

# Achieving energy sustainability in higher education facilities

Perspectives series  
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## Introduction

Higher education campuses host enormously complex operations with challenging infrastructure requirements and often runaway overhead. With rising energy costs, shrinking budgets, cutthroat competition, and increased public scrutiny, these institutions have a tall order to fill as they pursue operational excellence.

Campus Facility Managers are looking for new tools and tricks to boost synergies, save money, and project forward-thinking technology and research leadership. This white paper will explore some of the relevant considerations and options encountered by the higher education institution looking to level up its facilities management.



# Energy as a prerequisite

For higher education facilities, sustainability isn't just part of the curriculum – it's a key component to their financial security and operational resilience.

**Institutions of higher learning face unique challenges when it comes to their energy usage. From ensuring public safety to keeping a laboratory online, the energy needs of a college campus are expansive and expensive.**

In the US, Higher education Facility Managers spend approximately \$14 billion annually on energy and utilities. Efforts to decrease the billions in energy costs are costly themselves – the National Association of Scholars (NAS) estimates that an additional \$3.4 billion is spent annually on campus-wide sustainability programs, separate from the ongoing energy spend.

The consequences of these complex energy and operational needs are far-reaching and impact every level of the university, including academics, student life and staff operations.

Aging and failing equipment can cause disruptions large enough to inhibit the college experience. Several college campuses, including Rutgers University and Michigan State University, reported preventable power outages in 2016 that significantly impacted academics and student life, not to mention a tremendous financial impact.



Approximate annual spend by higher education Facility Managers on energy and utilities in the USA

## Highlights

- An overview of the unique energy challenges facing higher education campuses
- An examination of both the central and peripheral benefits that can be expected in light of improved energy technology within universities
- A financial argument for advanced energy management in higher education
- An exploration of the fundamental mandate that compels higher education providers
- A brief review of accessible solutions for energy-based operational improvement

## Why do higher education facilities strive for energy sustainability?

For higher education facilities, sustainability isn't just part of the curriculum – it's a key component to their financial security and operational resilience.

**Institutes of higher learning have no shortage of reasons to up their energy game. From improved operations to a desire to play the paragon of innovation and from values of environmental justice to seeing the value of hot topic issues in raising the institution's profile. Energy efficiency is a nearly universal goal among university administrators.**

According to the Alliance to Save Energy (ASE), nine out of 10 universities consider energy efficiency a key part of their facility maintenance objectives. Aside from the energy savings that such efforts generate, universities find a positive spike in community impact and public interest just by participating.

Environmental initiatives make the campus an appealing place to apply and study. A Princeton Review study found that more than 60 percent of applicants take a college's environmentally-conscious initiatives into account when making an enrollment decision.

Nearly 1,500 sustainability focused academic programs are in operation across North American campuses, and hundreds more available in Europe as well, impacting civic and academic attitudes toward sustainability efforts in their communities and other spheres of influence.

Of course, one can argue that there's no better place than a college campus to put technology to work. Any operational technology could be dually leveraged as educational technology, creating a living-learning opportunity for students and improved capabilities for researchers.

A university that deploys cutting-edge energy technology is only ever an arm's length away from transitioning into a university with a cutting-edge energy technology program. In other words, any technology, technique or system resources used by the institution for management purposes is an education resource waiting in the wings, at no added cost.

While the motive is all but guaranteed, the means can be a little trickier. But with so many reasons for improvement cutting across so many different layers of operational capacities, universities would be wise to look for quick wins with short payback periods that can lay the groundwork for more comprehensive future restructurings.

Before exploring some of the options available for higher education facilities to advance their energy end games, it's worth diving a little deeper into the unique challenges that higher education campuses face.



**Number of sustainability-focused academic programs in operation across North American and European campuses**

# Energy challenges faced by higher education

For higher education Facility Managers, an enlightened energy strategy is not just a matter of implementing green technologies or encouraging energy conservation efforts among students and staff. It goes far beyond that; it speaks to the quality of the underlying services that these institutions are contracted to provide.

**Indeed, advanced energy management capabilities touch on a broad range of operational imperatives. Consider, the following operational parameters:**



## **A mix of new and aging buildings**

A study conducted by the ASE, which surveyed facilities leaders in colleges and universities across the United States, noted that 59 percent of buildings under a typical manager's purview are more than 15 years old, while 38 percent of those buildings are more than 20 years old.

