Creating System Reliability On A University Campus

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The Value of PowerChain™ Management

PowerChain™ Management helps enterprises achieve a competitive advantage through proactive management of the power system as a strategic, integrated asset throughout its lifecycle.

- *Enhanced Safety*
- *Greater Reliability*
- *Operating Cost Efficiencies*
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A reliable, high-quality power system is critical to every enterprise, but managing a power system effectively can be a challenge. Here is an example of how Eaton's PowerChain™ Management solutions helped a major Pennsylvania university achieve:

Greater reliability *— Maintain vital operations with steady, high-quality power every minute of every day.*

Background

A prominent Pennsylvania university was meeting its campus electrical needs with an aging infrastructure. Some of the equipment dated as far back as 1969 and the most recent system expansion occurred in the late 1980s.

As buildings were added through the years, the loads approached the existing capacity of the utility feeds to the campus. In addition, the system had no provisions for monitoring utility bills or managing energy usage.

A $20 million grant to construct a new Information Technology department facility on the campus is scheduled for completion in 2009. It will include an auditorium, two 100-seat lecture halls, several computer clusters and laboratory/office space for 80 faculty members.

The addition of the building and other increased campus building loads served as a catalyst to expand and improve the school's electrical power system. The expansion required the local power company to bring in a third feeder and an additional 7500 KVA transformer. As a result of the new utility service, the existing university campus distribution system had to be modified in order to accommodate the additional power and to ensure system reliability.

Challenges

One challenge was to integrate the third transformer into the existing campus distribution system. The added power source required changes in both the protection and control schemes.

The existing transfer control scheme monitored only a single-phase voltage. Loss of one of the unmonitored voltages could create a single-phase condition, which in turn would burn up motors, leading to the loss of the campus central chiller plant and considerable disruption of campus activity. Repairing and/or replacing large chiller motors would be extremely time

consuming and costly for the university.

A second challenge was to respond to the university's need for managing its energy costs. Establishing a program that permitted the allocation of energy costs to each department would allow the university to determine energy usage and costs related to individual projects and experiments.

Finally, all the changes related to the campus power system had to be made without disrupting campus life. Any outage would threaten campus safety, student and employee convenience and comfort, and disrupt ongoing experiments – some of them having been in process for several years. There also would be the potential for extensive damage to data centers and computers.

"This job highlights the outstanding functionality capabilities of the relay."

Kevin Friedrich, Application Engineer

Solution

The proposed system upgrade involved an existing protection scheme for parallel operation, as well as changing the transfer scheme from two mains to three. Eaton Electrical Services & Systems (EESS) field personnel worked with the local utility to integrate and coordinate the installation of new equipment into the existing power system.

To improve system reliability, EESS replaced electromechanical relays with Eaton multi-function, microprocessor FP 5000 relays. The FP 5000 provides complete protection and power system capabilities to monitor volts, amps, vars, watts, power factor, demand and KW hours.

"This job highlights the outstanding functionality capabilities of the relay," mentioned Kevin Friedrich, an acknowledged relays expert who coordinated the project for Eaton. "The flexibility of the FP 5000 allows for integrated protection metering and control for power distribution feeders."

In addition, the communication features of the new relay allow the university to better manage its power system. A Graphical User Interface (GUI) shows the one line, alarm conditions and breaker positions. The FP 5000 also can transmit information to a central location on campus, enabling facility engineers to monitor real time system activity.

If a fault does occur, the new relay provides detailed information, including waveform records, which are used to evaluate the situation and help restore the campus to full power.

To ensure system reliability, there was a need to coordinate the new system, thereby minimizing any outages that may occur during a fault condition. EESS addressed this need by performing the required short-circuit and coordination studies, then making the necessary system adjustments.

Results

Installation of the new Eaton FP 5000 relays improved the protection, reliability and control of the campus distribution system. The relay capabilities were essential to transfer and parallel

two of the sources in the event a third source was lost. EESS engineered the protection and automatic transfer scheme, modified drawings and installed the new equipment without a single campus outage.

An overall system test was successfully performed to verify the operation of the three-source transfer scheme.

This overall solution provides the university with the flexibility to switch loads and feeders to accommodate the maintenance of major electrical equipment without dumping loads. Simply put, no planned outages are required to maintain the system.

The university now obtains energy data that enables them to monitor its energy bills. The school also is obtaining information from each feeder, which allows its facilities personnel to balance and distribute the power more efficiently throughout the campus.

The overall design of the upgrade was planned to allow future expansion and flexibility, and a primary benefit is having the GUI system in a single location.

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