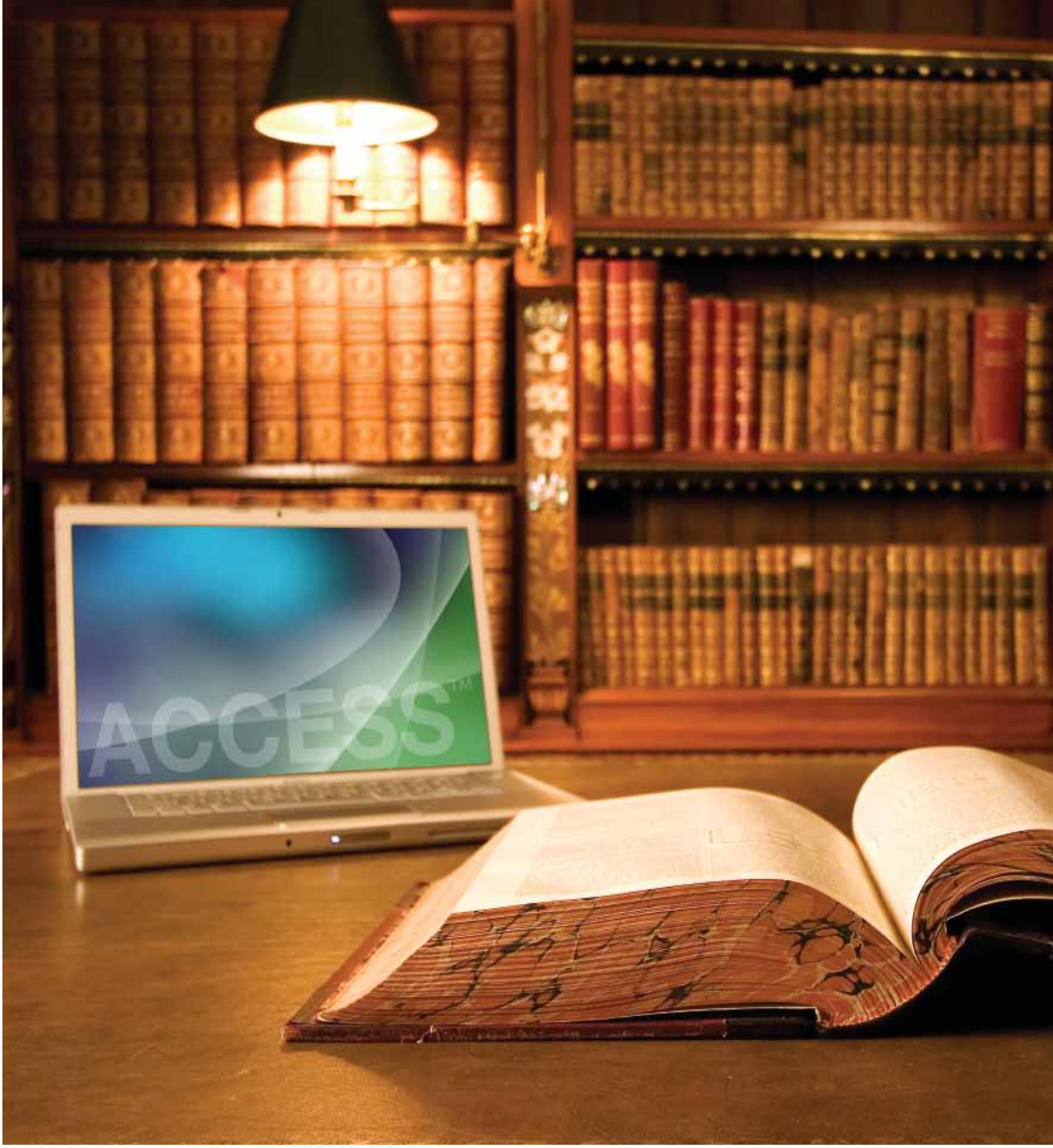

Energy knowledge is power

ACCESS Systems

Answers for industry.

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Siemens ACCESS™ system helps manage costs, plan campus growth and make power work harder for students, faculty and staff.

On a college campus, every book is precious. But at one world-class university located in the northeastern United States, some books are so rare and delicate that the library installed a special climate-controlled archive to protect them.

The sophisticated system is designed to maintain temperature and humidity at strictly controlled levels, a testament to the university's commitment to preserve these assets for future generations.

Unfortunately, however, the expensive system kept switching off for no apparent reason, leaving the books with little more protection than those in the regular stacks.