Barely one in five buildings is less than 10 years old. Nearly half of respondents of the survey said that their campuses contain a mix of new and old buildings. Whether they're five years old or 50, the buildings still need to be managed under the same umbrella. And what's more, this is not unique to the United States, it's a similar situation in Europe too.

The energy efficiency of a newer building is worlds away from the capabilities of one that's more than 20 years old. New buildings are constructed with different standards for energy use and with newer technologies such as combined heat and power (CHP).

Moreover, these old and new buildings are often conjoined by shared wings or subterranean utility tunnels. They're often reliant on shared HVAC infrastructure and served by the same backup power generators. This patchwork infrastructure causes a strain of existing grids and other infrastructure and makes it difficult to roll out energy efficiency efforts.

Given the gaps in these buildings' designs, thermodynamics, built-in tech and management systems, the ability for old and new buildings to synchronise or customise system settings as needed is a constant struggle. This usually results in unintelligent resource utilisation, where managers are forced to split the difference between buildings, regularly sending too little juice to some zones and too much to others.

A constant headache for the Facility Manager without the proper tools, there are solutions specifically designed to provide the granular operational visibility needed to recalibrate equipment and dependencies in a way that allows them to bridge such gaps.

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It's not just energy spend at stake for a university: grant money to complete research and results of months-long experiments are on the line if equipment fails to perform or performs below optimal levels.”



**Research labs:  
Beyond supporting research**

The reputation of an institute for higher learning often hinges on the quality of the facilities, the research lab being one of the first areas of scrutiny. The quality of and access to the newest equipment is often a factor considered by applicants and researchers alike, right alongside the groundbreaking research or advancements made within their walls.

Research labs use 30 to 100 kWh of electricity and 75,000 to 800,000 BTU of natural gas per square foot each year, three times as much energy as a typical administrative building or lecture hall.

Unlike lecture halls and dormitories, where energy-saving technologies – lighting and HVAC – stay relatively constant, it's impossible to make such a prediction for a research lab. The technologies are constantly evolving and a university needs to be prepared to handle new innovations that keep their labs at the cutting edge.

Not only does this crucial equipment require more energy, guaranteeing a high energy spend, but the work being conducted cannot be undermined by an energy surge, outage, or mechanical failure caused by poorly managed asset and infrastructure interface. It's not just energy spend at stake for a university: grant money to complete research and results of months-long experiments are on the line if equipment fails to perform or performs below optimal levels.

Thus, institutes of higher learning are best served looking inward to reduce their costs without impacting their main purpose – educating the next generation of leaders.



### Overcoming budgetary constraints

One answer to paying for these necessary operating costs may be to simply raise more money. With intense debate about rising college tuition and the scrutiny of public spending, increasing funds through tuition, student fees or public funding will neither be an easy nor a popular option.

Financing higher education facilities is a challenging proposition for producers and consumers alike: tuition at four year institutions has increased by 161 percent over a 14-year period, and those fees don't come close to covering energy costs, let alone the operational capacity of a higher education facility.

Tuition hikes are met with resistance, student outcry, and recently, political pushback. At the same time, with State coffers depleted from a protracted economic recession and mismanagement, petitions for increased government funding are likely to fall on deaf ears.

Massive, sprawling, and complex operations with lots of legacy baggage, higher education facilities are particularly vulnerable to runaway operational costs. Funded by a combination of tuition, grants, and public money, higher education facilities find a large portion of their spending earmarked for specific purposes and of little value in alleviating general budgetary constraints.

Moreover, as a result of the dominant but profoundly faulty college ranking system, higher education facilities are compelled to leave as much of available funding as possible tied up in endowment trusts.

# Meeting challenges head on: an educational tour de force

**Higher education facilities are tasked with an incredible feat: reducing overhead costs without impacting the flow of energy that keeps their institutions running.**

With seemingly insurmountable challenges like the vast differences in building capabilities, research labs that consume high amounts of energy, and critical funding shortages, Facility Managers are looking for that needle in the haystack solution that can address as many of their pain points as possible without compounding others, or disrupting daily operations.

