

Sioux Valley Energy *SVE SmartGrid Program*

Scope of Work

The Sioux Valley Energy (SVE) Smart Grid Program deployed an advanced metering infrastructure (AMI) system to provide AMI-based services for SVE customers; installations included 27,641 smart meters and a supporting communications network. The project also implemented a critical peak pricing (CPP) pilot across the service territory to assess the effectiveness of time-based rate programs. The pilot involved deployment of home area networks, in-home displays, and a customer web portal, as well as implementation of a time-of-use electricity rate.

Objectives

The project aimed to reduce peak electricity demand, overall energy use, and operations and maintenance costs, while increasing distribution system efficiency and reliability. The project has implemented two-way communications to (1) allow customers to view their energy consumption at their convenience through a web portal and in-home devices; (2) enable SVE to manage, measure, and verify targeted demand reductions during periods of peak demand; (3) enable SVE to remotely identify and diagnose outage conditions and more quickly restore power; (4) perform near-real-time engineering analysis of the electric distribution system to allow for the most prudent use of capital dollars for system improvements; and (5) enable net metering for load-side or customer-owned generation.

Deployed Smart Grid Technologies

- **Communications infrastructure:** SVE installed a power line carrier (PLC) network to enable two-way communications with the AMI meters and allow for monitoring and control of distribution automation equipment in both urban and rural environments. SVE monitors feeder loads, in near-real time, by aggregating smart meter data transmitted over the PLC network, improving distribution system operations and planning.
- **Advanced metering infrastructure (AMI):** The project deployed smart meters to all 25,740 residential and 1,901 commercial customers. These meters provide the capability to implement a variety of time-based rates and service options. The meters also reduce SVE's costs of electricity delivery; operational cost savings result from lower meter reading and customer services costs. New AMI-enabled functionality, such as outage and restoration notification, allows SVE to respond to outages and customer requests more efficiently. A portion of the meters are equipped with

At-A-Glance

Recipient: Sioux Valley Energy

State: Minnesota and South Dakota

NERC Region: Midwest Reliability Organization

Total Project Cost: \$7,207,187

Total Federal Share: \$3,603,593

Project Type: Advanced Metering Infrastructure
Customer Systems

Equipment

- 27,641 Smart Meters
- Power Line Carrier
- Advanced Metering Infrastructure
Communications Systems
 - Meter Communications Network
 - Backhaul Communications
- Meter Data Management System
- Geographical Information System
- Customer Information System
- Home Area Networks
- 84 In-Home Displays
- Customer Web Portal

Time-Based Rate Programs

- Critical Peak Pricing

Key Targeted Benefits

- Reduced Operating and Maintenance Costs
- Increased Electric Service Reliability and Power Quality
- Reduced Costs from Equipment Failures, Distribution Line Losses, and Theft
- Deferred Investment in Generation Capacity Expansion

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internal remote connect/disconnect switches. These meters have been deployed to locations with collections issues or provided to customers who would like to be on the pre-paid metering program.

- **Advanced electricity service options:** The project has provided customers with in-home displays that communicate with the smart meters via home area networks. An energy management web portal is available to all smart meter customers. The web portal and the other customer devices facilitate two-way information exchange, allowing customers to monitor and control their energy use and better manage their costs.
- **Time-based rate programs:** SVE implemented a critical peak pricing pilot in the summers of 2011 and 2012. Participants comprised 1,088 customers in four test groups, including a control group. SVE also provided 850 in-home devices to pilot participants. The pilot encouraged consumers to shift their energy consumption from on- to off-peak periods. SVE then measured and validated the impact of the price signals on peak demand. Pilot results were evaluated based on overall peak load reduction and customer acceptance. This information is critical for the design of future pricing programs. SVE has provided additional personalized education to pilot participants in order to more fully realize the benefits of time-based rate programs.

Benefits Realized

- **Increased electric service reliability:** All meters are mapped in the geographical information system (GIS), which is integrated with the customer information system (CIS), outage management system (OMS), meter data management system (MDMS), and AMI head-end, allowing SVE to identify, diagnose, and troubleshoot meter-related billing and performance issues remotely.
- **Reduced costs from equipment failures, distribution line losses, and theft:** The MDMS tamper detection capability provided an unexpected benefit in revealing line voltage problems, which are identified through meter data analysis and can be addressed proactively to improve power quality. The voltage level and the number of blinks that each meter sees are analyzed on a rotating daily schedule. This analysis allows SVE to address high or low voltage or a large number of blinks before problems escalate.
- **Reduced operating and maintenance costs and greenhouse gas emissions:** In the first six months of 2013, SVE avoided 367 truck rolls through remote meter diagnostics and troubleshooting enabled by the AMI network.
- **Improved customer service:** Customer service representatives are better able to answer customer questions about high bills. SVE staff can assist customers in navigating the web portal, helping them to access and understand the information provided.
- **Other:** The AMI, OMS, and GIS integrated systems indirectly support local law enforcement agencies, who can work with SVE to quickly locate and resolve some emergency situations in the area.

Lessons Learned

Customers will reduce their usage if they are notified of peak events. The “perceived penalty” of CPP results in greater reduction than the “reward” approach of peak-time rebates. The peak events were four hours, and member fatigue was observed; usage started to increase in approximately three hours.

Future Plans

SVE recently introduced a pre-pay program, and approximately 1,000 members are taking advantage of this new AMI-supported service. Pre-pay has proven to be one of the best usages of the technology. Write-offs from uncollectable accounts have decreased by almost 50% since program initiation. The utility plans to expand the program and is

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developing an energy management application for smart phones. Time-based rates are being evaluated as part of the current cost-of-service study. These can be effectively utilized for electric vehicle charging.

Because of the large influx of data captured through the MDMS, SVE plans to design and implement end-to-end business processes to efficiently analyze, understand, and report on the AMI system's status and impact on billing.

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