To find the source of the problem, campus engineers turned to the data collected and logged by their ACCESS energy management system from Siemens Energy & Automation, Inc.

According to the university's Facilities Management Team, which implemented the ACCESS project, heavy industries located nearby were feeding distorted power back onto the utility's lines, disrupting the operations of facilities downstream – including the library.

The utility verified the university's findings by installing temporary meters that quickly documented the over-voltage problem. But the solution isn't straightforward. While the voltage generally is too high, a problem that could be solved by changing the tap setting on the transformer, long-term data from the university's ACCESS power data logs captured occasional voltage dips as well – an even more serious problem that would be aggravated by lowering the transformer taps. Because the university could document other extremes of the fluctuation thanks to its ACCESS data history, it avoided trial and error and the risk of putting the wrong repair in place.

Helping campus engineers solve such mysteries across the university's 6.2-milion square feet of facilities is just one of the unanticipated benefits the university has received from its ACCESS system since deciding to purchase its first meters nearly four years ago. In fact, the system is so powerful and multi-functional that members of the universities facilities management team discover new benefits and applications on an ongoing basis.

The university strives to be on the cutting edge in all its programs, including facilities management. Representatives of other universities were invited to their campus to see ACCESS in action and to share what the team has learned. Visitors are consistently impressed, and team members say they have yet to discover another university with a system that rivals the performance of ACCESS.

Much more than simple metering

When university officials first started shopping for a solution to manual readings, they had in mind, a simple automated meter reading system that could provide more frequent and detailed statistics on energy usage patterns. The university's utility rate and its electric bills were climbing steadily, and team members wanted to find ways to manage campus energy use to control costs and limit the school's environmental impact. Once-a-month readings told the team little about where power was being used or for what purposes, however. To manage the university's power use, they needed more and better information.

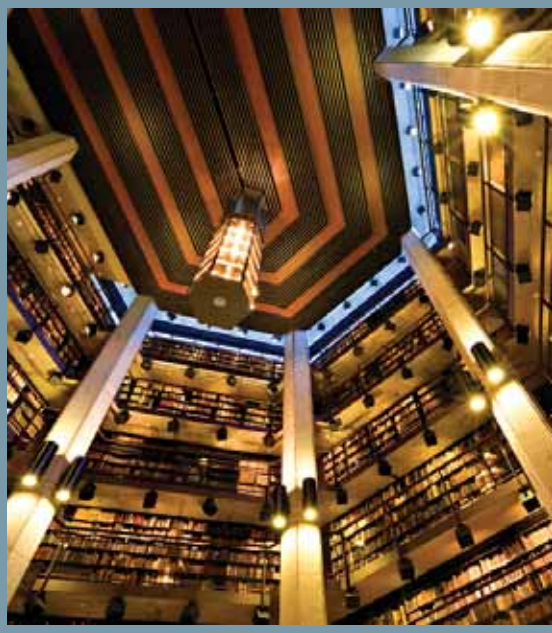
It didn't take the facilities management team long to realize that while a simple metering system would give the university more information about usage patterns, it wouldn't help them to diagnose problems or make knowledgeable choices among possible solutions. In addition, few metering systems could monitor the wide range of energy types in use at the university, including electricity, gas, steam and oil.

Once the team began evaluating full-fledged energy management options, which also measure such variables as harmonic loads and power factor, the choices quickly narrowed down to a few systems from established global companies. Some systems were eliminated because they would have required the university to store its data off site incurring monthly fees and limiting the facility management team's ability to analyze the data. Team leaders also felt that off site storage would be risky, a concern that proved true – several of the vendors who pushed the idea the hardest later went out of business.

In the end, superior technical and installation support made the Siemens ACCESS solution the clear winner. With a selection of meters capable of monitoring all the university's energy types and built-in Modbus™ communication capabilities, connecting the system to the university's wired Ethernet network also was relatively simple. Meters were installed in one week, and data connections were completed the following week, precisely as scheduled. The system, which started with thirty meters, has grown to eighty and continues to expand.

The system captures a range of measurements, including voltage, current, frequency, power factor and harmonics. It also can track energy usage on a bi-directional, absolute, net, time-of-use or loss compensation basis. The ACCESS system is totally web-enabled and capable of generating standard or customizable HTL web pages for remote monitoring using a standard web browser.

The system showed that the feed from the local utility, which should be at 480 volts, routinely spiked to 510 volts and tripped the breaker to the archival storage.



Responsible energy use is a university priority

Of all the benefits the university is realizing from its ACCESS system, however, energy conservation is near the top of the list. The motivation to conserve energy is two-fold – lowering energy bills will leave more dollars to spend on other priorities, and saving energy supports the university's environmental commitments.

