City of Leesburg, Florida

Leesburg Smart Grid Investment Grant Project

Scope of Work

The City of Leesburg's (Leesburg's) Smart Grid Investment Grant project involved city-wide deployment of advanced metering infrastructure (AMI), installation of new customer systems, and expansion of distribution automation (DA) capabilities. Leesburg enacted a consumer education program to help customers fully exploit the new devices and the energy usage information they provided. The project also automated and increased the efficiency of portions of the electric distribution system through deployment of automated voltage capacitors, intelligent electronic device (IED) controls located in new and existing feeder breakers, and automated field reclosers. A system-wide coordination and sectionalizing study was also performed.

Objectives

The project aimed to improve power quality, reduce line losses, shorten power outage duration, and reduce the number of customers affected by outages. In addition, Leesburg expected both to encourage conservation and energy efficiency behaviors and to reduce the utility's peak demand.

Deployed Smart Grid Technologies

- **Communications infrastructure:** Fiber optic networks were deployed as part of project scope, although some networks were in place before project initiation and were leveraged by the project. Leesburg used networks connecting critical infrastructure to distribution substations for two-way communications and data backhaul. Data from the IP-based smart meter mesh communications network were also backhauled over the fiber optic networks. Point-to-point radios were used to control capacitor banks. Additionally, the smart meters were equipped with a ZigBee customer interface enabling two-way communication between the utility and customer location.
- **Advanced metering infrastructure:** The project deployed 16,683 smart meters with remote service switches. The switches enable Leesburg to respond to customer requests more efficiently while reducing transaction costs. The meters provide outage notification and restoration information, which is integrated with

At-A-Glance

Recipient: City of Leesburg

State: Florida

NERC Region: Florida Reliability Coordinating Council

Total Project Cost: $19,587,256

Total Federal Share: $9,748,812

Project Type: Advanced Metering Infrastructure
Customer Systems
Electric Distribution Systems

Equipment Installed

- 16,683 Smart Meters
- AMI Communications Systems
  - Meter Communications Network (RF Mesh)
  - Backhaul Communications (Fiber)
- Meter Data Management System
- Initial Deployment of Customer Web Portal
- Distribution Automation Equipment for 4 Circuits
  - Distribution Automation Communications Network (Point-to-Point Radio, Fiber)
  - SCADA Communications Network
  - 2 Substation Transformers
  - 6 Distribution Feeder Breakers with IED Controls
  - 13 IED Controls in Existing Feeder Breakers
  - 11 Automated Distribution Reclosers
  - 20 Automated Capacitors
  - 2 Transformer Monitoring Relays
- 9 Distributed Energy Resource Interfaces

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 Costs

Leesburg's outage management system. This information helps reduce the duration of power outages and the cost to restore service. Some of the smart meters will be used to obtain voltage and power quality data for distribution planning and operations.

- **Advanced electricity service options:** Leesburg initiated the rollout of a web portal capable of displaying electricity usage information and corresponding billing histories for a small group customers (planning for a wider rollout was ongoing at the time of SGIG project completion). Programmable communicating thermostats were provided to a select number of residential customers.
- **Distribution automation systems:** The DA systems include voltage and capacitor automation systems, single- and three-phase automated recloser switches, and IED controls located in new and existing feeder breakers. The reclosers automatically correct momentary faults, reducing the number of customers affected. The reclosers are part of an automated network into which four distribution feeder breakers serving 3,700 customers were also integrated. The system is managed with a controller designed to identify a fault location, isolate the fault, and restore service to functional network areas (fault location, isolation and service restoration, or FLISR).
- **Distribution system energy efficiency improvements:** The project incorporated automated capacitor banks with reactive power control functionality on the distribution circuits that have voltage constraints.
- **Distributed energy resources interface and control systems:** Leesburg installed new controls and communications interfaces on eight existing standby generators located at municipal facilities. These devices enable the generators to operate more efficiently and effectively when needed during peak demand events.

Benefits Realized

- **Improved electric service reliability and power quality**: The DA system upgrades have allowed Leesburg to avoid approximately 10,150 customer outage minutes since 2009. While this represents the "official" reduction of customer outage minutes to date, additional time savings could be attributed to the new infrastructure and improved outage analysis time. In addition, the project's automated capacitor banks with reactive power control functionality improve power quality for customers, increase distribution efficiency, and reduce distribution line losses.
- **Reduced costs from equipment failures, distribution line losses, and theft**: AMI meters provide Leesburg with tampering alerts, and internal analysis of meter consumption data allows the utility to identify unusual trends associated with electricity theft. While the reductions in theft costs associated with unauthorized diversions are difficult to estimate, it is apparent that there have been significant reductions in the occurrence of theft. The word is definitely "on the street" that the City of Leesburg can detect any tampering associated with the new smart meters. The devices have also allowed Leesburg to catch numerous electricians and homeowners attempting to repair or upgrade their electric facilities without applying for permits and receiving inspections.
- **Reduced meter reading, operating and maintenance costs:** Since meters can now be read remotely, Leesburg has been able to reduce meter reading staff and costs associated with this activity. The actual cost savings would have been much greater had the other City-owned utilities (water and gas) joined the electric department in replacing their meters with remotely read meters.
- **Reduced truck fleet fuel costs**: Leesburg has automated the service order process and eliminated the need to roll a truck to read a meter.

City of Leesburg, FL *(continued)*

Lessons Learned

- **Invest more time in the analysis of the cost-saving project elements prior to project commitment and construction.** While Leesburg engaged a professional firm to analyze the fiscal aspects of the project, numerous assumptions proved to be off the mark. Too little attention was paid to the risks involved, and this oversight resulted directly in the cost-saving portions of the project being overestimated or eliminated.
- **Have a dedicated project manager and project team in place to delegate authority and coordinate efforts.** An independent project manager and team can help ensure project success through oversight and appropriate delegation of tasks.
- **Have dedicated resources that are separate from and additional to the existing personnel.** While visiting another project, it was noted that numerous personnel were relieved of their regular job duties while they worked on their project. This proved to be a very valuable and successful tactic, as the ability to focus solely on the project prevented schedule slippage, ensured quality control, and prevented employee exhaustion and morale problems.
- **Require a high level of contractor oversight and communication.** The project experienced a delay in meter data management system deployment, which translated to a substantial overall schedule slippage. High-level contractor oversight and communication can help avoid these types of issues.
- **Recognize that the communications infrastructure must be as reliable as the installed system components.** The project encountered issues of non-reporting meters after deployment as a result of insufficient mesh network strength in certain areas. In these cases, Leesburg rearranged relays and access points or installed other equipment to improve communication range.

Future Plans

Leesburg is considering offering net-metering and pre-payment plans to customers. Because the DA elements of the project have proven successful, many of the same technologies will become standard for future infrastructure additions and improvements. Continual adjustments will be made to the installed devices to further enhance their efficiency and effectiveness.

Contact Information

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