

PECO

Smart Future Greater Philadelphia

Scope of Work

PECO's Smart Future Greater Philadelphia project included installation of a robust, multi-tiered communications infrastructure to support deployment of advanced metering infrastructure (AMI) and distribution automation (DA). Over 784,000 smart meters were deployed, as well as a meter data management system (MDMS), a web portal, a time-of-use (TOU) pricing pilot, and a variety of DA assets, including capacitor and voltage controllers.

Objective

The main objective of the project was to accelerate the deployment of PECO's planned AMI system, the MDMS, and selected DA equipment to deliver the benefits of the new technologies more quickly to customers and improve operational efficiency.

Deployed Smart Grid Technologies

- **Communications infrastructure:** PECO deployed a multi-tiered communications infrastructure that includes a high-bandwidth fiber optics and microwave core network, a medium-bandwidth radio frequency backhaul, a low-bandwidth radio frequency field area network, and ZigBee communications to enable home area network technology. The project installed 368 miles of fiber optic cable, connecting 71 substations to the core network and providing digital communications for existing system telemetry protection applications. The new communications infrastructure provides system-wide support for AMI and DA, enabling more flexible and reliable operation of the distribution system while positioning PECO with the capability to add future programs and functionality for its customers.
- **Advanced metering infrastructure:** The project included the accelerated deployment of more than 784,000 smart meters and a MDMS, as well as the integration of AMI with existing back office systems. PECO's AMI system supports outage management and delivers reliable restoration notifications. Remote connect/disconnect functionality saves truck tolls and has enabled PECO to respond to customer service requests more efficiently.
- **Advanced pricing programs:** A dynamic pricing pilot offered TOU rates to a limited number of residential and commercial customers. PECO's plan was developed with input from community stakeholders and the approval of the Pennsylvania Public Utility Commission. Communications and outreach campaigns were launched to educate

At-A-Glance

Recipient: PECO

State: Pennsylvania

NERC Region: ReliabilityFirst Corporation

Total Project Cost: \$415,118,676

Total Federal Share: \$200,000,000

Project Type: Integrated and/or Crosscutting
Systems

Equipment/Systems

- 784,253 Smart Meters
- AMI and DA Communications Networks
 - Fiber Optics and Microwave Network
 - Radio Frequency Network
 - Home Area Network
- Meter Data Management System
- Customer Web Portal
- Distribution Automation Equipment
 - Distribution Management System/SCADA
 - Intelligent Substation Upgrades
 - Feeder Monitors/Indicators
 - Automated Feeder Switches
 - Capacitor Automation Equipment

Dynamic Pricing Programs

- Time of Use: Pilot Program Offered to 120,000 Residential and Commercial Customers
- In-Home Displays: Pilot Program at 57 Volunteer Participant Locations

Key Benefits

- Improved Electric Service Reliability and Operational Efficiency
- Improved Customer Service
- Reduced Truck Rolls

customers about the new AMI-enabled pricing program. PECO also initiated a technology pilot, installing home area network (HAN) devices in the homes of 57 volunteers to evaluate the operability and reliability of those devices.

- **Distribution automation systems:** PECO deployed 100 new reclosers, 21 vacuum circuit breakers, communications upgrades for more than 300 existing reclosers, disturbance monitoring capabilities at 31 substations, remote terminal unit upgrades at 4 substations, and intelligent microprocessor upgrades at 10 substations. These devices will help reduce the number of sustained outages, shorten restoration times, and improve operational efficiency. The project also replaced the utility's distribution management system (DMS). This effort included implementation of a geographical information system (GIS) and integration with the existing distribution automation assets, enabling PECO to more effectively manage power distribution to better match customer demand. Associated with the new DMS system, PECO conducted proofs of concepts for automated switching analysis; load flow; short circuit analysis; and fault location, isolation, and system restoration (FLISR).
- **Distribution system energy efficiency improvements:** PECO installed 63 distribution capacitors, made upgrades to 63 capacitor controllers, and replaced 44 automatic voltage controllers, ultimately making improvement to 87 substations. Additionally, PECO performed a proof of concept of an integrated volt/volt-ampere reactive (volt/VAR) application at 2 substations that involved installation of 4 transformer automated voltage controls and 36 automated capacitor controls to pilot conservation voltage reduction technology at 2 substations with 12 associated circuits.

Benefits Realized

- **Improved electric service reliability:** AMI integration with outage management systems has improved service reliability. After a recent major storm, these technologies reduced restoration time by three days.
- **Improved power quality and operational efficiency:** Through upgrades to the distribution system and new smart devices, PECO achieved a 1% voltage reduction at the affected substations. In conjunction with the volt/VAR application, these improvements enabled improved voltage and reactive power control on 72 distribution circuits to improve voltage regulation and reduce energy losses.
- **Improved customer service:** Web presentment of electric usage data has improved customer satisfaction and service.
- **Reduced truck rolls:** Remote connect/disconnect has saved 33,000 truck rolls already since the inception of the program and provides faster, more convenient service.

Lessons Learned

- Utilizing multiple installation vendors provides greater flexibility.
- Deployment of advanced AMI system capabilities (e.g., remote connect/disconnect, third-party data access, and web presentment) requires a critical mass of meters and a stable network.
- External meter evaluations based on UL standards provides reassurance of product quality.
- Integration of new systems requires an agile approach during design and deployment.
- DA systems integration maturity is continuing to evolve.
- HAN industry interoperability functionality is continuing to evolve toward a reliable "plug and play" solution.

Future Plans

PECO plans to continue AMI meter deployment to all 1.6 million of PECO's electricity customers. To ensure success, the utility will continue to partner with, learn from, and support other utilities in their ongoing AMI deployments.

Contact Information

James Johnson
Project Management Office, Manager
PECO Energy Company
James.Johnson5@exeloncorp.com