

Smart Grid Solutions Strengthen Electric Reliability and Customer Services in Florida

With 4.6 million customers, nearly 70,000 miles of power lines and 16 power plants, Florida Power and Light Company (FPL) is one of the nation's largest electric utilities. FPL says maintaining reliable service while keeping rates affordable is "Job One." While pursuing its mission, FPL is implementing "Energy Smart Florida," which is the largest and one of the most comprehensive of the U.S. Department of Energy's (DOE), Smart Grid Investment Grant (SGIG) projects. FPL had already committed to smart meters and had been running pilots for several years in preparation for SGIG upgrades. The DOE grant enabled FPL to accelerate its plans and undertake additional grid modernization improvements for the entire electric delivery system, including transmission, distribution and metering. The total budget of \$800 million includes \$200 million in DOE funds.

Before SGIG funding, FPL's investment plans called for implementing only a handful of smart grid projects a year. FPL explains that the SGIG funds have had a catalytic effect on these plans. For example, because of SGIG funds, FPL has been able to implement thousands of additional improvements, test new systems and strategies, and begin to explore innovations for product and service offerings on the customer side of the meter. In many instances, these activities go well beyond those in their previous plans. According to Bryan Olnick, FPL's Vice President of Customer Service Smart Grid Solutions and Meter Services, "FPL's typical residential electricity bills are the lowest in the state, and the service we provide customers is among the most reliable in the country. With support from DOE, our SGIG project enables us to enhance service reliability while putting more control than ever before in the hands of customers over their power consumption and costs."

Preventative Maintenance is Avoiding Power Outages

FPL's smart grid plans involve a deliberate and phased approach. To date, equipment is installed and operational for about:

- 98 percent of the SGIG project's planned transmission system improvements,
- 50 percent of the planned distribution system improvements, and
- 75 percent of the planned smart meter change-outs.

In fact, as of April 2012, FPL had installed more than 5,000 intelligent monitors, sensors, and controls on their transmission and distribution grid, making it possible to predict and prevent outages and enhance service reliability to customers. This installation effort included replacing about 50 electro-mechanical protective relay systems with state-of-the-art computer-based systems, and installing feeder breaker and regulator

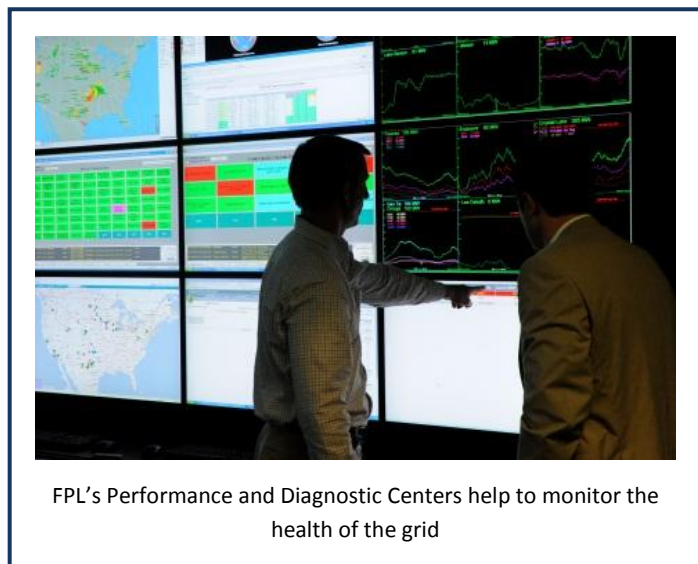


Smart devices have been installed on 78 substation transformer banks.

intelligent electronic devices at nearly 100 substations, more than 200 automatic feeder switches, and 45 phasor measurement units.

These improvements are already producing measurable benefits. Specifically, one of the new SGIG-enabled FPL capabilities involves “enhanced diagnostic systems,” which collect and interpret data from substation devices such as battery banks and transformers and transmit that information to FPL diagnostic centers for problem detection and outage prevention.

