Tri-State Electric Membership Corporation
Smart Grid Project

Scope of Work

Tri-State Electric Membership Corporation's (TSEMC's) smart grid project involves deployment of about 15,000 new smart meters, supporting communications infrastructure, an upgraded meter data management system, and advanced energy management programs for customers. The Advanced Metering Infrastructure (AMI) system and associated customer web portal provide the capability to enhance outage management, enable remote, automated meter reading, and introduce time-based rate programs to customers.

Objectives

The project aimed to reduce theft, improve outage management, lower operations and maintenance costs, and encourage conservation by providing customers with more information and more control over their energy consumption.

Deployed Smart Grid Technologies

- **Advanced metering infrastructure (AMI):** The project has installed 15,156 new smart meters (12,500 residential, 592 commercial, and 2,064 Remote Service Switches (RSS)) in TSEMC's service territory, covering nearly the entire customer base. The meters provide capabilities for a variety of current and future customer electricity price and service options that, when adopted, may contribute to reductions in TSEMC's wholesale generation and electricity delivery costs. New features include outage and restoration notification and remote service connect/disconnect switches so that TSEMC can respond to outages and customer requests more efficiently. An upgraded meter data management system (MDMS) provides a platform for validation, organization, analysis, and distribution of the meter data to other applications, including the billing system and the new customer web portal.

- **Communications infrastructure:** The project has deployed a two-way meter data network across the entire TSEMC service territory. Power line carrier (PLC) communications modules relay data from smart meters, through substations, to the TSEMC back office monitoring systems.

- **Customer system devices:** TSEMC deployed a web portal to enable customers with smart meters to access their usage, cost, and load profile data, as well as support a pre-pay pricing option. The pre-pay program gives customers additional tools and flexibility to manage usage to a budgeted amount. As of the third Quarter of 2013, 810 households had enrolled in the pre-pay program (out of the 2,096 RSS meters), and 947 households regularly access the web portal to monitor and better manage their consumption.

- **Time-based rate programs:** TSEMC operates within the Tennessee Valley Authority, which deployed a wholesale time-of-use rate structure in 2012. TSEMC will in the future offer corresponding retail time-of-use rates to its

At-A-Glance

Recipient: Tri-State Electric Membership Corporation

States: Georgia, North Carolina, Tennessee

NERC Region: SERC Reliability Corporation

Total Project Cost: $2,428,454

Total Federal Share: $1,138,060

Project Type: Advanced Metering Infrastructure Customer Systems

Equipment Installed
- **15,156 Smart Meters**
- **Advanced Metering Infrastructure**
  - **Power Line Carrier Network**
  - **Remote Service Switches**
- **Meter Data Management System**
- **Customer Web Portal**

Key Benefits
- **Reduced Meter Reading Costs**
- **Reduced Operating and Maintenance Costs**
- **Reduced Truck Fleet Fuel Usage**
- **Reduced Costs from Theft**
- **Reduced Greenhouse Gas and Criteria Pollutant Emissions**

customers. This program will provide customers with greater control over their electrical costs while encouraging increased awareness of the dynamic price of electricity.

Benefits Realized

- **Reduced Operating and Maintenance Costs:** AMI enables remote, automated meter reading at frequent intervals and provides the data needed to generate off-cycle bills without dispatching crews to the field to take readings. Meter department costs have been reduced by 75% of the pre-project 2009 levels. Furthermore, additional operational cost savings are derived from the automation of meter reading, remote meter troubleshooting capabilities, and more efficient customer service activities.

- **Reduced Truck Rolls and Fleet Fuel Usage:** Based on historical data, the use of the service disconnect meters to remotely disconnect and reconnect services and the success of the pre-pay program have led to a reduction in the truck rolls and fuel usage by the equivalent of an entire vehicle, considering that more than 31,000 miles and 7,770 trips that were avoided in 2012 alone.

- **Reduced Costs from Theft:** In much the same way that outages are detected, theft and meter tampering are detected based on an MDM evaluation of the momentary outages in the surrounding area and customers.

- **Power Quality:** Minimum and Maximum voltages may be reported for a single customer or group of customers for customer and feeder evaluation to improve power quality.

- **Meter Data Completeness:** Meter data is more reliable and missing readings have been reduced to 0.2% of the total readings for the year. This has also reduced truck roll and fuel usage and has allowed existing employees to concentrate efforts on more productive activities instead of reading non-reporting meters.

- Distributed Generation: The project supports customer owned distributed generation by reporting daily generation and may provide interval data if necessary. Currently TSEMC supports almost 1MW of photovoltaic generation producing in excess of 1 million kWhs each year.

- **Reduced Write-offs and Bad Debt:** The pre-pay program allows customers to manage their usage on a daily basis and has been found to be a useful for the customers' budgeting purposes. It even provides an opportunity for customers who were on traditional billing to "catch up" and pay previous balances while still remaining connected. Debt recovery for the cooperative exceeds $35,000.

- **Outage Detection:** TSEMC integrates its AMI meter status data with the GIS system to detect outages and dispatch crews even without customer interaction. Many customers are seasonal and are not at the location to report the outage. During major feeder outages, the restoration status for "end of the line customers" is monitored while crews are still in the area allowing improved efficiency of repair crews.

Lessons Learned

Interdepartmental cooperation and teamwork was critical to completing this project successfully. Each department, including construction/maintenance, metering, billing, mapping, and engineering was involved in the development of the project execution plan and the deployment processes necessary for maintaining business continuity.

Customer acceptance was much greater than anticipated. Most customers understand the financial benefits of the AMI system and embraced the customer programs aimed at delivering more reliable and lower cost service. TSEMC membership has taken advantage of the opportunity to use the new tools to make more informed decisions about their energy usage.

Future Plans

The grant enabled TSEMC to deploy an AMI system and offer programs that are customer- focused and forward-looking that would otherwise have taken 5-10 years to deliver based on financial constraints. TSEMC will continue to install additional service disconnect meters in support of the pre-pay program and for continued improvement in the meter department's operational efficiency and cost reduction efforts. TSEMC expects to leverage AMI system data and functionality to improve outage management, offer time-based rates, and explore options for a demand response program.

Contact Information

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