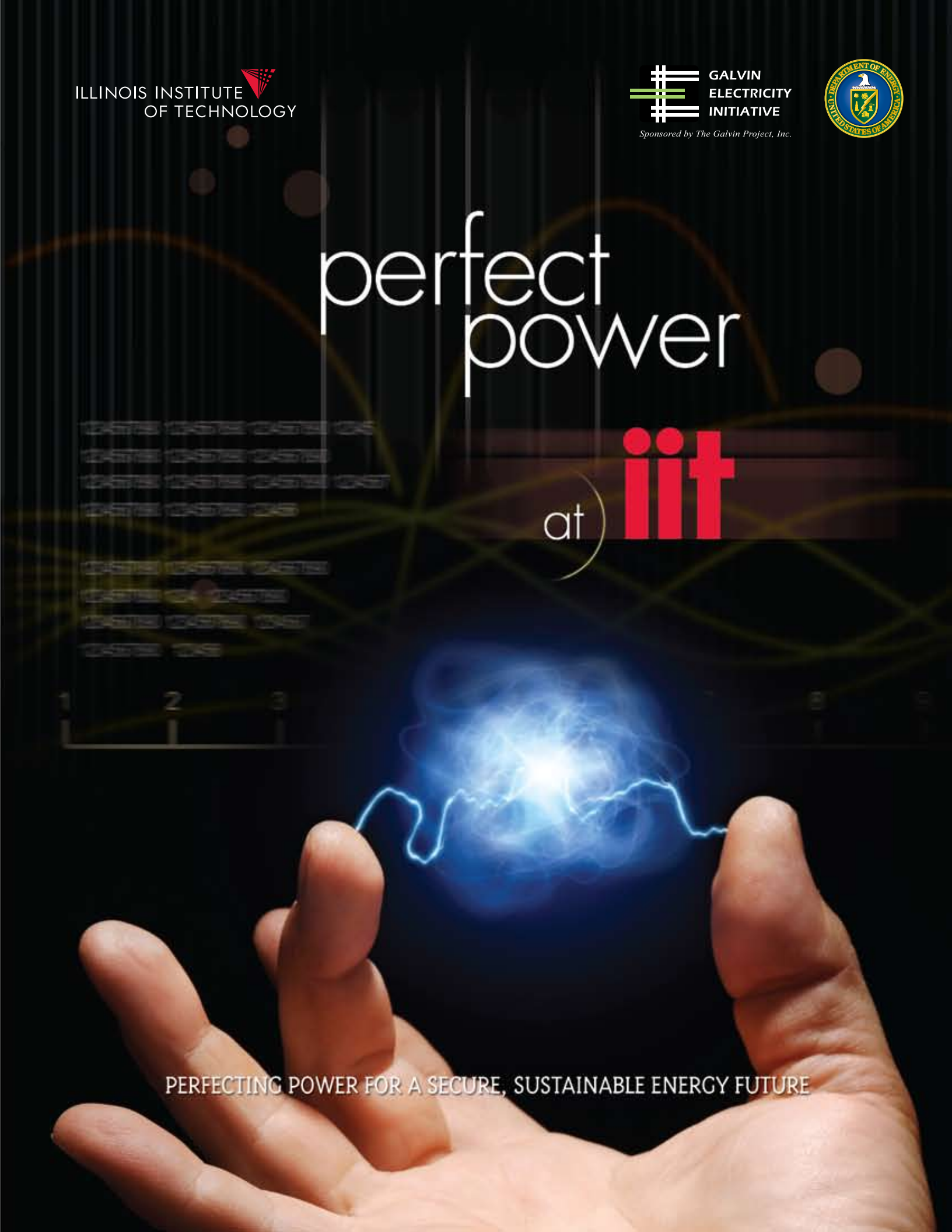
ILLINOIS INSTITUTE OF TECHNOLOGY

GALVIN ELECTRICITY INITIATIVE

Sponsored by The Galvin Project, Inc.

perfect power at iit



PERFECTING POWER FOR A SECURE, SUSTAINABLE ENERGY FUTURE

THE **ISSUE**

Built largely in the 1960s or before, our electric power system cannot reliably run the kinds of digital devices on which today's economy depends. The effects of this inefficient, unreliable, and outdated electricity system are acutely felt each year at Illinois Institute of Technology (IIT). Like many other universities and municipalities, IIT is on the brink of outgrowing its current electricity distribution system.

