

# SMART GRID FOR SMART CITIES: OPPORTUNITIES AND CHALLENGES

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**WEDNESDAY, FEBRUARY 3, 2010**  
**NYU WAGNER GRADUATE SCHOOL OF PUBLIC SERVICE**  
**259 LAFAYETTE STREET, NYC**

**8:00 A.M.**

**Robert B. Catell**  
Chairman  
AERTC

Keynote Speech  
"Smart Grid for Smart Cities" Program  
NYU Wagner Graduate School  
February 3, 2010  
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### "What Problems Would a Smart Grid Solve?"

I'd like to thank NYU Wagner for organizing and hosting this program, The Sallan Foundation, the CUNY Institute for Urban Systems and the New York League of Conservation Voters for sponsoring it, and for inviting me to speak.

Having spent my career in the energy business, I agree with the premise that building the Smart Grid will be one of the great engineering and technological achievements of our time. You could go further: It will be the biggest thing that's happened in the energy business in a hundred years. No part of the energy process – energy generation, transmission and distribution, consumption, conservation, regulation – will be the same. To give you an idea of the scale of the change, I'd like to begin with a little story about technological progress. I hope you haven't heard it before, because it's a perfect description of where the energy industry is right now.

If Alexander Graham Bell returned to earth today, the progress in telecommunications over the last 125 years would be mystifying: a cell-phone would be as incomprehensible to him as a phaser from *Star Trek*. But if Thomas Edison came back today, not only would he recognize our electric energy industry technologies, he could probably fix them.

The key to improving the entire energy process is the development and application of new technologies. That's why I'm pleased to chair the advisory board for the Advanced Energy Research and Technology Center at Stony Brook University and the NYS Smart Grid Consortium.

The Smart Grid Consortium is housed at the Energy Center, and both of them are broad partnerships that are still growing. Their purpose is to focus all of New York's brain power and drive on our energy challenges and to develop solutions.

The establishment of the Smart Grid Consortium was announced by Governor Paterson last summer. It already involves every major utility in New York – including Con Ed, National Grid and the Long Island Power Authority, and I can tell you this is the first time in the history of the state that all of these entities have come together - - and it also includes New York City, the New York Independent System Operator, the Public Service Commission, the New York Power Authority, the New York State Energy Research and Development Authority, NYSTAR, IBM, General Electric, Computer Associates, the New York State Business Council, and Brookhaven National Laboratory, which Stony Brook co-manages for the U.S. Department of Energy.

From the academic sector, Advanced Energy Center members City College and NYU-Poly, Clarkson University, Rochester University, Syracuse University and the Rochester Institute of Technology (RIT).

These organizations, from all over the state, are focused on making New York a world leader in Smart Grid research, development, and deployment. If New York achieves this position of leadership, then our companies across the industry spectrum will be able to take leadership positions in their sectors as well because energy reliability and efficiency will improve while improving the environment at lower costs.

I've been asked to address "what problems would a smart grid solve?"

Looking at the large picture, The Smart Grid will reduce costs all the way along the energy process by delivering levels of efficiency and reliability that just have not been possible up to now.

Making the electric power grid "smart" will exploit the computer, telecommunications and micro-/nano-electronics technologies of the 21st century – and will drive the creation of new technologies – to manage, protect and optimize the power network by:

- Monitoring and reporting the status of millions of data points, from Smart Meters in your homes and places of business to sensors on our transmission and distribution lines to remote control devices at substations to complex interactive systems at generating plants;
- It will recognize needs and initiate corrective actions – ideally, before an emerging problem affects the customer.

For more than a century, most of us have learned about outages when our customers called to tell us about them – thankfully, not very often. The Smart Grid will not only tell us about the problem but may well have fixed it by the time of the report.

-- The energy system management capabilities of the Smart Grid will be essential to integrate distributed generation and storage resources – in other words, wind, solar and other alternative energy sources – as they come online. (This will be one of the keys to making alternative energy a mainstream power source.)

-- It will protect the grid's two-way communications and information systems against attack by means of state-of-the-art cyber-security systems; (The Advanced Energy Center is directly adjacent to the New York State Center of Excellence in Wireless and Information Technology, which has world-class cyber-security researchers.)

-- Finally and perhaps most important, the Smart Grid will provide energy customers with unprecedented control over their energy usage and their costs by giving them detailed information in real time and allowing them to choose how much energy to use and when to use it.

This means developing and implementing all of the information and control systems technologies we use in our work and family and social lives: programmable systems, smart meters, smart appliances, remote sensing and communications, interactivity, user-friendly graphical computer interfaces, real time data feeds with visual displays at home, in the office and on your new iPad.

When you add the Smart Grid to the new alternative and renewable sources of power, it's obvious that we're about to live through a technology revolution in the energy industry that will be every bit as far-reaching as the information technology revolution of the last generation.

