

Oklahoma Gas & Electric

Positive Energy® Smart Grid Integration Program

Abstract

The Oklahoma Gas and Electric (OG&E) Positive Energy Smart Grid Integration Program project involves system-wide deployment of a fully integrated advanced metering system, distribution of in-home devices to almost 6,000 customers, and installation of advanced distribution automation systems. The project is a partnership with customers, aimed at reducing peak loads, overall electricity use, and operations and maintenance costs while increasing distribution system efficiency, reliability, and power quality.

The project implements secure wireless communications to: 1) allow smart meter customers to view their electricity consumption data whenever they want through a personalized Web site (study participants are testing other visual displays), and 2) allow OG&E to manage, measure, and verify targeted demand reductions during peak periods. New systems capture meter information for billing and implement new customer pricing programs and service offerings. The project deploys a more dynamic distribution management system, automated switching, and integrated voltage and reactive power control (IVVC) that reduces line losses, reduces operational costs, and improves service reliability. The project also includes a study of consumer behavior in response to different forms of time-based rate programs and home area network smart technology on an opt-in basis. Finally, the program includes collaboration with University of Oklahoma faculty and students to deploy technologies within 46 buildings on the Norman, Oklahoma campus and to take advantage of opportunities for education and training.

Smart Grid Features

Communications infrastructure includes a secure wireless network system that provides the backbone for energy management programs and allows for integration with smart appliances and home area networks. This infrastructure also provides OG&E with expanded capabilities for communication to link customer information, energy delivery system operations, and system reliability information.

Advanced metering infrastructure (AMI) includes deployment of approximately 770,000 smart meters covering OG&E's entire service territory and its supporting IT infrastructure. This system provides

At-A-Glance

Recipient: Oklahoma Gas & Electric

State: Oklahoma and Arkansas

NERC Region: Southwest Power Pool

Total Budget: \$293,201,332

Federal Share: \$130,000,000

Key Partner: University of Oklahoma

Project Type: Integrated and/or Crosscutting Systems

Equipment

- **770,000 Smart Meters**
- **AMI Communications Systems**
 - **Meter Communications Network**
 - **Backhaul Communications**
- **Meter Data Management System**
- **Customer Systems for 48,000 Customers**
 - **Home Area Network**
 - **In-Home Displays**
 - **Programmable Communicating Thermostats**
- **Distribution Automation Equipment for 400 out of 1,064 Feeders**
 - **Distribution Management System**
 - **Automated Distribution Circuit Switches**
 - **Automated Capacitors**

Consumer Behavior Study Targeting 5,250 Customers

- **Time of Use**
- **Variable Peak Pricing**
- **Critical Peak Pricing**

Targeted Benefits

- **Reduced Electricity Costs for Customers**
- **Reduced Operating and Maintenance Costs**
- **Increased Electric Service Reliability and Power Quality**
- **Deferred Investment in Generation, Transmission, and Distribution Capacity Expansion**
- **Reduced Greenhouse Gas Emissions**

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automated meter reading, improved meter accuracy, enhanced outage response and notification, and improved theft of service detection. More detailed and timely data on peak electricity usage improves load forecasting and capital investment planning.

Advanced electricity service options offered through the program involve deployment of devices and Web-based technology to modify electricity use and reduce peak demand to homes and businesses. These smart technologies include Web portal access, in-home display devices, energy management systems, and programmable communicating thermostats. These devices, combined with the AMI system, are intended to help customers make decisions to reduce their peak electricity load and overall energy usage on a real-time basis.

Time-based rate programs being tested by customers include variable peak pricing and standard time-of-use pricing, both with critical price elements.

Distribution automation systems include advanced automated equipment to improve the performance of the distribution equipment. OG&E will deploy automated switches and reclosers, fault circuit indicators, and feeder meters integrated with a distribution management system on 400 high priority circuits. This reduces service interruptions and the frequency and duration of outages while also reducing field operation requirements. Distribution automation helps with future implementation of distributed generation such as solar and wind installed on or near residences and commercial buildings.

Distribution system energy efficiency improvements involve the deployment of automated capacitors, as well as voltage and current sensors integrated with feeder monitors. The automation of these systems allows for greater control of power quality and enables more cost-effective voltage and reactive power control. Increased voltage control allows for smaller voltage drops over the distribution feeders and improved power factor, reducing line losses, and increasing the overall efficiency of the system, which is especially important during peak periods of demand.

Customer collaboration opportunities with the University of Oklahoma include a range of programs to engage students and faculty, as well as to complete the engineering design and implementation of Smart Grid technologies in 46 campus buildings to reduce electricity consumption and operating costs.

Consumer Behavior Study

OG&E is assessing the relative merits of several time-based rate program options and information treatments on a subset of residential and commercial sector volunteers in Norman. This is a randomized, statistically-based study involving 4,000 residences and 1,320 small businesses, including the control group. The pricing options include 1) variable peak pricing, a rate plan where the peak period price changes daily to better reflect exigent system conditions and the real cost of providing power with a critical price element, and 2) a time-of-use rate plan with a critical price element. Smart technologies being tested include a personalized Web site, display devices, and programmable communicating thermostats. The study will explore how consumers respond to the peak price options as well as the relative effects of the various information-providing technologies. The study also will estimate impacts on total electricity use, customer bills, and hourly load profiles using information collected through advanced meters.

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Timeline

Key Milestones	Target Dates
AMI/distribution automation deployment begins	Q4 2009
Customer study I and IVVC study	Summer 2010
Customer study II and IVVC study	Summer 2011
Distribution management system installed	Q4 2011
AMI deployment completed	Q4 2012

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