UNIVERSITY OF NEW MEXICO IS TEST BED FOR REBUILDING AMERICA

Square D solution automatically brings mechanical and electrical data together

Larry Schuster, physical plant utilities engineer at the University of New Mexico, plays a major role in the success of an ongoing $53 million capital improvement project dedicated exclusively to energy systems on the main campus in Albuquerque.

As part of the project, the university is building a 12,000-ton chilled water production plant; replacing five boilers with cogeneration units; replacing all chillers; conducting an upgrade of the electrical system; and undertaking a host of demand-side energy management investments.

To justify the energy improvement project, Schuster needed to develop baseline energy measurements, providing the ability to evaluate and improve system performance through analytical and control systems. But up until one year ago that was difficult to do. The 600-acre UNM campus had only two main campus electric meters and no way to collect building steam, chilled water or natural gas consumption data.

Today, after years of planning, UNM has opened the proverbial information floodgates with a Comprehensive Integrated Metering and Monitoring System (CIMMS) from Square D that automatically harvests mechanical data using MODICON Momentum PLCs and combines it with electrical data using POWERLOGIC® Circuit Monitors and System Manager Software (SMS).

For Schuster, having both mechanical and electrical information available to him on a real time basis is "like seven years of plenty compared to seven years of drought," he says. "Now we have enough information to judge how well we are doing and what we are doing it with."

Team Approach

The process began in 1997 when APPA: The Association of Higher Education Facilities Officers chose UNM as the test bed for a unique program grant funded by the U.S. Department of Energy Rebuild America Program. The goal was to develop a template that would anticipate, analyze and demonstrate

energy savings and cost avoidance as the basis for financing infrastructure capital investments. Today, the metering and monitoring component of that template is available on the APPA web site.

To get the ball rolling, John Tysseling, president of Energy, Economic and Environmental Consultants, in cooperation with APPA, developed the CIMMS system proposal.

At the time there were many measurement systems available from various vendors, according to Tysseling, but none that comprehensively incorporated all the thermal systems with the electrical system; nothing that measured energy-use patterns on a campus-wide integrated basis, whether it be a normal seasonal or daily type of variation. There was no way to measure a baseline use profile over a period of time and then, subsequent to a renewal or capital investment, the changes in that baseline in new facilities.

“So we pulled together individuals from various disciplines,” Tysseling said. “For the most part they were consultants or industry representatives. In fact, we had a technical specifications review session where Square D and a number of its competitors were all in the same room assisting us in setting standards that could be universally applied to various systems.”

The team wrote a generic set of specifications that allowed multiple vendors to bid into those specifications. It also created an RFP where no vendor’s equipment became a mandatory requirement.

“That was really the battle,” Tysseling says. “How do you write something specific enough to allow for the procurement to proceed efficiently and at the same time general enough that it had the ability to be met by several different vendors equipment?

“We felt it was necessary to give guidance to the types of information that would be required, and the frequency with which that information would be updated and periods of time to be retained,” Tysseling says. “But we didn’t want to constrain the vendors to any particular meter hardware, data protocols or even a specific screen format for the interface.”

Comprehensive and Integrated Solution

Six companies responded to the RFP. Square D submitted its proposal with New Horizon Technologies of Butte, Montana, and the Energy Systems Laboratory at Texas A&M University.

“Square D spent more time putting together a comprehensive, integrated package opposed to a bunch of discrete pieces that would do it...if you could figure out how to make it work,” Schuster said. “Square D’s proposal was evaluated as the most advantageous system compared to the others.”

The centerpiece of the Square D system consists of 28 POWERLOGIC Circuit Monitors that perform monitoring and power quality analysis throughout 30 campus buildings and utility plants. Capabilities include on-board data logging retaining energy usage interval data in non-volatile memory to alleviate data loss and reporting gaps during possible communication network downtime.

Other features include true RMS metering and ANSI C12.16 revenue accuracy, sag/swell and harmonic power quality analysis, field installable option modules for Ethernet and I/O, on-board alarming, and programmable logic. The POWERLOGIC system also includes six POWERLOGIC Power Meters, System Manager Software (SMS) and 23 Ethernet Communications Modules.

Another key element of the CIMMS is the integration of mechanical metering. Twenty MODICON Momentum PLCs harvest more than 100 thermal data points from utility company gas and electric meters and mechanical meters. Inside the PLCs, Square D implemented function blocks with algorithms by New Horizon Technologies that calculated steam chilled water and natural gas energy consumption from mechanical sensors, associating flows, temperatures and pressures. All of the energy consumption values are logged onboard storing data up to 60 hours.

The Momentum PLC logged data is automatically collected by the CIMMS and stored in the SMS historical database, making it possible to analyze mechanical thermal and electrical energy trends and reports as a seamlessly integrated part of the system.

SMS is the primary communication and data collection server that is used for integrating MODBUS devices, uploading onboard logs, storing historical data logs and pictorially displaying data. New Horizon Technologies' EnerTel® software, developed by eComponent Technologies, overlays the SMS data base to create historical data views, load profiles, utility cost estimates and custom reports. Primarily, The University of New Mexico uses chilled water production and consumption and individual building energy consumption and energy cost reports.

The combination of SMS and EnerTel software provides Schuster with a number of automatic reports that eliminate the drudgery of hand calculations. For example, reports may be generated on the entire campus energy balance as well as electricity, steam and chilled water subsystems.

The collective data is integrated into an information system relying primarily on the Ethernet TC/IP backbone fiber optic system that the university already had in place for communications. According to Tysseling, that piece of the project was among the most innovative. "It basically created a way to collect and centralize energy information from a variety of locations throughout the campus." Summary

information is viewed on an Interactive Graphics Module (GFX) that displays campus layout, screen navigation, building mains metered data, cogeneration status and thermal data.

According to Tysseling, one of the effective ways to work with this information is to develop a customer port for your own purposes. “Your need for information changes over time,” he says. “Today, you may be concerned about the operation of the steam
system. Tomorrow you may want to see the relationship between the steam and the chilled water operation from multiple sectors of the campus at different time periods. The reports can be customized. It is not an expert system – anyone could be trained to use it.

“The idea for the UNM CIMMS project was hatched out of a recognition that this information is valuable from an economic sense,” says Tysseling, an economist by trade. “It is useful engineering information, but its primary value is in measuring value. You have to have a way to measure what those saving are, and for business officers of the university, this information is most critical.”

Today, the $1 million first phase of the CIMMS project has been fully operational for six months and includes 30 UNM campus buildings and utility plants. A second phase, including 20 more buildings incorporating HVAC control, is planned.

“The intention is to track operational and system information on a real time basis,” Schuster says. “It is just getting to the point where there is enough historical data in the system that we can do something with the information.”