Chicago electric utilities are getting 'smart'

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Tucked away in President Obama's stimulus package is $11 billion for investment in smart grids, a new electric utility infrastructure that would save energy and reduce the cost of electricity.

With increasing government support, the electric utilities industry, which currently spends less than 2 percent of its annual revenue on research and development, according to the U.S. Department of Energy, might be in for a complete overhaul.

Chicago's Illinois Institute of Technology is home to one of several smart grid prototypes being built around the nation. The institute is working with the Galvin Electricity Initiative, a non-profit group started by Robert Galvin, former Motorola Inc. CEO, to get the project off the ground.

Galvin, who stepped down from the top spot at Motorola more than 20 years ago, developed the smart grid initiative after a massive East Coast blackout in August 2003. IIT is using Galvin's model to create a "perfect power" grid for the university.

Galvin contends that lack of innovation by the electric utilities industry has cost Americans up to $150 billion in damages caused by power outages.

"The people in the power business are too nonchalant," Galvin

said in an interview. “For all the time there has been a monopoly [of] energy companies, there’s been no move to improve this technology.”

Galvin’s initiative, which he calls “perfect power,” would use intelligent, digital technology to create a two-way flow of information between the electricity grid and consumers.

The system would require a new infrastructure that would sample voltage and currents in the grid many times a second, instead of at the current rate of every two to four seconds. This kind of awareness would allow utility companies to quickly realize bottlenecks or congestions in the grid instead of waiting for customers to call and report problems, and eventually would mitigate or completely prevent expensive power outages.

The system also requires smart meters that would allow customers to monitor their energy use and the real-time cost of energy. Those meters would communicate with smart appliances, which would receive real-time energy prices and would run based on those prices as well as on pre-programmed consumer wishes. A smart washing machine, for instance, could be set to run late at night, a time when energy costs less because the demand is lower.

Because electricity is currently generated in plants outside of heavily populated areas, Galvin said, by the time it reaches its destination, it's been reduced by two-thirds to three-fourths as energy is lost as heat in the transmission cable, dissipates into a magnetic field or is absorbed in insulating material.

In Galvin’s plan, utility companies would build several small-

scale power generators located close to consumers, as many as one in each neighborhood, to reduce the amount of lost electricity.

“Electricity should be produced close to where it’s going to be used,” Galvin said. “[A smart grid] is entirely feasible…The technical things are all doable. We have the recipes.”

Under Galvin's plan, customers would see savings of 50 percent to 70 percent on electricity bills.

In the Energy Independence and Security Act of 2007, the government stated its intention to support modernization of the electric utilities system. Title XIII of the act established a Federal Smart Grid Task Force to promote awareness of the smart grid and coordinate and collaborate with utilities companies, equipment managers, national laboratories and state agencies.

The Galvin Electricity Initiative is one of the groups the Federal Task Force is partnering with to accelerate the development of smart grids.

The net generation of energy produced between 1997 and 2007 increased by 20 percent, to 4.2 billion megawatt-hours from 3.5 billion megawatt-hours, according to the U.S. Energy Information Administration.

Growth in the demand for energy has exceeded the growth of electricity transmission lines by almost 25 percent every year since 1982, according to the Department of Energy Web site.

“If the grid were just 5 percent more efficient, the energy

savings would equate to permanently eliminating the fuel and greenhouse gas emissions from 53 million cars," states the Web site.

Investment of approximately $1.5 trillion would be required between 2010 and 2030 to pay for a new utility infrastructure, according to the Brattle Group, an economic consulting firm.

Money is the key to overhauling the current utilities system. Before the "perfect power" prototype at the Illinois Institute of Technology was launched last October, the project secured $7 million in grants from the U.S. Department of Energy and $5 million from IIT itself.

The project would not have happened without those funds, said Mohammad Shahidehpour, professor of electrical and computer engineering at IIT.

Shahidehpour said the project should be completed in five years, and will reduce energy consumption and costs on the IIT campus through the communication between smart appliances and the grid. For instance, he said, carbon dioxide sensors will control air conditioning. The sensors will measure the number of people in a room based on the amount of carbon dioxide being exhaled, and will turn on and off accordingly.

The perfect power model would pay for itself within five years of completion and would generate at least $20 million in savings for the university over 10 years, according to an IIT press release Nov. 20.

Galvin's projects extend beyond Illinois. An upcoming

housing development just outside Albuquerque, N. M., Mesa del Sol, is partnering with Galvin to create a prototype of his perfect power grid for 300 homes slated for construction in March.

Michael Daly, president of Mesa del Sol, said the developers value sustainability.

“Ultimately we think the consumers will begin to ask, ‘Do you have a smart meter system?’” Daly said.

The houses at the Mesa del Sol prototype will be outfitted with solar photovoltaic panels on the roof and smart appliances in the houses. The roof PV panels, Daly said, could be generating electricity and selling the excess electricity produced back to the grid.

“[The smart grid] generates locally,” Daly said. “It creates green energy all over the place.”

Daly said the prototype, once funding is secured, would take one to two years to complete after the houses have been built. He estimated that the prototype itself would cost $15 million, and is planning to find the money through the recently passed stimulus package and private funding.

Daly said he's confident the national electric utilities system could be overhauled with federal support. Built into the stimulus package that was signed into law on Feb. 17 are contracts designated specifically for utility companies installing smart grids.

Smart grid research has caught the interest of more than just

private companies. Chicago's Commonwealth Edison Co., which provides electricity to 70 percent of the Illinois population, has begun a series of workshops to discuss developing a modern system, according to Alicia Zatkowski, communications manager at ComEd.

Zatkowski said representatives from ComEd are currently meeting with state officials and energy experts to propose a recommendation for ComEd to implement a smart meter system. Next week, she said, a new round of meetings would begin to discuss developing a smart grid system.

“For ComEd it helps create efficiency,” Zatkowski said. “A smart grid will help us know exactly where the problems [in the grid] are. And customers will be able to monitor their energy usage. If they are using a lot, they can see.”

Specific costs and savings, Zatkowski said, would not be released until the first set of workshops ends in five months.