City of Wadsworth

Connected Grid Project

Scope of Work

The City of Wadsworth's (Wadsworth's) Connected Grid project involved system-wide deployment of advanced metering infrastructure (AMI) and targeted installation of in-home displays (IHDs), home area networks (HANs), programmable communicating thermostats (PCTs), and load control devices. Wadsworth also upgraded and expanded its deployment of distribution automation (DA) equipment across 17 circuits, including installation of automated reclosers (feeder switches) and capacitor bank controls.

Objectives

The AMI system enables remote meter reading, diagnostics, and troubleshooting, as well as improved customer engagement via AMI-enabled energy management tools, customer web access, and time-based pricing programs. New load control devices and PCTs help Wadsworth reduce peak load on the system. The DA upgrades improve reliability and reduce operations and maintenance costs and line losses.

Deployed Smart Grid Technologies

- **Communications infrastructure:** Wadsworth implemented a 24-mile fiber optic network to support the increased data traffic from the AMI and DA systems. The AMI meter network uses a radio frequency (RF) mesh Technology.
- **Advanced metering infrastructure:** The project involved system-wide deployment of smart meters for residential, small commercial, and large commercial/industrial customers. The residential smart meters are HAN-compatible for future integration with other in-home devices, such as smart appliances.
- **Meter data management:** A new meter data management system was installed to validate, process, and package interval and event data for other back-office systems and the new customer web portal.
- **Advanced electricity service options:** Volunteering customers can choose between the Peak Rewards or Right Time Pricing programs, new time-of-use (TOU) rate programs that encourage customers to shift consumption to off-peak times of the day. Wadsworth provided IHDs and PCTs to customers participating in

At-A-Glance

Recipient: City of Wadsworth

State: Ohio

NERC Region: ReliabilityFirst Corporation

Total Project Cost: $10,596,140

Total Federal Share: $5,298,070

Project Type: Advanced Metering Infrastructure
Customer Systems
Electric Distribution Systems

Equipment

- 12,600 Smart Meters
- AMI Communications Systems
  - Meter Communications Network (Radio Frequency Mesh)
  - Backhaul Communications (Fiber)
- Meter Data Management System
- 73 In-Home Displays installed
- 1,164 Programmable Communicating Thermostats
- Customer Systems for 1,325 Customers (Peak Rewards and Right Time Pricing program participants)
  - Home Area Networks, 73 installed
  - Customer Web Portal, 1,361 participants
  - Direct Load Control Devices, 124 installed
- Distribution Automation Equipment for 17 Circuits
  - Distribution Management System
  - Distribution Automation Communications Network
  - Automated Distribution Circuit Switches, 31 switches installed
  - Automated Capacitors, 13 installed

Time-Based Rate Programs

- Time of Use

Key Benefits

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

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the programs. IHDs and the web portal present usage data, trends, and energy conservation tips to customers to provide them with near-real-time information with which to make informed home energy management decisions and lower their monthly bills. Approximately 11% of the customer base is participating in one of the two programs.

- **Direct load control devices:** Load control relays are connected to the HAN and the smart meters. These devices enable Wadsworth to control certain appliances in exchange for rebates or monthly bill credits. HAN-eligible load control equipment includes air conditioners, water tanks, or pool pumps. Wadsworth uses these devices to limit its peak load and defer investment in distribution system capacity.
- **Distribution automation systems:** Wadsworth installed automated feeder switches and capacitor bank controls on 17 circuits. A new distribution management system improves reliability, voltage control, and power quality. The integration of capacitor automation and a power quality monitoring system reduces energy losses and allows the system to operate closer to authorized limits.

Benefits Realized

- **Improved electric service reliability and power quality:** Wadsworth has improved overall network reliability by adding remote switching functions and capacitor bank controls for remote volt–ampere reactive (VAR) control and reduction in line losses. Automated switching provided remote restoration of circuits during power outages, reducing outage times. Advanced solid state meters installed in connection with the AMI project are providing power quality information, including power factor information for commercial customers.
- **Reduced meter reading costs:** All customer locations are equipped with AMI meters that are capable of providing remote meter readings for billing purposes. Manual readings have been very nearly eliminated, as have associated meter reading labor and vehicle costs, resulting in significant operating savings.
- **Reduced operating and maintenance costs:** AMI meters are equipped with remote disconnect and reconnect capabilities, allowing Wadsworth to disconnect or reconnect a service without requiring a truck roll to manually visit the customer location. In addition, the AMI system can perform a power check to confirm a service is energized without the need for an on-site visit. These functions have reduced the number of truck rolls, which in turn reduces labor hours and vehicle maintenance costs.
- **Reduced costs from equipment failures, distribution line losses, and theft:** The City's new distribution management system, capacitors, and remote switching operations are helping to balance circuit loading and reduce the number of transformer failures. This load balancing helps to avoid overloading circuits, which reduces line losses and equipment failures. Theft detection capabilities provided by the new AMI system permit Wadsworth to respond to potential theft situations in a timely manner, which not only reduces revenue loss but also uncovers potentially unsafe wiring conditions.
- **Reduced truck fleet fuel usage and greenhouse gas and criteria pollutant emissions:** Remote switching functions have reduced both outage restoration times and the number of truck rolls needed to diagnose and fix problems. Even as they continue to enhance customer satisfaction, service restoration and meter reading improvements are contributing to a reduction in vehicle mileage and associated truck fleet fuel, maintenance costs, and greenhouse gas emissions.

Lessons Learned

- The project affected every department and ultimately necessitated organizational restructuring. Smart grid projects result in an overhaul in utility functions at every level, not just the equipment level.

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- Information technology (IT) demands on a smart grid project are significant, especially as cyber security must be a top priority. Utilities should be prepared for significant IT scope, identifying resources in advance. Research into cyber security will be required, and a cyber security plan should be developed and implemented. Wadsworth also formed a cyber security committee. Privacy rules must also be considered in IT implementation.
- The IT demands affected all staff, as everyone had to develop some familiarity with IT—and many other new skills. At times, the demands exceeded staff resources and availability.
- Most customers do not inherently understand how electricity rates are determined or how "smart" equipment benefits them, and many customers will resist new technologies. Wadsworth had to educate customers about the value of the programs being offered. Utilities must consider how to engage customers before implementation.
- Projects of this scale usually require contracts with multiple vendors, many of whom are learning about the maturing technologies themselves. Managing vendors and the integration of their activities is critical for project success.
- Project duration was long. The project team—and all staff affected by the project—must stay focused throughout implementation.

Future Plans

Wadsworth will continue to refine network switching operations to further improve response times. The utility will also continue to market load control and TOU pricing programs to increase customer participation. HAN programs will be expanded as new customer end-use programs become available.

Contact Information

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