Golden Spread Electric Cooperative, Inc.

Smart Grid Project

Scope of Work

The Golden Spread Electric Cooperative, Inc. (GSEC) Smart Grid Project deployed advanced metering and distribution automation (DA) to 10 of its 16 member distribution cooperatives (co-ops). The deployment included a total of 88,411 smart meters. The geographic area served by GSEC and the 10 participating co-ops is large and rural in nature. Each member co-op designed and planned a project to address specific challenges and achieve benefits.

Objectives

In general, the projects aimed to reduce customer electricity costs, peak demand, and operations costs while improving distribution reliability. The GSEC project deployed advanced metering infrastructure (AMI) to (1) allow select customers to view electricity usage through a web portal and/or mobile application (app), (2) allow participating co-ops to manage, measure, and verify targeted reductions during peak periods, and (3) reduce operations and maintenance costs by automating meter reading and service tasks. The AMI installations also targeted improved service reliability, along with the DA deployment.

Deployed Smart Grid Technologies

- **Communications infrastructure:** The distribution co-ops installed equipment to connect AMI and DA devices to their head end systems. Each co-op used a system and approach suitable to the terrain in that particular service territory. Options included wireless and power line carrier (PLC) communications systems.
- **Advanced metering infrastructure:** The project deployed 88,411 AMI (smart) meters throughout the 10 distribution co-ops. For some co-ops, the installation provided 100% communications coverage. For others, the project involved developing pilot programs to assess operational capabilities and benefits for later expansion. Smart meters enable two-way communication, which supports (1) electricity usage information exchange, facilitating better management of customer loads, and (2) automation of customer service requests and meter reading, resulting in operational cost savings and improved customer service. In some cases, AMI systems were integrated with outage management, distribution, and customer information systems, allowing the co-

At-A-Glance

Recipient: Golden Spread Electric Cooperative, Inc.

State: Texas

NERC Region: Texas Regional Entity and Southwest Power Pool Regional Entity

Total Project Cost: $44,102,121

Total Federal Share: $17,263,114

Key Partners: Bailey County, Big Country, Deaf Smith, Lamb County, Lighthouse, Lyntegar, North Plains, Rita Blanca, South Plains, and Taylor electric cooperatives

Project Type: Advanced Metering Infrastructure
Customer Systems
Electric Distribution Systems

Equipment Installed by Co-ops

- 88,411 Smart Meters
- AMI Communications Systems (wireless, PLC, and others based on terrain)
  - Meter Communications Network
  - Backhaul Communications
- Meter Data Management System
- Web Portal Access for Select Customers
- 1,311 Programmable Communicating Thermostats
- 1,882 Direct Load Control Devices (AC and irrigation)
- Distribution Automation Equipment for 151 out of 703 Circuits
  - Distribution Management Systems
  - Distribution Automation Communications Network
  - SCADA Communications Network
  - 97 Automated Feeder Switches
  - 23 Automated Capacitors
  - 16 Automated Voltage Regulators
  - 114 Feeder Monitors
  - 34 Remote Fault Indicators
  - 138 Smart Relays

Key Benefits

- Improved Electric Service Reliability and Power Quality
- Reduced Costs from Equipment Failures, Distribution Line Losses, and Theft
- Reduced Meter Reading Costs
- Reduced Operating and Maintenance Costs
- Reduced Truck Fleet Fuel Usage

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ops to respond to outage and customer requests more efficiently.

