

# PERFECT POWER AND SMART GRID TECHNOLOGY

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## A Briefing Document

ILLINOIS INSTITUTE OF TECHNOLOGY



## The Issue

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- **Our nation's outdated grid.** Our current transmission system for electricity (the electrical grid) was built largely in the 1960s or before, and is in need of a major upgrade with new technologies to eliminate blackouts and other disturbances that occur when we cannot anticipate, detect, respond to and correct problems in the grid quickly.
- **New investments in "Smart Grid."** This new grid has been named the "Smart Grid", and is a major focus of President Obama's future energy plans. IIT has begun work on the development of a Smart Grid prototype – a Perfect Power System – on its Chicago campus.
- **Chicago can be a pioneer in energy.** Transforming our nation's grid has been compared in significance with building the interstate system or the development of the internet. Chicago can be a leader in the development and implementation of this new technology.

## What is the Smart Grid? What is Perfect Power?

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- **Smart Grid** – A Smart Grid envisions an electric grid in which digital communication and control will flow over power lines in addition to power. This will help a system detect congestion and respond to potential outages before they happen, and allow for new technologies, such as Smart appliances, that can help consumers even out peaks of high demand to increase efficiency and reduce consumption.
- **Perfect Power** – A Perfect Power system means an electrical system that will not fail the consumer. A Perfect Power system would consist of a network of small, self-contained Smart microgrids that use Smart Grid technology to seamlessly blend utility power with local power generation, from conventional or alternate sources, to deliver electricity without interruption to the microgrid.

RELIABILITY  
SECURITY  
EFFICIENCY  
SUSTAINABILITY

## Next Steps – What needs to be done?

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- 1) **Create a functioning Smart Grid prototype**  
The Smart Grid needs a proof-of-concept prototype that is tested and evaluated by top researchers. IIT's Perfect Power system will serve as that prototype.
- 2) **Develop Smart Grid technology through a cross-industry collaboration**  
A collaboration of energy, technology and appliance industry leaders and entrepreneurs, housed at IIT, can develop new technology and work on the necessary language and protocols that will allow diverse Smart Grid devices to talk to each other on the grid.
- 3) **Expand Smart Grid prototype to community-wide scale**  
Once the Smart Grid / Perfect Power prototype is proven on a campus-wide scale, the next step is expanding a Smart Grid system to a wider community area in Chicago.

# Perfect Power and Smart Grid Technology @ IIT

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**IIT GOAL 1** Establish IIT as the premier research institution for Smart Grid technology.

**IIT GOAL 2** Establish a cross-industry collaboration to accelerate adoption of Smart Grid.

**IIT GOAL 3** Provide hands-on learning opportunities for students and community.

## Action Plan

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**UNDERWAY**

### 1) IIT PERFECT POWER PROTOTYPE (\$12.8 million CAPITAL)

- IIT recently began implementing a Perfect Power prototype in partnership with the Galvin Electricity Initiative and the U.S. Department of Energy on its Chicago campus.
- The prototype will be the first energy distribution system of its kind in the United States, and will serve as a model for other universities, municipalities, developments and other communities for the next generation of electricity delivery systems.

### 2) EXPAND SMART GRID & PERFECT POWER RESEARCH (\$44 million ENDOWMENT)

- IIT will continue to invest in faculty, researchers and graduate students to make IIT the most recognized and respected institution for smart grid technology and sustainable energy.

### 3) CREATE CROSS-INDUSTRY SMART GRID COLLABORATION (\$18 million ENDOWMENT & CAPITAL)

- IIT will bring the leading energy, technology, appliance, and entrepreneur innovators to IIT's campus to develop new technology and the standard language and protocols for Smart Grid technology to communicate.
- Researchers and developers need an environment that best mimics what the "real world" of the Smart Grid will look like – thousands of devices created by different manufacturers that work together without failing.

R&D teams will work with IIT researchers to create smart refrigerators, air conditioners, heating systems, lighting, power backup systems, and plug-in hybrid systems.

### 4) CREATE A "LIVING LAB" – SMART GRID RESEARCH BUILDING & TECH PARK (\$84 million CAPITAL)

- IIT is currently working on plans for a Smart Grid & Sustainable Energy "Living Laboratory". The "Living Lab" will provide space for members of the **Smart Grid Collaboration** to test their new technologies and communication network.
- IIT researchers will measure and evaluate every single building component – from the smart meters and smart technologies to its renewable energy (solar and wind power) sources plugged into the smart microgrid.
- The Technology Park will provide space for industry teams and start-up companies to develop Smart Grid technology for production.
- The "Living Lab" will also be a tool for public outreach, housing a permanent installation that will demonstrate the Smart Grid and "Smart Home" of the future to the public, and be a great destination for students (and adults) of all age levels.

## Benefits to the City of Chicago

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Chicago's continuing growth as a technologically innovative, "green, sustainable" city is as dependent on its human capital as it is on its energy systems and infrastructure.

### Benefits of IIT's Perfect Power & Smart Grid Project to Chicago and its residents:

- **New high-tech jobs, businesses.** The Smart Grid Center will attract the best minds and top energy and tech companies to Chicago's South Side to develop Smart Grid and sustainable energy technologies and jobs.
- **Job Training.** The Smart Grid Center will provide technology training opportunities for local residents in partnership with City Colleges of Chicago.
- **Creates a Green Community.** An expanded community-wide Smart Grid project will help create sustainable communities on Chicago's South Side
- **Supports Transit-Oriented Development.** Location at 35<sup>th</sup> and State (Green Line, Metra Line) helps increase marketability for Park Boulevard development.
- **Secures essential infrastructure.** An expanded community-wide Smart Grid project will help ensure security and reliability of City Police and Fire headquarters.
- **Supports Chicago 2016 Olympics.** Smart Grid and Perfect Power infrastructure can help develop sustainable Chicago 2016 Olympic venues, and ensure their security and reliability.

## Building the "Living Lab"

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The Smart Grid & Sustainable Energy "Living Laboratory" would require new construction of 100,000 to 150,000 sq. ft. in an architecturally significant facility, to the highest LEED standards and adaptable to include all present and future smart grid technologies.

**Location.** The Northeast corner of 35<sup>th</sup> Street and State Street, next to the Green Line "El" Stop.

### The building will house:

- Smart Grid research center
- Company suites for smart grid technology development
- Smart Grid demonstration "home"
- Space for anchor tenants in expanding University Technology Park
- Linked to "green" parking structure combining smart grid technologies with support for plug-in hybrid, electric and alternative fuel vehicles

### Targeted funding sources:

- Private philanthropy
- Federal intermodal transportation funding
- U.S. Department of Energy
- National Institute for Standards and Technology
- Private equity developer partnership
- Tax Increment Financing