For example, FPL’s SGIG-upgraded Transmission Performance and Diagnostic Center (TPDC) remotely monitors power transformers in 500 FPL substations. New bushing monitors – monitors that can detect and diagnose problems before they occur – have been installed on some of those transformers to evaluate the health of both the high and low voltage bushings, including capacitance, power factor, and the extent of current imbalance. Bushing failures can damage transformers, which means costly repairs and the possibility of extended service interruptions. In January 2012, a newly installed monitor detected an out-of-tolerance high voltage bushing. Customers served by this transformer were temporarily switched to another one, and the affected transformer was removed from service. Meanwhile, the faulty bushing was replaced, preventing an outage that would have affected several thousand customers.



FPL’s Performance and Diagnostic Centers help to monitor the health of the grid

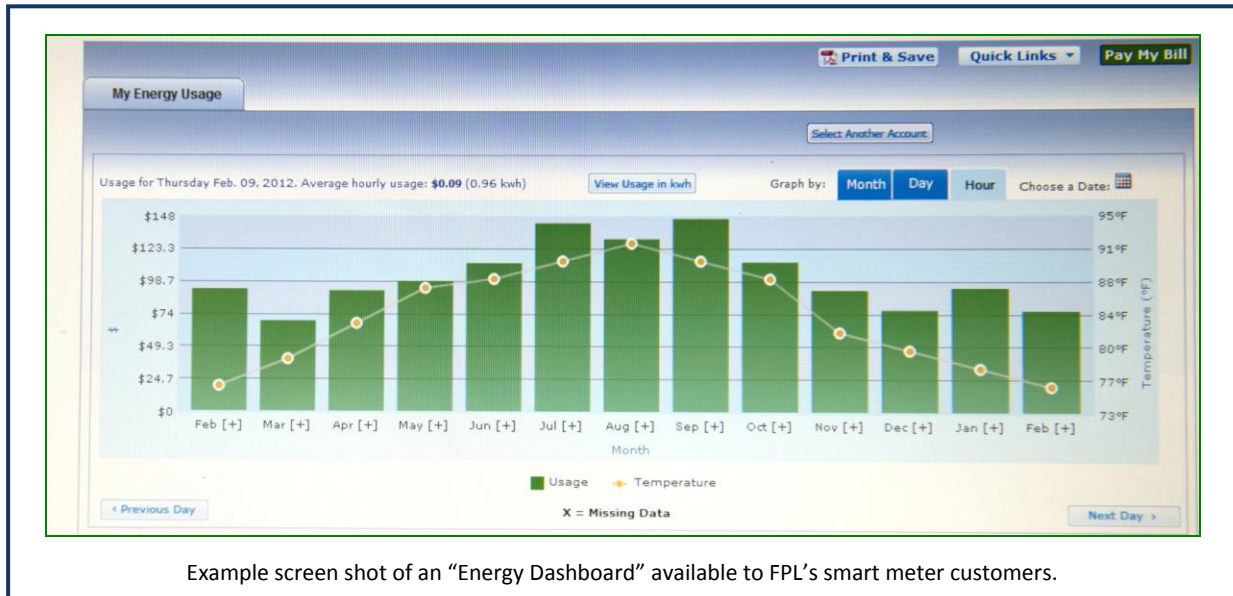
The TPDC is also monitoring the battery banks that provide power to 500 FPL substations. The battery banks are monitored for both high and low voltage levels, and high impedance. In February 2011, a TPDC monitor received an alarm signal indicating a battery problem at a substation located in a remote section of FPL’s service territory. A local field engineer was dispatched to the site and found the alarm was caused by a loose interconnection strap. The repair was made and prevented a battery malfunction which might have resulted in an extended outage for the hundreds of customers served by that substation.

