CenterPoint Energy Houston Electric, LLC

Smart Grid Project

Scope of Work

As a result of the $200 million Smart Grid Investment Grant awarded by the U.S. Department of Energy, CenterPoint Energy Houston Electric's (CEHE's) Smart Grid Project accelerated the deployment of a territory-wide advanced metering infrastructure (AMI) system for more than 2 million endpoints. The communications infrastructure facilitates the transfer of meter data to CEHE's data collection engine and, ultimately, to customers through the Smart Meter Texas (SMT) web portal. The grant also provided the impetus for the initial deployment of CEHE's Intelligent Grid (IG) program. The IG deployment consisted of an advanced distribution management system (ADMS) as well as substation and distribution system upgrades across approximately 13% of CEHE's service territory, encompassing a portion of the Texas Medical Center (the world's largest medical center), Houston's key business districts, the Port of Houston, petrochemical infrastructure facilities that are vital to the nation's fuel supply, and high reliability impact areas along the northern portion of the service territory.

Objectives

AMI automates meter reading to improve efficiency and accuracy and reduce truck rolls. The system also enables tools and technologies that allow residential and commercial customers to effectively manage and control their electricity usage. IG improves system efficiency and reliability. Moreover, through the additional monitoring information provided to system operators, CEHE is now able to locate faults quicker and expedite the restoration process.

At-A-Glance

Recipient: CenterPoint Energy Houston Electric, LLC

State: Texas

NERC Region: Texas Reliability Entity

Total Project Cost: $639,187,435

Total Federal Share: $200,000,000

Project Type: Advanced Metering Infrastructure

Equipment Installed

- **2,042,352 Smart Meters**
- **AMI Communications Network (RF, WiMAX, and Cellular Technologies)**
- **Web Portal**
- **Microprocessor-Based Relays in 31 Substations**
- **570 Intelligent Grid Switching Devices Across 188 Distribution Circuits**
- **Advanced Distribution Management System**
- **Distribution Supervisory Control and Data Acquisition (DSCADA) System**

Key Benefits

- **Improved Distribution System Reliability**
- **Reduced Meter Reading Costs**
- **Reduced Operating and Maintenance Costs**
- **Reduced Truck Fleet Fuel Usage**
- **Reduced Costs from Theft Detection**

Deployed Smart Grid Technologies

- **Advanced metering infrastructure:** CEHE deployed over 2 million smart meters. This infrastructure provides remote service connection and disconnection and meter reading, improved meter accuracy, enhanced outage notification and response, and improved tamper and theft detection. The availability of more detailed and timely data on peak electricity usage and distribution system conditions improves load forecasting and capital investment planning.
- **Communications infrastructure:** A combination of radio, microwave, and fiber optic technology support AMI and distribution automation functionalities. Using cellular signal boosters, WiMAX 3650-megahertz (MHz) radios, 900 MHz radios, and signal repeaters eliminated the need for more costly satellite services. In addition, the amalgamated network includes back-up cellular communications, back-up battery power, data security encryption, and advanced site designs for the hard-to-reach areas. The infrastructure provides two-way communications with AMI meters and switching devices via private radio network. CEHE now has expanded capabilities for

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communicating customer information to retail electric providers, and remote switching capabilities allow for improved control of the distribution system.

- **Advanced electricity service options:** All CEHE customers with new smart meters may register for access to the new SMT web portal. This tool, in combination with the common data repository, is intended to provide customers with information that helps them better manage their energy usage and costs.
- **Substation and distribution infrastructure:** CEHE has upgraded 31 substations with microprocessor-based relays and installed approximately 570 intelligent grid switching devices (IGSDs) on 188 distribution circuits. This equipment and associated technology are being utilized remotely to reduce the extent and duration of service interruptions and minimize field operational requirements, improving distribution system reliability and overall operational efficiency.
- **Advanced distribution management system deployment:** CEHE deployed a new distribution SCADA system (DSCADA) as a component of ADMS. DSCADA provides the distribution controller with improved visibility into the distribution system's operation and the ability to remotely monitor and operate the IGSDs.

Benefits Realized

- **Improved distribution system reliability:** As a result of the automation associated with substation upgrades, IGSD deployment, and DSCADA implementation, CEHE has avoided approximately 15.5 million customer outage minutes since 2011. Where this automation was utilized, the outage restoration process has shown year-over-year improvements of 9% (2011), 22% (2012), 25% (2013), and 35% (2014 through August 31).
- **Reduced operating and maintenance costs:** Since there is no longer a need to physically read meters, CEHE has been able to significantly reduce meter reading staff and costs associated with this activity. Expenditures were also reduced through the smart meters' remote service switching feature and other efficiency improvements in operations and maintenance activities. As of December 31, 2013, overall operating and maintenance costs had decreased by approximately $55 million.
- **Reduced truck fleet fuel usage and reduced service fees:** CEHE has automated the service order process and eliminated the need to roll a truck to read a meter or start or stop service. The resulting cumulative fuel savings are approximately 950,000 gallons (as of August 31, 2014). CEHE has processed almost 10 million automated service orders since July 2009, saving customers approximately $24 million annually in service order fees.
- **Reduced costs from theft detection:** AMS meters send CEHE meter tampering alerts, and internal analysis of meter consumption data allows the utility to identify unusual trends associated with electricity theft. Thanks to these combined technologies, CEHE has been able to reduce the costs associated with diversion or theft by approximately $2 million (as of December 31, 2013).

Lessons Learned

- Implement a strong project governance process. CEHE established a project management office (PMO) with overall responsibility for the project. Other key organizational areas involved in the project management process included risk management, change management, financial management, project planning and scheduling, metrics and benefits reporting, and technical architecture. These teams met on a regular basis to resolve issues, identify risks, and ensure that the project was making sufficient progress. Going forward, the concept of a PMO has now been integrated into CEHE's business model as a best practice.

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- Design and build cyber security into the system architecture and deployment process from the beginning rather than retrofit later. The protection of customer data and the integrity of electric grid are paramount considerations and should be viewed as one of the integral components of any smart grid project.
- Utilize standard designs and installation processes. This is particularly important when using contractor resources, new standards, or new types of equipment.
- Require a high level of quality assurance. CEHE audited internal quality assurance processes of the vendors and implemented enhanced internal processes to ensure deployment of only high-quality products.
- Recognize that the communications infrastructure must be as resilient as the power delivery infrastructure.
- Develop the capability to monitor performance of the equipment installed in the field and the infrastructure necessary to operate it successfully.
- Map out a coordinated deployment strategy for not only the meters but also the communications equipment and back office upgrades. Having a time-sequenced plan in place made for a much more efficient deployment.
- Leverage existing infrastructure. Existing distribution poles, for example, were used for mounting cell relays and IGSD communications equipment. In addition, existing substation sites were used for construction of radio communications towers connecting to the private backhaul network.

Future Plans

- CEHE will continue to deploy AMI meters as the customer base grows.
- The remaining ADMS components (an outage management system and distribution management system) are targeted for initial deployment in November 2014, with subsequent deliveries of operational or advanced capabilities in early 2015.
- A deployment plan for system-wide IG expansion has been developed. Current projections are initiation in 2016 and completion in 2026.
- CEHE will continue to work with the ADMS vendor and the user community to develop and deploy additional advanced capabilities and applications.

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