San Diego State University Scores Points with its Utility Company

San Diego State University (SDSU) is a respected institution of higher-learning, and among other things, is particularly well-known for its research expenditures and undergraduate International Business program. It's the largest university in San Diego and the third-largest in the state of California.

With today's larger university campuses operating as almost cities unto themselves, their energy and power needs have become more and more demanding and the need for reliability is paramount. In SDSU's case, being located in California adds an additional layer of challenges when you take into account the state's well-documented history of energy issues – including consistent shortages and outages – both things that could cripple its sprawling campus. Just one such incident has the potential to halt or even damage important research, postpone classes and athletic events, and leave the over 33,000 students enrolled without power.

The man charged with monitoring and analysis of SDSU's campus is Bill Lekas. His experience in the field of energy management spans almost 25 years, and Lekas' management of the SDSU campus has not gone unnoticed by his peers. In 2006, he was named Manager of the Year in Region 5 by the Association of Energy Engineers (ACE). Additionally, SDSU Physical Plant was presented with an award for sustainability from UC-Santa Barbara for best practices for Monitoring Based Commissioning with the SDSU Library and Science buildings.

SDSU's energy infrastructure is constructed to be both efficient and self-sufficient. Its campus includes a co-generation plant, which combines two combustion turbines capable of 5.2 megawatts each. The steam generated goes into campus' heating and cooling, with the excess going into a generator to produce electricity. In this manner, the plant is capable of providing all power needed by the campus.

On average, SDSU actually ends up exporting 125,000 kilowatt hours or 50 to 100 kW in extra power each month to its utility, San Diego Gas & Electric. "Although, our utility doesn't currently offer us a credit or bill reduction of any kind for directing our surplus power to them, we still provide our excess, which can help when there may be a shortage with other customers," says Lekas.

Laying the Groundwork

Things weren't always this way. To get to this point, you have to go back 15 years to a project that began in 1991, when the university made the decision to commission a massive energy infrastructure project. A large and important part of this project included the installation of power meters and circuit monitors to provide power monitoring capabilities.

The addition of power monitoring was a response to several issues. There was the inefficiency of wasting electrician man-hours investigating problems that may or may not have even existed within its infrastructure. What's more, SDSU was experiencing power quality issues, such as utility sags in voltage, which can cause equipment to overheat.

"We had the need to continuously monitor the loads for power quality issues," says Lekas. "But more than that, we wanted the system to be integral to the distribution boards and be easy to use." It also seemed logical to have the same manufacturer's equipment handling both the distribution and the monitoring functions on campus. Since Square D® was specified for the distribution boards, switchboards and substation as part of the utility infrastructure, it decided to go with the manufacturer's PowerLogic® meters and circuit monitors as part of the monitoring project.

Moreover, there was the necessity of monitoring operations at its co-generation plant. With power monitoring in place, SDSU would have the capability to monitor how much electricity the co-generation plant put out and work to avoid exceeding the campus usage amount designated by the utility.

SDSU Reaps Benefits of Power Monitoring

SDSU uses the PowerLogic system today for power management, power plant operation, billing information, event verification and troubleshooting. Because of the system in place, Lekas and his team have been able to monitor efficiency and troubleshoot problems quickly with direct access to real-time and historical data through a simple Internet connection.

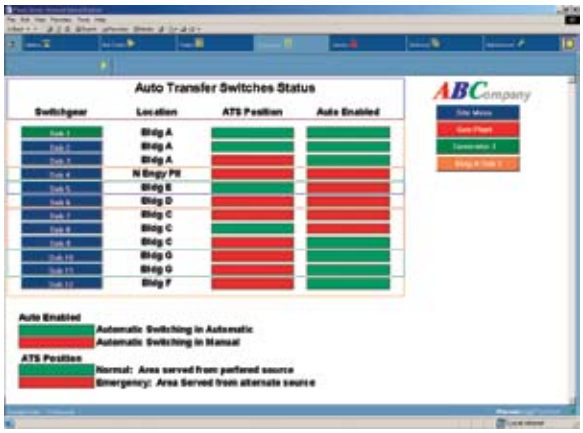
The university has seen high returns for its investment in power monitoring. "For starters, our co-generation plant saved $2 million last year alone on purchasing energy from the utility," says Lekas. "Moreover, we've been able to stay online when other utility customers have gone down." Additionally, SDSU has been able to cut maintenance costs.