The TPDC is also monitoring capacitance voltage transformers (CVTs) and is measuring voltage levels and other power flow variables. TPDC engineers implemented an algorithm that uses these data to detect early CVT degradation so preventative maintenance measures can be taken. In September 2011, the TPDC received an alarm signal indicating potential problems with a degraded phase on a CVT. Local field engineers were dispatched, located the damaged CVT, removed the affected transmission line section from service, and replaced the defective CVT, thus preventing a failure that could have resulted in an extended outage and affected several thousand customers.

Customer Information and Education is Helping Reduce Bills

Another of FPL's new smart grid capabilities involves providing customers with information and data displays so they can better control their electricity consumption and costs. Each customer with an activated smart meter can view his or her own "Energy Dashboard" through FPL's website. The dashboard displays information about consumption and costs a day after it has been recorded by the smart meter. Each customer can view his or her own power use by the hour, day, and month and can receive bill estimates based on current usage patterns. Information from the dashboard is also available by calling FPL and talking to a representative or accessing the interactive voice response system.

The dashboard is helping users make more informed choices about electricity consumption and costs throughout the month. While similar web portals and displays are becoming more common, getting customers to use them has been a challenge for many utilities. FPL is pursuing several approaches to drive expanded use, including email reminders and, with Miami-Dade College, sponsoring a course on



Example screen shot of an "Energy Dashboard" available to FPL's smart meter customers.

how to use the dashboard to reduce power costs. About 900 of FPL's customers have taken the course, which is designed for senior citizens and lower-income customers, and the course will also be offered this year by Broward College and Palm Beach Community College.

Results of these education efforts are encouraging. In fact, many customers are regular dashboard users and have provided comments to FPL on how much they like it. For example, one FPL customer said, "If people choose to use the customer portal, they will definitely see benefits. Changing our energy habits has saved our family about \$100 dollars a month compared to similar homes in our area." Another customer noted, "I think the online portal is the greatest tool FPL has to offer. In today's economy, every dollar is important. Thanks to the smart grid, my family is saving as much as \$30 a month."

Expanded Capabilities Provide Future Opportunities

FPL plans to build on its SGIG-enabled smart grid capabilities for future products, services, and applications. According to Mr. Olnick, “The improvements we’re making now to our electric grid enable us to add customer benefits for years to come. For example, we’re putting a lot of attention toward outage restoration because we understand how important it is to our customers. We are conducting pilot projects to learn how the new smart meters work with other components on the system to help us pinpoint and fix outages fast. We are taking a disciplined, measured approach to these and other pilot projects, including testing new products and services involving home-area networks. We plan to leverage all of the smart grid information to make our service more reliable and offer our customers greater choices, convenience, and control.”

In planning for the future, FPL has found workforce training to be an important success factor. For example, FPL offers a one-day, highly interactive “Introduction to Smart Grid” course to both technical and non-technical employees. Students learn that the smart grid goes beyond smart meters and includes a wide variety of changes to business practices and protocols (both technical and administrative). In many instances, students also learn that these changes involve new roles within an employee’s respective business unit and require new skills in information technologies and systems integration for solving problems with large databases at headquarters and equipment installations in the field. FPL is developing follow-up curricula for technical training in capacitor bank protections and controls, distribution substation scheme upgrades, feeder breakers, and intelligent electronic devices.

Like other power companies in the SGIG program, FPL is learning that smart grid technologies come with an implied commitment to education and training, for both employees and customers. Armed with new knowledge from smart grid data, workers are changing traditional ways of doing business, and customers are changing consumption patterns with subsequent efficiency improvements and cost savings for both the utility and its customers. Supported with SGIG funding, FPL is planning for a smooth transition from traditional to new ways of delivering electricity and in the process involving employees and customers in identifying and realizing smart grid benefits.

Learn More

The American Recovery and Reinvestment Act of 2009 (Recovery Act) provided the U.S. Department of Energy with \$4.5 billion to fund projects that modernize the Nation’s energy infrastructure and enhance energy independence. For more information about the status of other Recovery Act projects, visit www.smartgrid.gov. To learn about DOE’s Office of Electricity Delivery and Energy Reliability’s national efforts to modernize the electric grid, visit www.oe.energy.gov.



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