A number of converging factors have brought the system to a tipping point:

- IIT is experiencing three or more power outages each year, at a cost of up to $500,000 annually in restoration expenses, lost productivity, and ruined experiments that often cannot be recovered.
- Its energy infrastructure is getting old and critical components are facing the end of their useful life.
- Demand for electricity to power the technology and research needs of its students, faculty, and staff is growing steadily.
- IIT will soon be renegotiating its wholesale contract with Constellation NewEnergy, as it expires in 2010.

THE **SOLUTION**

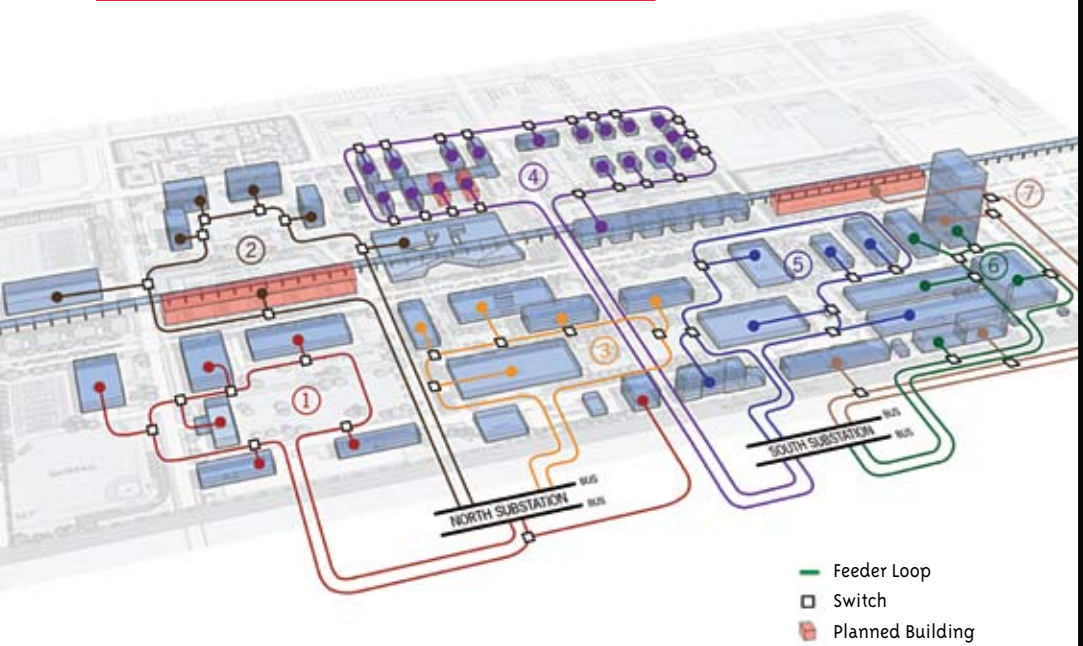
The Perfect Power System at IIT will be the first energy distribution system of its kind in the United States.

IIT has partnered with the Galvin Electricity Initiative and the United States Department of Energy (DOE) to develop a comprehensive solution to this urgent situation—one that will reduce the time and money lost to power outages and meet IIT's growing, specialized energy needs. This partnership, in collaboration with S&C Electric, Endurant Energy, and ComEd, has developed a Perfect Power System design for IIT's Main Campus. This flagship system will confront and model—for other universities, municipalities, developments, and more—a solution to the nation's energy crisis.

The Perfect Power System at IIT will position the university as a pioneer in electricity delivery and infrastructure. As an innovator of this approach, IIT will attract the attention of prospective students, alumni, the research community, the power industry, potential donors, federal and state agencies, and other important stakeholders.

The Perfect Power System design at IIT will result in a power system that will not fail the end user. The system consists of smart microgrids featuring a loop system and redundant electricity. It will offer IIT the opportunity to eliminate costly outages, minimize power disturbances, moderate an ever-growing demand, and curb greenhouse gas emissions.

HIGH RELIABILITY DISTRIBUTION SYSTEM
(DRAWING NOT TO SCALE)



IIT's Perfect Power System will include the following elements:

Self-sustaining electricity infrastructure

An intelligent distribution system and system controllers

Onsite electricity production

Demand-response capability

Sustainable energy systems and green buildings/complexes

Technology-ready infrastructure

INVESTING IN PERFECT POWER

The Perfect Power System will allow IIT to avoid costly system upgrades and realize efficiency savings well into the future. It is estimated that the system will pay for itself as it's built, over the next five years. The project is funded by IIT and the DOE.