SDSU uses the power monitoring system to maintain the campus load, unless the utility asks them to export more. Utilizing the PowerLogic® meters, Lekas and his team are also able to monitor and control the frequency of the generated power, which can affect the performance of electronic devices (such as timing).

The PowerLogic® meters measure demand and check usage every 15 minutes, unless they are experiencing a voltage anomaly. Then, this information is cataloged and examined to determine when peak demand is typically being reach, and apply that information for billing purposes and to match the utility report. The system also has a virtual meter, to show the current status of the campus load.

"We are able to back down during the determined off-peak hours to reduce energy consumption and save money," says Lekas. "The system actually has the capability of pulling the information every five seconds, but that takes too much of a toll on the network."

An unexpected benefit, according to Lekas, is having the ability to record data history, and keep close to a year archived. "We are able to look back at the history, even further back than what the utility can offer us."



All told, SDSU has integrated the monitoring of steam, chill, domestic water and gas on campus. In its current form, the power monitoring system is capable of monitoring all substations, 30 percent of the individual buildings on campus, and work is being continued to bring more and more under the PowerLogic umbrella every year.

Unique Application Offers Challenges

Prior to the power monitoring system, SDSU was experiencing different problems tied to the challenges of operating a campus application. "We were having unique issues because of our status as a university campus – so it was a learning situation for both sides – and we've both learned a lot since we started," adds Lekas. "I am on a first name basis with everyone in the Power Monitoring support group, and we're able to bounce ideas of each other and come up with solutions."

"The service and support we received from the entire Power Management and field support team is another major reason we specified a Square D® PowerLogic® system," says Lekas. PowerLogic® systems are typically purchased and installed by a contractor, but serviced through Square D.

An example of power quality troubleshooting came with the constant triggering of the uninterruptible power supply (UPS) alarms. With the metering in place, Lekas and his team were able to start monitoring the incoming power to the UPSs. Specifically, they monitored voltage harmonics with-in tolerance as well as current harmonics with-in tolerance and found out the UPSs were not set up properly. The parameters on the UPSs were set too high causing them to trip. But they were able to diagnose the issue, and get it corrected.

"Because we purchased priority technical support, we have access to the PowerLogic University, local training, and any improvements and enhancements to the products we purchased are installed automatically." This is a big reason why Lekas and SDSU continue to specify PowerLogic® products as the system continues its expansion to reach the remaining corners of the campus.

Another benefit realized is solving occasional issues with the photovoltaic arrays – or solar power system – that is part of the San Diego State University campus. Each photovoltaic array is a linked collection of photovoltaic modules, and each module is made up of numerous interconnected solar cells. These cells then convert solar energy in to direct-current electricity to help power the campus. SDSU started monitoring the input and output to the solar system inverters to drop the incoming power accordingly to prevent damage to the inverter.

With the power monitoring system and the capabilities it affords to Lekas throughout the entire campus, even the local utility company has been able to benefit from it. The utility oftentimes calls SDSU for information. For instance, capacitor switching at the utility was causing voltage disturbances – sag and swell – at the campus and Lekas was able to provide San Diego Gas & Electric with data from the PowerLogic® system, which enabled the issue to be solved by changing out the capacitor banks.

Remote Monitoring and Continued Expansion

When the original power monitoring capabilities were added as part of the energy infrastructure project, there was additional money remaining in the budget. This allowed SDSU to allocate the extra funds to provide remote monitoring for the campus. “Because the electrical contractor who installed the power monitoring equipment came in so far under budget, we were able to do a justification as part of the initial bid process for remote monitoring,” says Lekas.

The remote monitoring system is controlled by a main server running the PowerLogic® System Manager™ Software (SMS). System Manager™ web-enabled energy and power management system software is designed for energy-intensive businesses and power-sensitive processes. It allows Lekas access to real-time and historical PowerLogic information using Internet Explorer. “When we started with the remote monitoring, we had a serial connection to the software, then moved to an IP network with CAT-5 cable, and are now connected directly through fiber optic lines.” In the near future, Lekas plans to continue expanding the reach of the monitoring system to include submetering for over 130 meters throughout the SDSU campus, which will ultimately communicate to the existing Powerlogic® system.

“As long as you have the gateways, you can bring anything online with the remote monitoring we have in place,” says Lekas. “It is making it really simple to continue our expansion throughout the campus. Before I retire, I’d like to bring the entire campus under the PowerLogic® system,” says Lekas.

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