

City of Anaheim Public Utilities Department

Model for Small and Midsize Utility Districts around the United States

Scope of Work

The City of Anaheim Public Utilities Department's (Anaheim's) smart grid project involved a limited deployment of advanced metering infrastructure (AMI) and an expansion of distribution automation capabilities. Distribution automation devices included circuit switches, remote fault indicators, and smart relays. In addition, an enterprise service bus (ESB) was installed to provide the interface to the meter data management system (MDMS), customer information system (CIS), and the outage management system (OMS).

Objectives

New AMI and distribution automation technologies will help improve service quality and reliability. The systems will reduce outage time, reduce delays in fault detection in the distribution system, and improve power factor to reduce system losses. In addition, Anaheim will reduce the cost of meter reading where the AMI deployment has been completed.

Deployed Smart Grid Technologies and Benefits

- **Communications infrastructure:** A new wireless multi-point network runs from each smart meter to the utility operations center. This infrastructure provides communication capabilities that allow the utility to better understand and integrate customer information, energy delivery system operations, and system reliability information.
- **Advanced metering infrastructure:** Anaheim deployed 7,140 smart meters, as well as supporting data management and information technology infrastructure. This system provides automated meter reading, improved meter accuracy, enhanced outage detection, power quality monitoring, and improved meter tampering detection. A new MDMS provides expanded capabilities to analyze, interpret, and query meter readings and power usage information, which improves Anaheim's billing and electricity management efforts and load forecasting abilities.
- **Distribution automation systems:** Anaheim-deployed devices include automated switches, automated reclosers, faulted circuit indicators, and/or automated capacitor bank controllers on 100 distribution circuits. These technologies will help reduce the frequency and duration of service interruptions while also reducing field operations requirements. Distribution automation also supports future implementation of distributed energy

At-A-Glance

Recipient: City of Anaheim Public Utilities Department

State: California

NERC Region: Western Electricity Coordinating Council

Total Project Cost: \$11,068,415

Total Federal Share: \$5,368,182

Project Type: Advanced Metering Infrastructure
Electric Distribution Systems

Equipment

- 7,140 Meters
- AMI Communications System (Wireless Multi-Point)
 - Meter Communications Network (Wireless Mesh)
 - Wireless Backhaul Communications (220 MHz Radio)
- Distribution System Automation/Upgrade
 - 34 Distribution Circuits with Automated Reclosers
 - 17 Distribution Circuits with Automated Switches (Underground and Overhead)
 - 23 Distribution Circuits with Automated (Supervisory Control and Data Acquisition [SCADA]-Monitored and -Controlled) Capacitor Banks
 - 100 Distribution Circuits with Remote Monitored Fault Indicators
- Enterprise Service Bus

Key Benefits

- Reduced Meter Reading Costs
- Reduced Operating and Maintenance Costs
- Improved Electricity Service Reliability and Power Quality

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resources such as solar, wind, and combined heat and power systems through automating adjustments to rapid, small fluctuations in grid voltage and current.

- **Distribution system energy efficiency improvements:** Automated capacitors have been integrated with a power quality monitoring system. The capacitors improve voltage and volt-ampere reactive (VAR) control, power quality, and distribution capacity by reducing energy losses on the distribution system.

Lessons Learned

- **Unanticipated construction issues can have an impact on the schedule.** New requirements for pole loading calculations significantly slowed down the process for installing the fiber optic cables that are required to operate the automated reclosers. In addition, railroad crossing permits for certain fiber optic routes caused unforeseen delays.
- **Projects required greater technical knowledge and training than expected.** Construction of the automated capacitor banks and automated reclosers was hampered by lack of technical knowledge and training. For instance, placing in service the zero crossing controllers for the automated capacitor banks proved to be more complicated than anticipated. The switching requirements of the electric system also hampered the installation of the automated capacitor banks since, most of the time, only one capacitor bank could be taken out of service per feeder for retrofitting to the new designs.
- **Limited qualified testing crews had an impact on the commissioning schedule.** The planning team overestimated the Anaheim testing crews' bandwidth to support placing equipment in service. As a result, much equipment was installed but was placed in service only after considerable delay. Anaheim does not allow contractors to place automated equipment in service, so only Anaheim-employed test technicians are allowed to perform this task.

Future Plans

Going forward, the first step will be to install fiber optic cables to the automated reclosers that have not been placed in service. After all the overhead equipment and related software is in service, Anaheim will be monitoring the performance, reliability, and usage of in-service equipment for improvements and/or problems. While monitoring the overhead equipment, the utility will begin engineering, testing, and designing the underground automated reclosers and capacitor banks. These projects will be initiated as budgets, staff time, and project justifications allow.

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