In order to meet sustainability goals while simultaneously maintaining a high level of service and overcoming operational hurdles, Facility Managers should look for noninvasive solutions with fast returns on investment.

Advanced energy monitoring systems offer device-level insights – identifying savings opportunities while also scouring the data trail for potential failure points to be addressed before things go sideways. Such solutions also lay the infrastructural, attitudinal, and financial groundwork for more comprehensive improvements. Identified as a low-cost measure for energy efficiency by the EPA, energy monitoring systems unlock the potential for facilities to meet other EPA recommended goals.





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### Using energy monitoring systems to meet energy efficiency goals

Understanding the flow of energy is a prerequisite to unlocking the promise of sustainability for higher education facilities. Energy monitoring systems accomplish this by collecting the data that each device generates, whether it's a brand-new piece of lab equipment or the lighting system in a dorm room.

Wireless, self-powered sensors collect data and report it back to the Facility Manager through a companion software suite. From there, Facility Managers are presented with usage patterns that reflect on the health/efficiency of the facilities' overall operations, the systems on which they rely and their component devices. In short order, a conscientious Facility Manager can identify instances where operations would benefit from automation, recalibration, infrastructure reinforcement, system entanglements, or conversely, disentanglements, etc.



### Energy management helps facilities tackle financial goals

Without impacting operations and for a relatively inexpensive investment, energy management programs produce a high return on investment, with meaningful results being felt within months of installation.

In fact, the most economical solutions promise payback between 3 months to a year, while citing case studies with initial investment returned after the very first month.

Savings spill over from straightforward waste reduction to capital performance enhancement and energy optimisation projects; with the collected data providing the basis for more finely tuned maintenance routines and the wherewithal to participate in a successful demand-response program.

The savings speak for themselves. Those funds not spent on energy and rampant operational costs could be directly reinvested into educational excellence.



Educational institutions have a moral obligation not just to prepare the next generation for the workforce but to prepare them to be responsible and informed global citizens. Eschewing wastefulness in favor of attention to detail, efficiency and perpetual process improvement goes a long way to discharging that obligation.”

**Device-level monitoring works in all types of buildings**

Device-level monitoring serves as an equalizer for buildings in the higher education facility system that were built at different times and eras, whether they are five years old or 50 years old. By collecting data at the device level – as opposed to on the building level, zone level, or system level – facilities can bypass the issues presented by aging infrastructure. The wireless sensors are easily installed, with no downtime, let alone construction, required.

**Energy Monitoring Systems: An additional layer of oversight**

Many institutes of higher education have incorporated automation systems and other energy-saving technologies as part of their facility management plans. But the way in which such technologies work – namely by offering more extensive and more granular operational visibility – has opened to possibly for other total energy unrelated applications.

Student safety and security is one major factor driving the need for additional oversight. Crime on college campuses, particularly violent assault, is a persistent problem. While the number of reported incidents have dipped over recent years, this is owed to increased administrative vigilance rather than a decrease in the threat.

Security systems in dorms, well-lit pathways, alarm systems and more all rely on automation or other energy systems working properly.

Knowing that these systems are working properly is of incredible human and reputational consequence. Device-level energy monitoring can indicate if streetlights aren't turning on at dusk or if an alarm on a dormitory door is failing to set. This added level of oversight ensures that the automation systems Facility Managers and security forces count on are working to properly ensure security.

Energy monitoring systems provide additional oversight for research laboratories as well. We've already established that labs use an exorbitant amount of energy in order to adequately complete their important work. With important research at stake and massive sums of grant money on the line, an added layer of operational insight within the lab can prove priceless and possibly mean the difference between a middling institution and a top tier one.

Once a usage pattern is deciphered from the collected data, the ongoing operation of the lab can be compared to this average. Unusual spikes or dips can indicate that a piece of equipment is malfunctioning, performing poorly, or has even been sabotaged.

This awareness in turn allows for diagnostics and preventative maintenance before the equipment fails, keeping everything from refrigerators preserving priceless specimens to the HVAC system maintaining optimal temperatures in tip-top shape.

