

Hawaiian Electric Company, Inc.

East Oahu Switching Project

Scope of Work

Hawaiian Electric Company, Inc.'s (Hawaiian Electric's) East Oahu Switching project involved the installation of automation equipment for a key part of the utility's 46-kilovolt (kV) sub-transmission grid, coupled with a smart controller to automate switching in the event of a transmission outage in the area. The distribution automation entailed upgrades in eastern Oahu near Honolulu, with 8 of the company's 147 substations receiving new supervisory control and data acquisition (SCADA) equipment and communications links. SCADA equipment and a communications link were also installed on a 46 kV sub-transmission line switch that can restore power to 4 distribution substations in the project's service area.

Objectives

The project aimed to enable more precise and timely responses to outages, enhanced distribution system reliability, and reduced operations and maintenance costs.

Deployed Smart Grid Technologies

- **Communications infrastructure:** Grid operators now have an expanded platform to monitor the distribution grid. The advanced communications infrastructure, which utilizes a mixture of private leased-lines and Company owned communication circuits and network equipment, allows the smart controller to receive system updates from the eight distribution substations and 46 kV line switch to track outages more rapidly and precisely. The smart controller also analyzes the data and informs the company's energy management system (EMS) of system conditions. SCADA devices are controlled by a data concentrator that serves as a remote terminal unit at each distribution substation switchgear and is connected to telecommunications equipment to transfer data to the main dispatch center.
- **Distribution automation systems:** Smart substation controllers detect loss of power, determine whether the cause is related to a specific transmission substation problem, and automatically perform switching at the 46 kV sub-transmission level to restore power to distribution substations. This restoration scheme was accomplished by installing SCADA equipment at eight distribution substations, one 46 kV pole-top disconnect switch, and a smart substation controller in the main dispatch center. If an outage is detected, the smart controller initiates pre-programmed protocols and instructs the EMS to execute line switching at the 46 kV pole-top and re-energize distribution substations. The project was lower in cost than a traditional construction line upgrade project, improved reliability in the project's service area, reduced the construction impact to the community, and reduced response times for customer outages.

At-A-Glance

Recipient: **Hawaiian Electric Company, Inc.**

State: **Hawaii**

NERC Region: **N/A**

Total Project Cost: **\$10,234,824**

Total Federal Share: **\$5,117,412**

Project Type: **Electric Distribution Systems**

Equipment Installed

- **1 Smart Controller**
- **1 Automated 46 kV Sub-Transmission Circuit Switch (used to restore power to 4 distribution substations)**
- **Substation Automation and Communication Network Equipment for 8 out of 147 Substations**
 - **SCADA Communications Network**

Key Benefits

- **Improved reliability to Oahu's urban core**
- **Enhanced system visibility and asset utilization**

Hawaiian Electric Company, Inc. (continued)**Benefits Realized**

- **Improved reliability to Oahu's urban core:** This project enabled Hawaiian Electric to provide additional reliability to Honolulu, the major urban core of Oahu by implementing a smart switching scheme to reduce response time for customer outages caused by a transmission substation outage. Furthermore, this project allowed Hawaiian Electric to forgo another, more construction-heavy project. Hawaiian Electric originally planned to install three new 46 kV underground sub-transmission lines along a main thoroughfare in urban Honolulu to address the same issue, but the utility was able to reduce adverse impact to the community from the construction that would have been required.
- **Enhanced system visibility and asset utilization:** Normal day-to-day operations of the electric grid are enhanced by additional visibility that SCADA provides to the operations center. The project also proved a grid "self-healing" concept that can be applied to the distribution system, where there is a need for more automation.

Lessons Learned

This project enabled Hawaiian Electric to gain working knowledge of smart technologies with the installation of the first smart controller on the system. To construct a robust smart grid system, Hawaiian Electric needed more system data than originally anticipated. Without enough real-time system measurement points, the project team had to utilize historical peak circuit loading for a few circuits. This lack of visibility can inhibit proper switching scheme operations because of inaccurately calculated capacity in the backup circuits.

Future Plans

As more SCADA measurements become available, the smart switching scheme will be updated to take advantage of the additional data and visibility into real-time system conditions. The company is also looking into leveraging the knowledge gained through project implementation to enhance other areas of the distribution system. With a clearer understanding of what smart technologies can accomplish, Hawaiian Electric can better plan and execute future projects.

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