

## City of Naperville, Illinois

### City of Naperville Smart Grid Initiative

#### Scope of Work

The City of Naperville (Naperville) Smart Grid Initiative involved city-wide deployment of an advanced metering infrastructure (AMI) system, a meter data management system (MDMS), and an expansion of distribution automation (DA) capabilities.

#### Objectives

Naperville project objectives included reductions in peak demand, operations and maintenance costs, and greenhouse gas emissions, as well as improvements in power quality management.

#### Deployed Smart Grid Technologies

- **Communications infrastructure:** Naperville installed a radio frequency (RF) mesh network for communications from substations to meters and distribution automation devices, and leveraged an existing fiber backhaul network for communications between substations and the utility operations center. This infrastructure provided Naperville with expanded two-way communications capabilities to integrate customer information, energy delivery system operations, and system reliability information.
- **Advanced metering infrastructure:** Naperville deployed 58,407 smart meters throughout the city and established a supporting meter data management and information technology infrastructure. This system provides remote meter reading, enhanced outage detection, power quality monitoring, and improved meter tampering detection. The AMI system enables real-time monitoring of grid endpoints and network health.
- **Distribution automation systems:** Naperville installed automated switches, feeder monitors, and remote fault indicators integrated with the supervisory control and data acquisition (SCADA) system to enable automated sectionalizing and self-healing, which reduces the frequency and duration of outages for customers and allows the utility to deploy field crews more efficiently.

#### Benefits Realized

- **Reduced operating and maintenance costs:** A new meter data management system provides expanded capabilities to analyze, interpret, and query meter readings and power usage information, improving Naperville's billing and customer service operations. Fewer truck rolls and field investigations are required to accurately diagnosis and troubleshoot issues at the meter and to address customer billing inquiries.

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#### At-a-Glance

**Recipient:** City of Naperville, Illinois

**State:** Illinois

**NERC Region:** Reliability First Corporation

**Total Project Cost:** \$21,988,220

**Total Federal Share:** \$10,994,110

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**Project Type:** Advanced Metering Infrastructure  
Customer Systems  
Electric Distribution Systems

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#### Equipment Installed

- 58,407 Smart Meters
  - AMI Communication System (RF Mesh and Fiber Backhaul)
  - Meter Data Management System
  - Distribution Automation Equipment for 6 out of 117 Distribution Circuits
    - Automated Distribution Circuit Switches
    - Equipment Condition Monitors
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#### Key Benefits

- Reduced Operating and Maintenance Costs
  - Deferred Investment in Distribution Capacity Expansion
  - Improved Electric Service Reliability and Power Quality
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**City of Naperville** *(continued)*

- **Improved electric service reliability and power quality:** The distribution automation system has improved grid reliability by 40% to 50%. Automated recloser switches reduce the frequency and duration of service interruptions. New automated switches and smart meters monitor and remotely control power quality.
- **Deferred investment in distribution capacity expansion:** A new meter data management system accurately identifies coincidental highest demand on the distribution transformers, of which Naperville has more than 8,000. Previously the highest demand was routinely overestimated based on the empirical formulas. Knowing each transformer demand level prevents unnecessary transformer replacements, therefore allowing Naperville to defer investment in infrastructure until it is necessitated by data collected from automated meters.

**Lessons Learned**

As part of the original project scope, Naperville had planned to offer a load control management system that leveraged the ePortal. However, delivery of the portal was delayed, which resulted in the planned time-of-use rates and demand respond programs being removed from project scope. Naperville will roll out these programs when the supporting features are running through ePortal. The two key lessons learned were:

- Integrating multiple smart grid systems for frequent, accurate data exchange is a challenging process that requires dedicated resources.
- Load control management systems based on customer participation are in their infancy. Such systems require extensive development in the coming years.

**Future Plans**

Real-time monitoring of the Naperville electric grid endpoints provided the foundation for conservation voltage reduction (CVR) and demand-side management. Naperville is working on the deployment of a CVR program for energy efficiency and peak demand reduction. The next step is integrating meter outage data with a geographical information system to improve outage identification and outage response time. Naperville is also planning deployment of an asset management system that leverages data from the AMI system.

**Contact Information**

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