- **Advanced electricity service options:** The project offered a pilot programmable communicating thermostat program. The programmable thermostats facilitate two-way exchange of information and enable customers to better manage their electricity use and costs through appliance control. Another option allows consumers to enroll in a pre-pay program that enables them to budget the dollar amount of electricity they plan to use each month to help keep their electricity use affordable.
- **Direct load control devices:** Lamb County, Rita Blanca, South Plains, and Taylor installed load control devices in their distribution territories. Including the programmable thermostat pilot program, a total of 3,193 direct load control devices were deployed. The load control devices are used for both residential air conditioning (AC) and large irrigation pumping. Participating customers receive rebates on their electric bills in exchange for allowing the distribution cooperative to reduce load during peak periods or when GSEC issues emergency load shedding requests.
- **Distribution automation systems:** The DA systems involved deployment of a variety of devices throughout the distribution systems. Some co-ops used DA deployments to address needs specific to their territories. While the deployments differ, all work to improve distribution system reliability and operational efficiency. DA devices include switches, remote terminal units, supervisory control and data acquisition (SCADA), and other intelligent electronic devices.
- **Distribution system energy efficiency improvements:** Deployment of integrated voltage/volt–ampere reactive (volt/VAR) control by Deaf Smith, Lyntegar, South Plains, and Taylor distribution territories has improved the efficiency of the distribution systems, reduced line losses, and improved power quality.

Benefits Realized

- **Improved electric service reliability and power quality:** The installed smart grid technologies identify voltage and power factor issues, provide real-time monitoring of system performance, pinpoint outages, ping meters to verify voltage restoration, and provide valuable data for planning system improvements which, in turn, create better reliability and power quality.
- **Reduced costs from equipment failures, distribution line losses, and theft:** DA identifies equipment problems before major failures occur and in some cases provides self-healing of the distribution system. The member co-ops are able to reduce distribution line losses by synchronizing their billing period with GSEC's billing period and by implementing power loss correction programs to maintain power factor at each load area. AMI pings provide tamper detection and theft reduction.
- **Reduced greenhouse gas and criteria pollutant emissions:** Reductions in distribution line losses have lowered the amount of electric generation required to serve the co-op load, thus reducing greenhouse gases. In addition, AMI and DA have reduced the number of truck rolls and vehicle miles driven per year, thus lowering pollutant emissions. Annual savings are in the range of 12,000 truck rolls and 375,000 vehicle miles avoided.
- **Reduced truck fleet fuel usage:** Fuel usage has declined in proportion to the number of vehicle miles avoided.
- **Reduced meter reading costs:** Co-ops converting to AMI from manual meter reading have realized reduced meter reading costs.
- **Reduced operating and maintenance costs:** Although specific numbers are not yet available, the co-ops saw reductions in operating and maintenance costs following equipment deployment.

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- **Improved member consumer satisfaction:** AMI and web portals provide consumers with a better understanding of their consumption patterns and better ability to adjust usage, improved resolution of billing questions, new billing options such as prepaid metering, and quicker service restoration. As a result, consumer feedback has been positive.

Lessons Learned

- **Planning:** Cleanup of existing meter records is necessary before proceeding with an AMI project to ensure that all systems are prepared for integration with the AMI system.
- **Consumer buy-in:** Communicating with consumers as often as possible during AMI deployment furthers their acceptance of the new technologies.
- **Communications equipment and testing:** Communications is a critical component of the system, and fiber connections make for a more stable installation. Because the geographic area of the service territories is large and rural in nature, the exclusive use of fiber is very costly. PLC and radio systems were utilized instead, and in some cases, they may require additional enhancements to strengthen signals as they travel over long distances. Testing in remote areas is especially important.
- **AMI meter failures:** The AMI meters are not as robust as expected. In some instances, voltage surges due to lightning have been a problem.
- **Additional personnel training:** Additional personnel training is often required to manage the new software platforms and voluminous data. Reductions in meter reader numbers because of AMI may be offset by additional staff to manage the new smart grid system technologies.

Future Plans

- **AMI and DA installations:** Several of the co-ops will continue with installation of AMI and DA beyond the grant period.
- **Cybersecurity committee:** GSEC created a cybersecurity committee to comply with grant requirements. This committee has been very effective, and thus it may be expanded to all 16 GSEC member distribution co-ops.
- **Summer peak load:** Pumping water for irrigation of commercial agriculture is the most significant driver of GSEC's summer peak load. Because irrigators have limited ability to curtail pumping during growing season without damaging their crops, GSEC's load control program is designed for emergency situations only. The hope is that future improvements in technology will create new opportunities to better manage the irrigation load.

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