Conservation and energy efficiency efforts where the ACCESS system is helping to provide valuable data and insights include:

- Experiments with lighting upgrades assessing whether the upgrades are delivering the promised energy savings. If so, the program will be expanded campus wide.
- Identification of specific loads that need to be managed. For example, an off-campus laboratory building is showing a pattern of unusually high consumption at night, when the building should be empty. The university is experimenting with various measures to control the load, including re-programming the lighting controls.
- Identification of loads caused by large motors. Motors that don't have variable frequency drives could be made to operate more efficiently if drives were added, especially if paired with automatic control systems. Collected data helped to cost justify the installation of variable frequency drives and premium efficiency motors on main heating distribution pumps.
- Monitoring of emergency generators and emergency transfer switches. A standby generator once ran for thirty hours without anyone realizing it, draining the fuel tank at a critical computing facility. If an actual power failure had occurred when the tank was dry, the data center could have been shut down. ACCESS helps facilities engineers spot and avoid such possibilities.
- Development of demand management strategies for the campus. Currently, the local utility charges the university primarily on a consumption basis. In the future, however, the utility is expected to put more emphasis on total demand. ACCESS will allow the university to reduce its peaks and avoid penalties. For example, the system could be used to help drive an automated load shedding system programmed to turn off non-critical loads as total demand approaches levels that could trigger higher pricing.

As university leaders have seen the benefits of the system, their desire to equip even more of the campus has grown. Over the past four years, the university's energy consumption has grown over 32% with only one third of the increase being attributed to physical campus growth and the remaining consumption being used by new technology equipment and facility loads. Team members expect that with an overview of the university's entire system and usage, it will be relatively simple to trim five percent off the school's energy bills. Such savings would greatly accelerate the return on investment from the system, creating a relatively short payback period.

"It comes down to having knowledge about what we can do," one facility management team member said. "There's so much more that we can do than we ever dreamed because of the data our ACCESS system gives us. We've already done a lot, but we've really only scratched the surface of the potential."

The ACCESS system captures a range of measurements, including voltage, current, frequency and harmonics.

The ACCESS system also proved its worth during planning for the addition of an MRI machine at the campus medical complex.

Coupled with WinPM.Net software, users can compile history logs or study individual events. The software allows users to manage their meters as well as their monitoring and control devices, analyze their data and decide on new courses of action. Data may be collected through serial, wireless modem or Ethernet links. ACCESS solutions may include custom-engineered computer screens that simulate mechanical and electrical activity, making it easier for engines to recognize their system at a glance.

Diverse applications add value to ACCESS system

The bulk of the university's power distribution dates from the 1960s. Most of the university's power is supplied by the local utility, but the campus also has a 3.2 MW of co-generation capacity in the winter from its steam heating plant. Data provided by the ACCESS system is aiding campus engineers in everything from converting energy to identifying the capacity to add new loads.

For example, ACCESS data alerted the team to the fact that the university's power factor wasn't as good as previously believed. The utility recently tightened its requirement for power factor (a measure of the amount of productive work being done by a flow of electricity), from 80% to 90%. Knowing in advance that it wouldn't be in compliance with the new requirements gave the university time to evaluate a variety of possible solutions, take corrective measures and avoid costly penalties from the utility.

Date gathered from the system also has been shared with the consulting engineers who are redesigning the university's campus utilities, allowing them to know details about the system that were never captured in the historical plans and specifications. Campus facilities engineers are particularly grateful to know where excess capacity exists to accommodate new loads. For example, the team thought they had enough excess capacity to add a cluster of research computers to a particular building. After installing ACCESS however, they discovered that the building didn't have the 120/208V 3-phase power capacity required during times of peak consumption. Armed with that knowledge, the team decided to feed the new computers from a 480-volt system with a step-down transformer.

Without the benefit of their ACCESS data, team members say, they would have used portable metering coupled with load estimating to project the building's capacity, and the projections probably would have been wrong. The difficulties are aggravated by the fact that most buildings on campus have undergone several renovations, and no single set of plans can give the team a complete picture. The ACCESS system also proved its worth during planning for the addition of an MRI machine at the campus medical complex. The supplier said the machine needed a supply of high-quality power, from the electrical grid or a power conditioner. When engineers studied data feeding the buildings electrical grid, they discovered a history of electrical events that would dictate a power conditioner. A unit was therefore designed into the project, which is considerably less expensive then retrofitting the building to accommodate one later.

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