Customer Success Story:
A large investor-owned utility (IOU)

Markets served
Industrial, commercial and residential

Maximizing a sustainable energy harvest in the Western U.S.

Location:
United States

Segment:
Utility

Challenge:
Leverage new technology designed to optimize Volt/VAR control to meet specific energy-efficiency regulations for residential and commercial customers

Solution:
Eaton's Cooper Power™ series Yukon™ Integrated Volt/VAR Control (IVVC) application enables utilities to monitor real-time voltage, watts and VARs

Results:
The utility can now use real-time visibility provided by Eaton's Yukon software to manage both high and low voltage limits during peak operations and better manage power factor to reduce peak energy demands by roughly 2%

Background

A large investor-owned utility generates safe, affordable and reliable electricity for more than a million retail and wholesale customers in the Western U.S. The company recognizes the growth in the region and expects to add nearly 700,000 new customers by 2030.

The utility incorporates sustainability throughout its power generation and delivery operations, taking a long-term strategic approach to its decisions. With this in mind, it set out to identify ways to monitor voltage to optimize power distribution and reduce total energy usage for both its residential and non-residential customers. The company needed to identify a reliable partner that could not only provide product solutions and technical support, but one that also had a deep understanding of the industry to help the utility meet its goals.

Challenge

To adhere to changing regulatory demands designed to reduce peak power consumption, the utility needed to test and validate solutions that would allow it to reduce overall energy usage. This meant that the company would first have to verify which products and systems were available before determining the true potential they would offer in the region, which relies heavily on air conditioning.

Once a system was selected, the utility would also need to know exactly what type of visibility it would provide, because the company wanted to monitor consumption as well as feeder equipment health and status. The technology would also need to be capable of helping to process data coming in from field advanced metering infrastructure (AMI).

From a testing standpoint, the utility would need to determine the type of area and customer base needed to get the most impactful results. The company looked for an 80/20 mix of residential and commercial customers, a feeder network with existing substation and line regulators, and a combination of overhead and underground power delivery with varying run lengths.

Based on the utility's parameters, Eaton was able to begin determining the products that made the most sense to deliver the best results. Together with the utility's staff, it was decided that Eaton's Cooper Power series Yukon product line would serve as an ideal solution, helping to flatten the overall voltage profile and minimize VAR flow to meet the strict energy demands.

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Solution

Serving as the hub for all data, Yukon Volt/VAR control software minimizes system VAR flow to help eliminate losses for improved energy efficiency and feeder voltage profiles. It automates the process of managing power factor / VARs on the utility's entire distribution system by allowing the operator to assign control algorithms at all levels of the grid. These algorithms for voltage and VAR management then can be implemented at a regional level, encompassing tens, or hundreds, of substations with the same algorithm, or on a specific basis using individual phase data on a substation feeder. The operator may also employ a hybrid system with a mixture of options depending on data available from the field.

Before deploying the products, the utility team carefully selected its project sites while also working alongside the engineering and IT teams to determine resources and implementation methods. Because the company would be using Yukon software, it quickly realized that a valid test would require all components be supplied by Eaton. This meant replacing a number of regulators, controllers and end- of-line monitors to reduce the risks of incompatibility and skewed results.

The utility team implemented the pilot program to test the Yukon platform against three objectives:

1. Validate product claims with regard to maintaining a high power factor and consistent voltage at the low end of the voltage target range
2. Compare test-site performance with the existing capacitor-control program
3. Measure voltages along feeders in an extended 28-mile run

By working alongside Eaton, the utility was able to develop a detailed test plan that compared IVVC-on days with IVVC-off days. This allowed the utility to get a more complete look at the data, comparing those with similar hour-by-hour ambient weather characteristics to get a better idea of load shapes.

Results

Following the test period, the utility worked with a third-party energy and utility consulting firm to review and analyze the results. As expected, the consulting firm found that the IVVC application successfully flattened the utility's voltage profile at the selected project sites, compared with averages at its other sites. In fact, the Yukon application was able to smooth out both voltage spikes and valleys in both everyday reading and at peak demand. Using the Yukon product, the power factor remained near an optimal 1.0 and conservative voltage reduction (CVR) demonstrated the potential to help reduce feeder demand by at least two percent—at three percent voltage reduction—during system peaks.

The consulting firm also found that the Yukon software helped the operation maintain a power factor of .98 or greater, with the software recognizing dips throughout the testing phase and quickly intervening to improve or resolve potential issues.

From a voltage standpoint, the Yukon solution successfully managed voltage toward the lower threshold during "on" days, and often remained two to four volts below average on "off" days. When examining the 15-minute data from the AMI (some of which were located in worst-case scenario environments), the consulting firm observed a safe reduction of the upper threshold from 125.0 to 123.5 volts. And while results did vary with the feeder topologies, on average, each one percent reduction in voltage then translated into a .7 percent drop in customer demand on the grid.

To learn more about Eaton's Yukon IVVC solutions, visit eaton.com/cooperpowerseries.

Eaton
1000 Eaton Boulevard
Cleveland, OH 44122
United States
Eaton.com

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