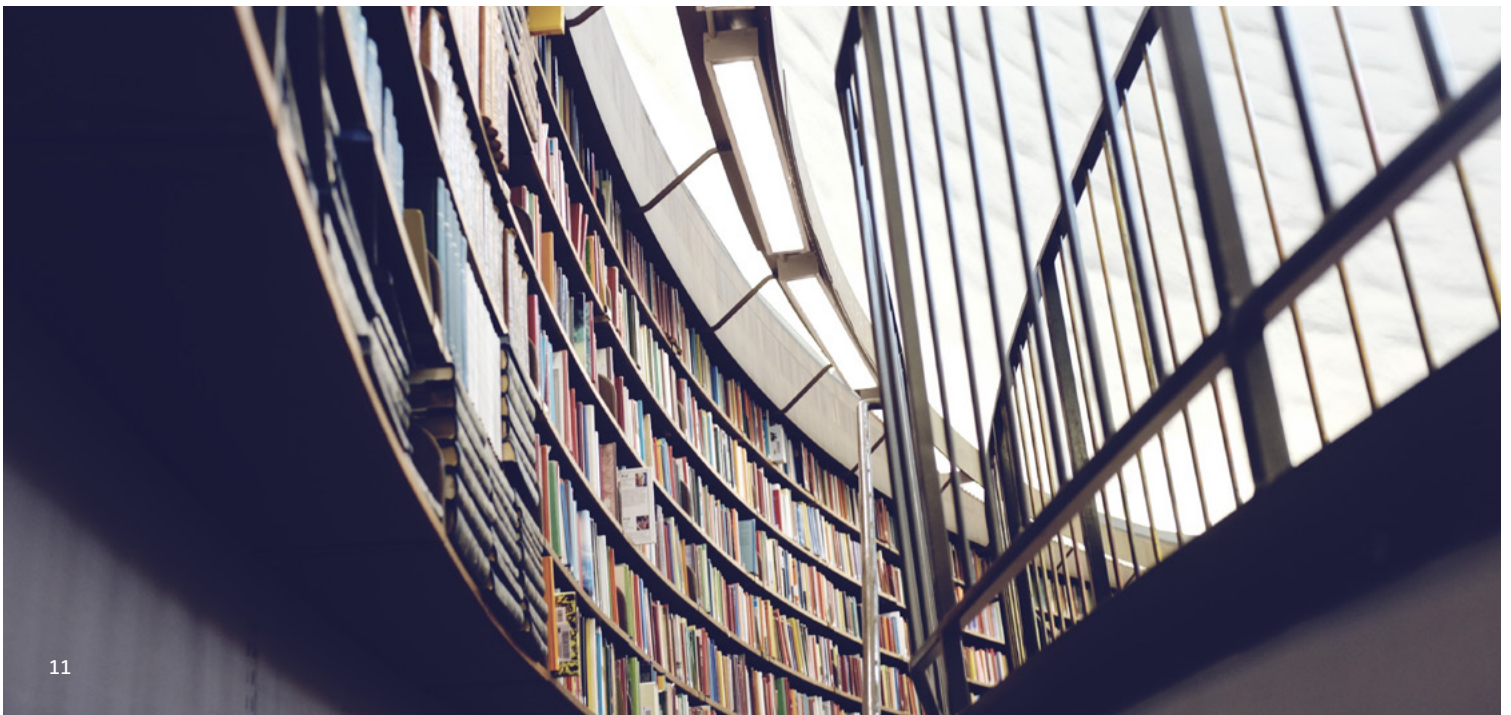
## Energy and education: In summation

Each higher education facility has dozens or even hundreds of buildings spanning its campus. Colleges and universities manage a mix of older and newer buildings with different levels of energy use and levels of energy-saving capabilities.

The multitude of energy efficiency challenges unique to higher education facilities do not make the job impossible. It simply needs solutions that mitigate the challenges without missing any opportunities for achieving an enlightened energy strategy.

**Device-level energy management systems stand out among the field as uniquely capable of answering the call:**

with a flexible rollout, progressive ROI and wider-reaching capabilities, energy management systems give Facility Managers the tools they need to rise to the challenge of slashing significant spend from the higher education facility's operations budget.



Panoramic Power, our energy insights solution, provides energy management to enable businesses to optimise their energy consumption and improve system level performance. Using affordable real-time wireless sensors coupled with our cloud based analytics platform, PowerRadar, businesses gain real-time, actionable insights to optimise their operations, processes and maintenance resources.



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