U.S. DEPARTMENT OF ENERGY | Electricity Delivery & Energy Reliability

Bright Lights, Big City: A Smarter Grid in New York

The Consolidated Edison Company of New York, Inc. (Con Edison) operates the world's largest underground electric distribution system and serves more than 3.3 million customers in New York City and neighboring Westchester County. 86% of its system is underground, with 94,000 miles of underground electric cables and 36,000 miles of overhead electric wires. To provide New York City with more reliable and affordable power, Con Edison is upgrading its distribution system to reduce the frequency and duration of outages and improve power quality.

Distribution Automation for More Reliable Power

Partially funded with $136.1 million in Recovery Act stimulus funds awarded by the U.S. Department of Energy, the Con Edison project includes distribution system automation or upgrade for more than one-third of its circuits. Con Edison's initial distribution automation deployment targets critical areas across the service territory.

"While customers may not notice the impact [of distribution automation] directly, tremendous benefits are realized in the reduction of risk of large-scale grid outages," says Aseem Kapur, department manager of Con Edison's Smart Grid Investment Group. "What [the distribution automation] does is help us mitigate the risk of a network shutdown resulting in a large-scale outage. The smart switches that we're deploying afford us the capability to rapidly isolate faults." As a result of the deployment of this technology, Con Edison expects that the risk of a large-scale outage will drop on average 40 to 50 percent in the city's top ten most critical networks.

[insert photo: ConEd Switch3.jpg
Caption: The smart switch is a main component of Con Edison's intelligent underground system.
Alt text: picture of 2 utility workers in blue hardhats working on Con Edison's underground distribution system.

Distribution Automation for Reducing Costs

In addition, Con Edison estimates that its capacitor automation program will increase system efficiency by reducing energy losses and increase system capacity that would enable deferral of expensive infrastructure upgrades required for meeting the increasing demand. The energy savings will be fully realized over a five- to ten-year period, occurring incrementally as the capacitors are installed. By 2013, Con Edison expects to save approximately 30 MW of energy as a result of the capacitor automation effort. In addition, these investments will help the Company achieve its targets for reducing carbon emissions.

Case Study – Con Edison

Distribution Automation for the Long Haul

Getting the entire system in place is a "heavy lift," says Kapur. "It is certainly a challenge to integrate all the equipment." Deploying, integrating, testing, launching, training, learning to understand the new streams of information and apply the results—all of these steps take time. While the new technologies have been proven in grid applications around the world, they have to withstand the harsh environments found under the streets of New York City—or other urban underground systems across the United States. A utility would typically do this type of integration over a ten-year planning cycle, but with the help of Recovery Act funds, Con Edison is planning to accomplish it in three years.

Insert photo: ConEd auto loop overhead display
Caption: An instructor at Con Edison's Learning Center examines a simulation of the advanced remote automatic restoration system.

To ensure that the technology will function properly, Con Edison is performing significant testing upfront. One-third of the Con Edison project's timeline is dedicated to testing, with two-thirds spent on installation and operation. By the end of the project, Con Edison intends to demonstrate a tangible investment in infrastructure for customers, and quantify the savings. Transformer monitoring provides a good example. Con Edison is testing a system that enables real-time monitoring and control of underground transformers via two-way wireless communication. Con Edison's Vault Data Acquisition System provides information on transformer loading, temperature, pressure, and oil level. The secure, two-way radio communication between the vaults, where the transformers are located, and the control centers is accomplished via a wireless mesh network. This type of monitoring is very important, especially during summer peak periods, since real-time data enable immediate dispatch to replace or repair a transformer prior to failure. The system will also help reduce operating costs and increase efficiency by performing mandatory switching remotely rather than switching manually with field crews.

Con Edison is already reaching out to power companies to share lessons learned. Thanks to the recent federal grants supporting smart grid upgrades, utilities nationwide are sharing information while deploying these new technologies simultaneously. Multiple organizations are riding the smart grid learning curve. Over the next three to four years, Con Edison expects to benefit greatly from comparing deployment techniques, trading benchmarks, uncovering new benefits, and collectively building a smarter national grid.

Learn More

The American Recovery and Reinvestment Act of 2009 provided DOE with $4.5 billion to fund projects that modernize the Nation's electricity infrastructure. For more information visit www.smartgrid.gov or www.oe.energy.gov. There are five recent reports available for download:

- *Smart Grid Investment Grant Progress Report*, July 2012

Case Study – Con Edison

- *Demand Reductions from the Application of Advanced Metering Infrastructure, Time-Based Rates, and Customer Systems – Initial Results*, December 2012
- *Operations and Maintenance Savings from the Application of Advanced Metering Infrastructure – Initial Results*, December 2012
- *Reliability Improvements from the Application of Distribution Automation Technologies and Systems – Initial Results*, December 2012
- *Application of Automated Controls for Voltage and Reactive Power Management – Initial Results*, December 2012