

Cooper Power Systems Cannon Demand Response Goes Hawaiian

Optimizing Energy Delivery with Clean Energy Management Solutions

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Hawaiian Electric Company, Inc., (HECO) may be the only electric utility in the United States—perhaps in the world—inspired to go into business by the vision and enthusiasm of a king. For more than 110 years, HECO has provided the energy that has fueled the islands' development through its colorful history—first as a kingdom, now as a modern state.

HECO and its subsidiaries—Maui Electric Company, Ltd. (MECO), and Hawaii Electric Light Company, Inc. (HELCO)—are owned by parent company, Hawaiian Electric Industries. HECO and its subsidiaries provide electricity to 95% of the state's residents on the islands of Oahu, Maui, Hawaii, Lanai and Molokai. HECO's service consumer profile includes residential, business and commercial and industrial members—which totals more than 1.2 million consumers.

A Vision Driven by Innovation

HECO is an island utility without any interconnection to the national grid and was combating frequency problems—which would occur instantly and without warning. Additionally, during a ten-year period electrical use was on the rise at an annual rate of 2%, as a result of successive growth. In 2004 on Oahu alone, the total power generating capacity was static—just less than 1,700 megawatts. As electricity demands grew—reserves shrank. To avoid a blackout event during periods of unexpected generation shortfalls, HECO needed enough back-up generation to meet the load condition that would exist if they would unexpectedly lose the largest genera-

tion unit running at that time.

HECO had a vision of their energy future—a pioneering vision of how they could meet the increased electricity demands and provide a reliable source of electricity through a portfolio of energy generation methods: renew-

“Island networks are particularly susceptible to under-frequency problems due to the closed nature of the system. Without the ability to draw on reserves from neighboring utilities, frequency will decline any time one of our generating units unexpectedly drops off-line. While not every frequency decline will trigger the load management receiver, Cannon's LUF devices will be an important tool in preventing outages caused by under-frequency events,” stated Keith Block, Director, Customer Efficiency Programs, Hawaiian Electric Company. He added, “We have already seen the LUF feature perform in a small frequency drop the first month; and it worked just as we intended.”

able energy, emerging technologies, conventional central-station power plants, and energy conservation and efficiency¹. A solution to this situation was to implement a system-wide direct

load management program that would provide a solid foundation for reducing peak electrical demand and provide its consumers new choices for reducing electricity costs. So, HECO turned to Cannon Technologies, now part of Cooper Power Systems, to work collaboratively to develop and implement an innovative direct load control management program solution that would support their vision.

Solving Load Control through Cannon Demand Response

HECO focused on an important feature embedded in the control devices: Line Under-Frequency (LUF) automatic protection. The LUF protection feature turns each managed load into a real-time safety valve which will instantly react to power system instabilities by shedding load. The feature can be adjusted and enabled remotely through the communication link.

Control events are generally signaled by the utility through paging communication, but the LUF feature works locally and independently, sensing and responding to under-frequency events within cycles, at each load connected to the load management receiver in order to be effective at combating frequency problems—which HECO was experiencing. The LUF feature added significant value to the system at an extremely low incremental cost, because the control units were already being installed for demand reduction purposes.

The residential program targeted the largest electric load in the Hawaiian home, the electric water heater. (HECO has a very high saturation of electric water heaters and a very low saturation



Controlling residential water heaters in Hawaii helps put clean energy management solutions to work via the Cannon Yukon software.

of air conditioning.) Because of the storage capacity of water heaters, interruption of these loads does not cause any customer discomfort.

The Commercial and Industrial Interruptible Direct Load Control Program (CIDLC) targeted large commercial and industrial consumers with at least 200 kilowatts of interruptible load. The loads specified by customers can be controlled by HECO operations or are controlled automatically by an under-frequency event with the control parameters set slightly lower than the residential water heating parameters. So if dropping the water heating load solves the problem, the commercial load may not be dropped. The CIDLC program includes a notification process that notifies a customer of a planned control one-half hour before the event and an under-frequency control soon after the event. The customer can also see their 15-minute load data and control status on the Web.

HECO focused on the use of the Cannon Yukon software platform to drive both the residential water heater control program and the commercial and industrial Web-based curtailment program.

Complete, Reliable and Flexible Load Management Technologies

HECO implemented a Residential Direct Load Control Program (RDLC) and a Commercial and Industrial Interruptible Direct Load Control Program (CIDLC). The RDLC Program targeted the water heaters on the island of Oahu. During the 2006 peak season, HECO's program had 11,827 residential water heaters installed—with 8.04 megawatts being controlled; and six commercial participants—with 4.3 megawatts being controlled.

These Direct Load Control programs allow HECO to operate reliably with smaller reserve margins and defer the cost of building a new power generation plant—and allow customers to benefit from fewer outages related to frequency droop events and experience lower energy costs.

The Cooper Power Systems Cannon demand response solution provided HECO the tools for tomorrow—today—allowing them to optimize their energy delivery.

Key Features of Implementation

Yukon server running in HECO's data center supports:

- Load management application
- Meter reading
- Settlement module
- Notifications—paging, text messaging, IVR
- Web access for customers

Secure hosted Yukon server running commercial/industrial curtailment devices provided:

- LCR 5000 load control receivers with Line Under-Frequency protection

Key Benefits of Implementation

- Reduced peak electrical demand
- Increased system reliability
- Reduced spinning reserves
- Reduced energy costs
- Deferred building a new power generation plant ■

¹Energy Generation Methods Described

- Renewable Energy. To leverage sources like wind, flowing water or wave (hydro), sunlight, geothermal and biomass (trash) to create energy.
- Emerging Technologies. To support research for hydrogen fuel-cell technology.
- Central-Station Power Plants. Like renewable energy and new technologies, central-station power plants play an essential role in providing reliable, readily available energy—especially critical when renewable sources such as wind, hydro and solar energy are temporarily unavailable.
- Energy Conservation and Efficiency. To provide energy tips and choices to use less energy and get more energy from the same amount of energy generation.