

Success Story: University of Notre Dame

Markets Served
Energy
Community Infrastructure

The University has relied on a wide array of metering and verification products from Eaton for over 20 years.

Paul Kempf, Senior Director of Utilities & Maintenance

University of Notre Dame reduces energy costs with Eaton's power metering and monitoring solutions

Location:

Notre Dame, IN

Segment:

Higher education

Problem:

High energy costs

Solution:

Tracking energy consumption and performance

Results:

Savings resulting from reduction in energy consumption

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Background

College and university facilities managers typically spend between 35 and 50 percent of their operating budgets on energy costs. The costs continue to grow due to increased consumption and the increase of the price of energy. The University of Notre Dame long ago recognized that investing in an energy measurement and verification system would enable it to reduce its energy costs and play a key role in achieving its sustainability objectives.

Since 1990, the University has installed an array of Eaton power metering and monitoring units as well as a host of the company's power distribution equipment and electrical components at its 1250-acre, 140-building campus.

Notre Dame systematically renovates existing buildings so they exceed energy efficiency standards. Many of the newly constructed facilities have received Leadership in Energy and Environmental Design (LEED®) certification. Under an energy conservation program initiated in 2008, the University has invested over \$10M in efforts that are projected to reduce campus energy use by over 10 percent.

Challenges

Notre Dame's Senior Director of Utilities & Maintenance, Paul Kempf, explains, "Electricity consumption is traditionally metered at the 'point of service' and nowhere else in a facility. It therefore makes detailed analysis of the load difficult. However, with significant focus on energy efficiency and sustainability, it still offers a comprehensive means of judging progress. Opportunities exist to reduce energy cost or the rate of growth substantially—often by 30 percent or more.

"The University evaluated where investing in energy savings efforts would provide maximum return and how to document the resulting savings. We determined that a measurement and verification system, focused on electrical consumption as a surrogate, would provide the necessary information to assess total energy conservation (including heating and cooling) by monitoring a single energy stream. We concluded that quality electrical monitoring was the best method for us to achieve our objectives, while investing to the fullest extent possible in actual conservation strategies."

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Solution

The University has systematically installed solid-state electric metering in order to work toward a centralized energy management system that will allow for the tracking of energy consumption and performance in multiple buildings at a central location. The on-campus Utilities Department has to date used an Eaton PowerNet™ system to monitor, control, trend and alarm electrical issues across the campus' high voltage distribution system. Electronic metering in campus buildings is also beginning to be pulled into a central system. With the advent of Web-based metering such as the Power Xpert® PXM 2000, remotely communicating with independent facility service meters has become easier and more cost-effective.

Eaton's electronic IQ Data Plus II, IQ 4000 and Power Xpert PXM meters comprise 86 percent of the 210 facility service meters currently installed throughout the campus. The remainder are electro-mechanical dial-type devices.

Recently, the University's Office of Sustainability set a goal to realize a 10 percent behavioral reduction in electricity usage in the campus residence halls. To achieve that objective, students will participate in an ongoing series of energy competitions. The University installed 30 Power Xpert PXM 2000 meters in the dormitories, which it will use to provide data to a Web-based application accessible to students, providing them with real-time results for their efforts and thus instilling a culture of conservation among students. Additionally these same devices will provide campus energy professionals with accurate and detailed energy data well beyond the basic kilowatt-hour analysis that will be the focus of the competitions.

Kempf notes, "While it is a common belief that metering technology saves energy, we believe that a key element is the technology's ability to provide real-time feedback to users. We have witnessed the positive impact that seeing the actual results of their energy conservation efforts has on students. The documentation provides strong, ongoing motivation for them to continue their energy conservation efforts. Over time, this results in behavioral changes that foster a commitment to ongoing improvement."

Results

Notre Dame's measurement and verification system has led to savings resulting from a reduction in energy consumption, site monitoring expenses, enhanced electrical system reliability, facilities operations and maintenance, which justifies the cost of the University's system.

Kempf adds, "The measurement and verification system as it grows provides the University with the ability to gather ever more information from the campus accurately and reliably without tying up valuable facilities personnel. The system provides the ability to monitor data in real time, logs it at specified intervals, and organizes the data for analysis automatically. This capability minimizes the time spent recording data."

Savings are realized from "outside the meter" expenses—i.e., buying power smarter—and "inside the meter" expenses—i.e., reducing energy consumption. Metering at the point of interconnection with the grid monitors power, power demand, energy and the quality of the purchased power in parallel with the utility meter. This aspect of the measurement and verification system allows the University to accurately compare the utility bill with the meter data, highlighting any discrepancies, particularly in the demand charges.

In addition, the logged data from the system generates an energy load profile, which can be used to determine if the current or a future rate schedule with the utility is in the best interest of the University. The voltage level at which power is purchased, time-of-day usage, interruptible power plans and reactive power usage all affect rates and are important data points.

"Inside the meter" solutions often rely on submetering individual "billing groups" and key loads within a facility. By sub-metering, several things can be accomplished. Kempf reports, "Submetering is a growing concern with many campus facilities.

"The recently opened Stinson-Remick Hall of Engineering, which includes the University's nanotechnology research center, energy center and a semiconductor processing and device fabrication clean room, has an extensive Power Xpert system. The system allows not only energy professionals, but also faculty, students and visitors, to monitor the energy profile of this complex and energy intensive facility. The Power Xpert system has created a learning laboratory for our students to see the impacts of weather, time of day and function of a facility on energy patterns. The system also monitors the contributions of a photovoltaic system installed on the building's roof and a micro-turbine located in the basement.

"The University has relied on a wide array of metering and verification products from Eaton for over 20 years to allow us to operate and manage our entire electrical system from our 138 kV grid connection, through our 5 kV distribution system and well into our many 600V class facility power distribution systems. Someone once said, 'You can't manage what you can't measure,' and in our case we truly believe that and use our metering systems to impact all things we do electrically."

Notre Dame's measurement and verification system has already helped it significantly reduce its energy costs and improve its sustainability. The scalable, upgradable system has demonstrated that it is an investment that yields measurable results and is an essential component of the University's ongoing commitment to positive financial and environmental results.

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