ESTIMATED PERFECT POWER COSTS AND SAVINGS	
System cost	$12M
One time savings	$5M
Annual savings	$1.3M
Simple payback period	5 years

$3.5 million of the total project funding will include research in advanced distribution automation and recovery systems, buried cable fault detection and mitigation, intelligent system controllers, and advanced ZigBee wireless.

THE **BENEFITS** OF PERFECT POWER

Perfect Power means not only a cheaper energy bill for IIT, but also a safer, more productive campus and the opportunity for IIT to set the standard for electric power delivery.

BENEFITS INCLUDE:

Create a greener campus — The Perfect Power System will help IIT achieve its Energy Action Plan objectives—including significantly reducing CO_2 emissions and improving efficiency in electricity use by 20 percent—by reducing peak demand, distributing energy more efficiently, and leveraging solar and other renewable resources.

Reduced need for scheduled upgrades — In addition to the savings listed above, Perfect Power will mean savings for ComEd and Illinois consumers, as it allows the utility to defer a planned $2 million upgrade to the Fisk substation. As noted, it will also eliminate the need for a new east campus substation that would otherwise cost IIT $5 million, for a total of $7 million in savings from avoided infrastructure upgrades.

IIT is positioned as an electrical engineering innovator — Perfect Power will position IIT as a living laboratory for the most advanced distribution system concepts and control technologies, providing a powerful resource for attracting students and government/industry funding.

Reduced energy costs — IIT is projected to save approximately $500,000 to $1.5 million per year by reducing electricity peak demand, electricity usage, and providing ancillary services to the grid. IIT can also reduce costs by purchasing a portion of its electricity in real time. In addition, IIT will save transmission and distribution charges and taxes.

Expanded research and education grant opportunities — IIT's Department of Electrical and Computer Engineering plans to attract additional grants and philanthropic support, in excess of $1 million per year, due to the added campus features and functions of the Perfect Power System. The societal benefits of the proposed $3.5 million research on Perfect Power is viewed to be substantially higher once the proposed research results are replicated throughout the U.S.

Improved power reliability and quality — With the Perfect Power System, cable failures will be automatically isolated and power rerouted to prevent local building outages. Onsite generation combined with demand response will allow the campus to continue to operate in the case of an interruption in ComEd supply.

Improved campus safety and security — The Perfect Power System will provide IIT with a significantly more robust energy system that can respond to weather, aging, and other threats, ensuring power to students, teachers, and tenants during emergencies. The system will also enhance IIT personnel safety due to the automation of manual high voltage switches.

TIMELINE FOR **IMPLEMENTATION**

Implementing Perfect Power at IIT will occur in four phases over five years. This timeline began in December 2008 and will continue through 2013.

A description of each phase is as follows:

PHASE I

Improve overall energy efficiency of the IIT campus and the reliability of the ComEd supply system.

PHASE II

Modify existing IIT turbines for fast start capability; add additional generation capability and install advanced building meters; to allow IIT to earn revenue for demand response and ancillary services.

PHASE III

Create a redundant and intelligent distribution system that interfaces with a dynamic campus-wide energy system controller to ensure continuous service to IIT buildings.

PHASE IV

Provide local uninterrupted power supplies, solar power, and the final version of the Intelligent Perfect Power Controller that will optimize building operating efficiency and reliability, demand response revenues, and ancillary services.

ILLINOIS INSTITUTE OF TECHNOLOGY

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Founded in 1890, Illinois Institute of Technology is a private, Ph.D.-granting research university that awards degrees in engineering, the sciences, architecture, law, design, psychology, humanities, and business.

IIT MISSION STATEMENT

To advance knowledge through research and scholarship, to cultivate invention improving the human condition, and to educate students from throughout the world for a life of professional achievement, service to society, and individual fulfillment.

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The Galvin Electricity Initiative, launched by former Motorola chief Robert W. Galvin, is leading a campaign to transform the nation's obsolete electric power system into one that can truly meet consumers' needs in this new century. Galvin's vision—a Perfect Power System that cannot fail the end user—includes a major technological update as well as the development of smart microgrids that benefit consumers and suppliers alike. Learn more at www.galvinpower.org.

For more information about Perfect Power at IIT, contact Jeffrey D. Bierig at 312.567.5057 or bierig@iit.edu.