Indianapolis Power & Light Company

Smart Energy Project

Scope of Work

Indianapolis Power & Light Company's (IPL's) Smart Energy Project involved implementation of distribution automation (DA) assets, an advanced metering infrastructure (AMI) system, a meter data management system (MDMS), and various customer systems. The project deployed 10,275 smart meters and DA equipment including automated switches, relays, reclosers, capacitors, voltage regulators, and condition monitors. Customer systems included enhanced website features, allowing customers to enroll in energy programs and to access personalized energy dashboards. IPL also deployed 162 electric vehicle (EV) charging stations, evaluating usage to better understand EV impacts on the grid.

Objectives

The Smart Energy Project aimed to improve the operational efficiency of its distribution system, reducing operations and maintenance costs. New DA assets are also used to shorten outage and restoration times, improving service reliability for IPL's customer base.

Deployed Smart Grid Technologies

- **Smart meters:** IPL deployed 3,817 meters to residential locations and 6,458 meters to commercial and industrial locations. The smart meters measure interval consumption data and communicate wirelessly to the utility. They also support outage detection functions that have been integrated into the outage management system.
- **Communications infrastructure:** Radio frequency mesh network technology was used to build the meter network. Receivers located at key substations transfer meter data to a fiber optic network, which backhauls the data to the AMI head-end system. An additional 90 miles of fiber optic circuits provides the necessary infrastructure for AMI and DA.
- **Advanced electricity service options**: IPL now offers a web portal for customers with either AMI meters or existing automated meter reading (AMR) devices. The web portal allows customers to view their usage information, access tips on energy conservation, and better manage their use and monthly bills.
- **Distribution automation systems**: The project deployed automated network relays, switches, reclosers, and substation and transformer monitoring systems across all 400 distribution circuits.

At-A-Glance

Recipient: Indianapolis Power & Light

State: Indiana

NERC Region: ReliabilityFirst Corporation

Total Project Cost: $52,700,847

Total Federal Share: $20,000,000

Project Type: Advanced Metering Infrastructure
Customer Systems
Electric Distribution Systems

Equipment

- **10,275 Smart Meters**
- **AMI Communications System**
  - **Meter Communications Network (Radio Frequency Mesh Technology)**
  - **Backhaul Communications Network (Fiber Optic Cable)**
- **Meter Data Management System**
- **Customer Web Portal (for customers with both new and pre-project meters)**
- **DA Equipment for all 400 Circuits**
  - **Distribution SCADA System**
  - **DA Communications Network**
  - **Automated Distribution Circuit Switches**
  - **Automated Capacitors**
  - **Automated Voltage Regulators**
  - **Equipment Condition Monitors**
  - **Smart Relays**
- **162 Electric Vehicle Charging Stations**

Key Benefits

- **Improved Electric Service Reliability and Power Quality**
- **Reduced Operating and Maintenance Costs**
- **Deferred Investment in Distribution Capacity Expansion**
- **Reduced Costs from Equipment Failures**
- **Reduced Truck Fleet Fuel Usage**

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- **Automated capacitor controls**: Automated capacitor controls, combined with a new distribution supervisory control and data acquisition (dSCADA) system, enables enhanced monitoring capability, improved service restoration times, and more efficient distribution of power across the system.
- **Electric vehicle charging stations**: IPL deployed 162 EV charging stations in residential, utility fleet, and public locations. IPL is collecting the usage data from the charging stations to help determine the potential impacts of EVs on the grid.

Benefits Realized

- **Improved electric service reliability and power quality:** DA equipment improves system reliability and operational efficiency through reduced outage and restoration times.
- **Reduced operating and maintenance costs:** Operators have the ability to configure field devices remotely. Live line restrictions on circuits can be enabled prior to crews completing work and returning the settings to normal, avoiding extra trips to the field.
- **Deferred investment in distribution capacity expansion:** The verification process for equipment status allows IPL to avoid additional unnecessary investments in capacitors. IPL is now able to verify that capacitors are in service and remotely troubleshoot reported issues if needed. In the past, additional units were installed as a safety factor to account for off-line units.
- **Reduced costs from equipment failures:** The combination of automated relays and reclosers helps isolate faults or resume operations in the event of a transient fault. Substation and transformer monitoring informs IPL of irregularities with assets before problems occur, thus reducing equipment failures.
- **Reduced truck fleet fuel usage:** IPL field personnel drive significantly fewer miles, thanks to fully automated meter reading and devices that operate remotely.

Lessons Learned

The use of cross-functional teams to design processes, install and operate new equipment, and manage the new systems worked well for IPL. Collaboration across divisions was essential to project success. While the initial DA communications network was not robust enough to support all of the deployed field devices, the expanded system improves service reliability overall and can be extended in the future. System integration efforts were more extensive than anticipated but ultimately effective. Customer acceptance of website enhancements resulted in improved J.D. Power and Associates customer satisfaction ratings.

Future Plans

IPL will continue to leverage its smart grid assets to improve reliability and reduce operating expenses. The team wants to develop processes and tools to more effectively monitor the new communication networks. IPL also plans to deploy additional system protection equipment, interface with distributed generation in its service territory, and continue to use conservation voltage reduction to reduce peak demand. Additionally, information collected from the EV pilot will be analyzed and used to design and implement a larger scale EV project.

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