Electric Power Board of Chattanooga (EPB)

Smart Grid Project

Scope of Work

EPB's smart grid project involved deployment of a fiber optic network as the primary means of communication for all smart grid equipment, an advanced metering infrastructure (AMI) system, an energy management web portal, and distribution automation (DA) equipment on over half of EPB's circuits. The project also delivered time-based rate programs to customers to create incentives for peak load and overall bill reductions.

Objectives

The EPB smart grid project has enabled a new kind of partnership with customers aimed at reducing peak loads, overall electricity use, and operations and maintenance costs. The distribution system upgrades increase operational efficiency, reduce line losses, and improve service reliability for customers.

Smart Grid Tools and Technologies

- **Communications infrastructure:** The project deployed a fiber optic network that enables two-way communication and data transfer between the meters, switches, substations, and control center. This infrastructure also provides EPB with expanded capabilities and functionality to optimize energy delivery, system reliability, and customer service options.
- **Advanced metering infrastructure:** The project deployed approximately 170,000 smart meters, providing AMI coverage for all EPB customers. New AMI features such as outage and restoration notification and remote service connect/disconnect switches enable EPB to respond to outages and customer requests faster and more efficiently.
- **Customer system devices:** EPB deployed an AMI-enabled web portal for all 170,000 customers to provide them with account balances and interval usage data from their smart meters.
- **Time-based rate programs:** EPB developed and offered a Time of Use residential rate program to give customers more choices and greater control over their electricity costs.
- **Distribution system reliability improvements:** EPB deployed automated feeder switches and sensor equipment on 171 distribution circuits in the service territory. The project also included the automation of existing motor-operated switches on 61 sub-transmission circuits for improved system reliability. Supervisory control and data acquisition (SCADA) system upgrades leveraged an Internet protocol-based fiber optic communications infrastructure to

At-A-Glance

Recipient: EPB

State: Tennessee, Georgia

NERC Region: SERC Reliability Corporation

Total Project Cost: $232,219,350

Total Federal Share: $111,567,606

Project Type: Advanced Metering Infrastructure
Customer Systems
Electric Distribution Systems

Equipment

- **170,000 Smart Meters**
- **AMI Communications Systems**
  - **Meter Communications Network**
  - **Backhaul Communications**
- **Customer Web Portal**
- **Replacement of SCADA System**
- **Distribution System Automation/Upgrade for 232 out of 370 Circuits**
  - **SCADA Communications Network**
  - **1,405 Automated Distribution Circuit Switches***

*Including automation of existing motor-operated switches at the sub-transmission level

Time-Based Rate Program Targeting up to 5,000 Customers

Key Benefits

- **Reduced Operating and Maintenance Costs**
- **Reduced Meter Reading Costs**
- **Improved Electric Service Reliability**
- **Reduced Costs from Equipment Failures and Theft**
- **Reduced Truck Fleet Fuel Usage**
- **Reduced Greenhouse Gas and Criteria Pollutant Emissions**

support expanded automation equipment installations and provide improved situational awareness for dispatch operators.

Benefits Realized

- **Reduced operating and maintenance costs:** EPB has realized $1.6 million in annual operational cost savings through automation of meter reading. Furthermore, avoided manual switching costs have saved the utility approximately $40,000 annually. The automated switching has significantly reduced the need to send staff into the field during and after storms to identify damage locations, isolate the damage, and restore the unaffected sections. In one severe storm that occurred July 5, 2012, EPB realized savings of over $1 million in overtime costs associated with the restoration effort.
- **Increased distribution system reliability:** Voltage control allows EPB to reduce peak demand by up to 30 megawatts per month, resulting in $2 million in wholesale demand savings annually. Over the last two years, EPB has experienced a 42% improvement in the System Average Interruption Duration Index (SAIDI) and a 51% improvement in the System Average Interruption Frequency Index (SAIFI).
- **Reduced costs from theft:** EPB lowered operations costs from remote meter reading and more frequent identification of electricity theft.

Lessons Learned

EPB's system, which is over 60 years old, was designed with 115 small substations and limited centralized communications architecture. With a 600-square-mile territory and extreme annual storms, this lack of connected communications and distribution management capabilities has traditionally meant slow response times and labor-intensive outage recovery. With the addition of AMI and DA, EPB has turned an antiquated system design into an automated, integrated grid with built-in redundancies.

Future Plans

The strategic deployment of DA equipment is part of EPB's plan to more fully automate its distribution system. Data from the smart switches will also provide the intelligence needed to calculate real-time loading on each of EPB's transformers so that demand can be better calculated and forecasted, thus utilizing existing capital assets more effectively. EPB is also considering exploring opportunities around distributed storage. With the communications infrastructure in place, transformers have the potential to be utilized as remotely controlled battery back-ups that can supply power during periods of peak demand.

Contact Information

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