I'd like to also describe how the Smart Grid will contribute to economic development. For most of the time I have been in the energy business, New York City and Long Island have traded the leadership position as the most costly energy location in the country.

The energy section of Mayor Bloomberg's PlaNYC points out that New York City's total energy bill for electricity, heat and hot water could rise more than 20% in the next five years. This will further increase the cost of doing business in New York City.

The main contributors are the continuing growth of demand and the aging power generation infrastructure, which uses 30 to 60% more fuel to generate the same amount of electricity as new, more efficient plants.

The New York City plan sets forth the very ambitious goal of reducing energy demand even as the City continues to grow, and it notes that increasing energy efficiency is the key to achieving this goal. The Smart Grid is the key to increasing energy efficiency. Some of you may be old enough to remember a New York retailer's advertising slogan that "an educated consumer is our best customer."

An educated and informed energy consumer is our best weapon in the struggle to reduce demand, and the information provided through a Smart Grid is the best way to educate those consumers so they can make choices that will reduce their energy footprint.

The City is interested in expanding real-time pricing beyond its current, modest base, as another efficiency measure; the Smart Grid is essential to provide real-time information for the energy buyer. All should contribute to reduced costs.

Our Smart Grid Consortium partner Con Ed has already initiated a *3G System of the Future* project to study how to integrate advances in communications, computing and electronics in order to respond faster and more effectively to localized network problems and demand fluctuations. The Consortium looks forward to assisting in any way we can to move this Smart Grid project forward.

There is an important aspect of the use of energy in our economy that hits New York City particularly hard -- data centers, the enormous server farms that have become essential for banks and other global financial institutions and many other national and global companies to manage their operations.

Although I have not seen any specific information, I would hazard a guess that the concentration in New York City of companies in the FIRE sector – finance, insurance and real estate – as well as numerous corporate headquarters means a concentration of these very heavy energy using facilities.

If current efficiency trends are not improved, total data center power consumption will reach about 100 billion kWh by 2011, almost double the consumption in 2006. Although the servers have to be kept running 24/7/365 with no outages, the great majority of the energy usage is not for operations but for cooling, as high as 90%. The implementation of smart grid energy management systems in buildings will be essential to reduce this peak demand.

As I'm sure you know, New York City has lost much of its manufacturing base over the last generation. The need for new technologies for the Smart Grid and for alternative and renewable energy sources represents a job creation potential for the City. Many of the products for these markets will be high value added, low bulk, potentially limited production run items that would be ideally suited to the manufacturing capacity that remains.

I'm pleased to say that one of the unique resources that the Advanced Energy Center will provide for the industry will be a Smart Grid Virtual Interoperability Test-bed and Validation Facility, where new technologies can be tested in conditions simulating scale, before thousands of units are deployed in a service area, providing the true market potential.

I'd like to conclude by discussing the Smart Grid's impact on the environment. As I've mentioned, New York City's Plan NYC contains sobering statistics about the City's energy usage. Without a very strong energy efficiency program, the City's peak electricity demand would grow by almost a third in the next 20 years. Total electricity consumption could rise by 44% or more with a commensurate negative impact on the environment.

On the other hand, a successful efficiency program, driven by the new tools and capabilities the Smart Grid put into the hands of customers, could move the City a long way toward the goal of reducing electric demand and greenhouse gases by 30% by 2030.

And finally, what will a smart grid of the future look like?

*GRID 2030: A NATIONAL VISION FOR ELECTRICITY'S SECOND 100 YEARS*, United States Department of Energy, Office of Electric Transmission and Distribution, prepared in July, 2003 provides the following picture:

"Grid 2030 consists of three major elements: A national electricity "backbone"; Regional interconnections, which include Canada and Mexico; Local distribution, mini- and microgrids providing services to customers and obtaining services from generation resources anywhere on the continent."

"Grid 2030 envisions a fully automated power delivery network that monitors and controls every customer and node, ensuring a two-way flow of electricity and information between the power plant and the appliance, and all points in between. "

“Its distributed intelligence, coupled with broadband communications and automated control systems, enables real-time market transactions and seamless interfaces among people, buildings, industrial plants, generation facilities, and the electric network.

Technological breakthroughs in superconductivity have made it possible to deliver large amounts of energy over long distances into congested areas unobtrusively, with near-zero voltage drop. New conductor materials enable two to three times the power through existing rights-of-way.

Advances in energy storage and demand-side management technologies have virtually eliminated peak-load problems. Economic losses from power outages and power quality disturbances are extremely rare (never caused by electric resource constraints), and customers routinely obtain electricity services at reliability and quality levels tailored to their individual needs with greatly reduced environmental impacts.”

Sound far out? Maybe not.

The Advanced Energy Research and Technology Center and the Smart Grid Consortium look forward to contributing to this smart grid of the future.