FirstEnergy

Smart Grid Modernization Initiative

Abstract

FirstEnergy's Smart Grid Modernization Initiative project includes deployment of advanced metering infrastructure (AMI), distribution automation assets, time-based rate programs, load control, and customer systems in New Jersey, Ohio, and Pennsylvania. AMI for residential and commercial customers enables two-way communication and helps customers manage energy use and bills. Distribution automation includes capacitor and regulator controls and feeder switches. Direct load control devices are being deployed to reduce peak demand. The project also includes a statistically rigorous consumer behavior study to assess load impacts and customer acceptance of time-based rate programs.

Smart Grid Features

Communications infrastructure includes an integrated system including fiber and a radio frequency mesh network and pole-mounted concentrators deployed in all three states supporting various smart grid technologies. The concentrators provide routing points between the radio wireless networks and transmit the data to the central control center.

Advanced metering infrastructure includes deployment of 5,000 smart meters for initial study potentially followed by a larger deployment of 39,000 meters in the Cleveland Electric Illuminated Company (CEI) service area. The smart meters offer enhanced outage visibility and reduced restoration times, and they provide data used for more detailed customer load profile analysis and demand forecasting.

Distribution automation systems include installation of a centralized software tool for distribution system control and upgrades of selected distribution circuits by Metropolitan Edison Company (Met-Ed) and CEI. Upgrades include supervisory control and data acquisition (SCADA) displays for substation breakers and field devices and installation of automated feeder switches and feeder monitoring devices.

Distribution system energy efficiency improvements include the installation of a centralized software tool for integrated voltage

At-A-Glance

Recipient: FirstEnergy

State: New Jersey, Ohio, and Pennsylvania

NERC Region: ReliabilityFirst Council

Total Budget: $114,940,273

Federal Share: $57,470,136.50

Key Partners: Cleveland Electric Illuminating Company (CEI), Metropolitan Edison Company (Met-Ed), Jersey Central Power & Light Company (JCP&L)

Project Type: Integrated and/or Crosscutting Systems

Equipment
- **Up to 44,000 Smart Meters**
- **AMI Communication Systems**
  - **Backhaul Communications**
- **40,500 Direct Load Control Devices**
- **Customer Systems for up to 44,000 Customers**
  - **In-Home Displays**
  - **Programmable Communicating Thermostats**
- **Distribution Automation Equipment for 65 out of 3,036 Distribution Circuits**
  - **Distribution Automation Communications Network**
  - **SCADA Communications Network**
  - **Automated Distribution Circuit Switches**
  - **Automated Regulators**
  - **Automated Capacitors**
  - **Circuit Monitors/Indicators**

Time-Based Rate Programs (a pilot study)
- **Peak-Time Rebate**
- **Critical Peak Pricing (opt-in)**

Key Targeted Benefits
- **Reduced Operating and Maintenance Costs**
- **Reduced Electricity Costs for Customers**
- **Improved Electric Service Reliability and Power Quality**
- **Reduced Costs from Equipment Failures, Distribution Line Losses**
- **Reduced Greenhouse Gas and Criteria Pollutant Emissions**

control from capacitor controllers, line capacitor switches, and load tap changers. This system facilitates automated control and optimization of distribution circuit voltages, which increase efficiency and improve power quality.

Time-based rate programs include peak time rebates and possibly opt-in critical peak pricing offered by CEI in conjunction with the deployment of the smart meters. Peak-time rebates offer a financial incentive for electricity customers to lower their peak demand while critical peak pricing provides a higher on-peak price signal to induce demand reductions. Both options involve day-ahead notification of the opportunity to earn the rebate or see a higher on-peak price.

Advanced electricity service options include in-home displays, programmable communicating thermostats, and direct load control devices to CEI customers participating in the consumer behavior study. These devices facilitate two-way information exchange and enable customers to better manage their electricity use and bills.

Direct load control devices include approximately 40,500 units and communications infrastructure to control air conditioners. Participants receive financial incentives in exchange for allowing the utility to raise thermostat set points by either 6 degrees or 9 degrees.

Consumer Behavior Study

This study involves 5,000 CEI customers and tests of various rate and enabling technology combinations to assess load impacts and customer acceptance in a randomized control design with treatment and control groups. This study includes two opt-out peak-time rebate options and possibly an opt-in critical peak pricing option. Enabling technologies include programmable thermostats with the customer choice of being utility-controlled or customer-controlled, power switches, and in-home displays. Notification methods include e-mail, phone, and text messaging. Usage information is available through a Web portal.

Timeline

Key Milestones	Target Dates
Direct load control asset deployment begins	Q1 2010
Distribution automation/advanced voltage control asset deployment begins	Q4 2010
AMI asset deployment begins	Q2 2011
Consumer behavior study pricing program begins	Q2, 2011
Direct load control asset deployment ends	Q2 2012
Distribution automation/advanced voltage control asset deployment ends	Q3 2012
AMI asset deployment ends	Q2 2013
Consumer behavior study pricing program ends	Q3 2014

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