Energy Management for Education Facilities Case Study

Energy costs are some of the highest expenses for educational facilities of all sizes. To understand their energy usage and lower their costs, educational institutions such as colleges and universities need to first understand their current usage. They need to know when and how much energy is used in their facilities and departments. They also need a way to measure the quality of the power in their system, since poor power quality negatively affects energy efficiency. Power quality problems can also lead to equipment damage, loss of data, and costly power outages. In addition to information, educational institutions need a means to control their electrical usage. They need to be notified in advance when their usage may generate a peak demand charge or a power factor penalty. They also need a way to learn when a power quality problem has occurred and to be able to analyze the cause and attribute it to either their system or the utility. An energy management system with usage, power quality, predictions. and alarms is therefore necessary to lower the energy usage and costs of educational facilities.

Many educational institutions also have sustainability targets, either generated in-house or determined by governmental regulations. To meet their goals in reducing their carbon footprint, they need to be able to track their sustainability efforts and report on their progress. The ability to monitor the institution's carbon footprint is another important requirement for an educational facility's energy management system.

Being able to consolidate other commodity usage, e.g., water or gas, into the energy management system adds another important layer of value. Institutions that can manage all their commodity usage in one system have an advantage when it comes to reporting on usage, comparing usage between facilities or building areas, and being alerted to potential problems, such as water leaks. An energy management system that can incorporate W.A.G.E.S. (water, air, gas, electric, and steam) meters as well as energy meters is of great benefit to an educational facility.

The EnergyPQA.com® AI driven energy management system meets all the needs previously discussed. It provides detailed usage and demand, power quality analysis, custom reporting on metered data, C-Suite reporting on cost management and power quality risk, and alarming on multiple conditions, including predicted peak demand up to three days in advance. It provides carbon footprint analysis and W.A.G.E.S. usage and predictions. It enables comparisons between facilities and between metered areas, such as individual departments, within a facility. It gives colleges, universities, and other large educational institutions the tools they need to successfully manage their energy usage and costs.

Let's look at two examples of how educational institutions use the EnergyPQA.com® system and benefit from the information it provides.

<u>University of Houston</u>

The University of Houston has been using the EnergyPQA.com® AI driven energy management system since November 2022. They currently have 19 meters registered in the system. The meters consist of the Nexus® 1500+ advanced power quality meter, the Shark® 250 Cyber secure energy and power meter, the MP200™ multipoint metering system, the Nexus® 1252 high-performance meter, and the Shark® 200 data logging meter. The meters are in one facility, with five users of the system, including the Admin, Ron Gonyea, who is the staff council representative for the university's Facility Services department.

There are other meters on the campus, the majority of which are on the high voltage (12,000 V) main feeder. There are plans to modernize older meters and part of that effort involves convincing decision makers of the payback of remodeling. Ron Gonyea is interested in breaking out the usage and cost reduction data in the EnergyPQA.com® system, to help with this. Currently, there is a project to add three more Shark® meters by the end of 2023.

Ron uses the Meter List and the meter dashboards to identify issues on campus, such as emergency repairs of the high-voltage circuits. He also checks the predicted usage to avoid overloading the system. He notes that the prediction accuracy has been improving as the system is in use. This is as anticipated since the machine learning in the EnergyPQA.com® system becomes "smarter" and more accurate after a few months of data has been recorded. Data from Ron's analysis lets him decide when to use tie breakers to move a load as well as when repairs are needed. It is also essential in the summer since the university is part of a load-shedding program with their utility. Ron can look at the utility's benchmark forecast and then compare the predicted usage from the EnergyPQA.com® system. Once he gets the order to shed load, he already knows which loads to shed. The EnergyPQA.com® system also helps him confirm how much electrical load was dropped and ensure that the university is compensated properly by the utility.

In addition to predicted demand and usage, Ron makes use of the CBEMA/SEMI F47 power quality log and performs detailed analysis of recorded waveforms. He shared an instance in which he was able to determine and prove that a chiller trip was caused by the utility, i.e., it was an upstream event, based on the waveform data analysis provided by the system. He uses the degree days charts to see usage for campus buildings and to compare costs for heating and cooling, as well as analyzing costs of electrically heated buildings compared to steam heated ones. He uses the alarm feature to be alerted to waveform capture based on exceeded limits. He has found the EnergyPQA.com® system's C-Suite executive summary reports to be helpful as well.

For future enhancements, Ron shared that the university is interested in, and excited to, further integrate the W.A.G.E.S. feature to track usage of commodities other than energy. The system provides usage and cost data for water, air, gas, electric, and steam meters' data and can also check for water and air pressure leaks.

Washtenaw Community College

Washtenaw Community College has been using the EnergyPQA.com® system since May 2021. They have 14 meters that consist of the Nexus® 1500+ advanced power quality meter, the Shark® 250 Cyber secure energy and power meter, the Nexus® 1252 high-performance meter, and the Shark® 200 data logging meter. The meters are in six facilities and there are two users, including the Admin, Bill Ghrist.

Bill uses the Facilities pages to view energy consumption. He totalizes the meters in some facilities to look at the total building energy usage. And the load disaggregation chart lets him view the breakdown of energy used in different parts of a facility. Bill uses the Meter List and meter dashboards to look at the trends of voltage, current, frequency, power factor, kW demand, and THD. He is planning to purchase the MP200™ multipoint metering system to better understand how much energy is being used by the chilling plant system. Currently, all the energy used in the chilling plant is transmitted through one substation. The MP200™ metering system will let Bill obtain detailed energy usage for it.

Bill also uses the meter comparison feature to see the yearly kWh usage per month and to compare daily usage. The Washtenaw Community College campus is working on sustainability. Electrical consumption is one of their largest carbon footprint areas and they are working to reduce daily energy usage as much as possible. The college established a goal to reduce the baseline electrical consumption by 2% per year starting in 2020 and continuing through 2030, for a total of 20% electrical reduction.

Bill has found that in the summer, especially, there is a large increase in energy usage. He uses the EnergyPQA.com® system to get a month by month snapshot of each of the building's energy usage and compare that usage to the previous year. He views the degree days chart to compare usage and temperature data. He uses the system's data to evaluate capital expenditures for improving HVAC and large scale LED lighting replacements, by demonstrating reduced energy usage and costs due to these improvements. He monitors demand and is considering taking part in a utility load-shedding program. He finds the Enterprise webpages with facility summaries, graphs, and facility details very helpful in explaining usage in the different facilities. He receives a monthly energy usage report for his facilities. He also studies the limit-exceeded waveform recordings that result from power quality problems originating with the utility.

In conclusion, the challenge of reducing energy usage and subsequent costs, attaining sustainability goals, ensuring power quality, and managing energy usage most efficiently is of paramount importance to educational institutions. The EnergyPQA.com AI driven energy management system provides colleges, universities, and other large educational facilities with the tools they need to accomplish their energy goals. For more information on the EnergyPQA.com® system and to schedule a Demo, visit:

https://www.electroind.com/products/energypqa-com-energy-management-system/