

Energy management in healthcare facilities

Perspectives series
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Introduction

Energy monitoring and management are important to healthcare facilities insofar as they can reduce costs, eliminate, and improve operations.

This fact is nothing new and yet, compared to other industries, healthcare has historically lagged in adopting the means and methods to understand and control their energy use.

This report will explore some of the reasons for healthcare's comparative inertia in the area of energy management as well as put forward an explanation for why that is now changing.



Healthcare facilities and operational technology adoption

Healthcare is a unique industry saddled with its own unique pressures. For many years, the complex web of entangled factors – both internal and external – conspired to place healthcare firmly in the doldrums of operational progress.

The high moral stakes and financial liabilities involved in healthcare serve as a powerful deterrent against any changes that aren't entirely necessary. Time-tested processes and old, faithful technologies enjoy preferential treatment for fear of inviting undue risk. Of course, because something works doesn't mean it can't work better and there are risks involved with operational petrification as well. Forward-thinking Facility Managers are looking for smart ways to improve processes and technologies, with minimal risk.

In terms of regulations, healthcare really is in a league of its own. With such strict oversight and prefabricated requirements, it's no surprise that innovation was bottle necked. Since healthcare facilities are so often hamstrung by intense budgetary limitations, decision-makers are often forced to adopt a short-sighted approach – favouring smaller but persistent inefficiency costs over more costly, one-time investments – in an effort to balance their books.

Highlights

- While a bevy of factors have historically combined to slow the adoption of non-medical, supporting technologies in healthcare facility operations, recent societal, legislative, and economic realities have reversed this trend
- Fueled by patient demand and financial good sense, healthcare Facility Managers are now racing to identify and integrate the safest, most operationally impactful, cost-effective and smart technologies available
- Healthcare is not unique in this regard. In fact, it is just one part of the larger movement to connect systems, collect more and better information, and ultimately increase control over complex processes and their outcomes
- With the age of digital healthcare upon us, the options available to Facility Managers are wide open. In light of the high stakes, it's more important than ever that these managers conduct their due diligence and look for options that check as many critical boxes – safe, secure, compliant, economical, user-friendly, etc – as possible

Healthcare facilities have been historically laggardly in terms of operational innovation for three primary reasons:

- 1 The high stakes, high liability nature of the services provided
- 2 Extreme and restrictive regulations
- 3 High costs and tight budgets and unfriendly to institutional change

More recently though, regulators have branched out from their single-minded focus on health and safety to introduce legislation aimed at system and process improvement. While this makes a profound nuisance for healthcare facilities in the short-run, in the long-run it liberates managers from their narrow, quarterly perspective and forces them to enacted changes that are in their own best interests.

It's also worth noting that healthcare is an inherently intimate service. For patients, it literally could not be any more personal. With that intimacy comes an understandable desire for privacy. Many – but not all – of the technologies and solutions being adopted by other industries require some forfeiture of privacy or the acceptance of some potential security vulnerabilities. With the impact of reasons two and three largely reversed, healthcare facilities around the world are now looking for ways to level up their operations through low-risk technologies. In so doing, there will be no shortage of opportunities for improvement.

Prominent operational challenges within healthcare facilities

As they relate to energy management, the challenges faced by healthcare facilities offer tremendous opportunities for those willing to study trends, adopt new processes, and install advanced systems that can empower them to optimise operational efficiency.

Soaring energy costs

Because they serve thousands of patients, employees, and visitors – often 24/7 – healthcare facilities consume a lot of energy in cooling, lighting, ventilation, refrigeration, computer, and other systems

In fact, an average US hospital uses 31.0 kilowatt-hours (kWh) of electricity per square foot annually¹. Hospitals alone spend over \$10 billion each year on electricity². As energy costs soar, they can consume up to 3% of a hospital's total operating budget and up to at least 15% of their annual profits.

Because consumption is high, so is the opportunity for efficiency when reducing waste, optimising systems, and educating employees.

According to McKinsey, the US healthcare industry could reduce spending by as much \$450 billion if the data collected at these facilities were properly parsed and acted upon.

The prospect of improved energy efficiency is an exciting one for healthcare Facilities Managers because a successful energy management program can change both business outcomes and patient outcomes.





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Exorbitant maintenance costs

Archaic and inefficient maintenance schedules and processes for equipment and systems within a healthcare facility needlessly eat away at a facility’s budget. Maintaining a clean and healthy environment is dependent on systems and devices that operate reliably.

Unfortunately, at many healthcare facilities, maintenance is more of a reactive process than a proactive one. Reactive maintenance is costly as it intrinsically allows for equipment outages and downtime. Aside from posing the potential for dangerous disruptions to care, it also makes for human resources disaster when specialists are on the clock but unable to perform for lack of designated equipment.

Moreover, the unpredictability associated with a reactive maintenance model can induce stress, while the resulting discontinuity of operational norms may have deleterious effects on the morale (and satisfaction) of patients, staff, and visitors.

In short, healthcare facilities can ill afford reactive maintenance practices, fixing equipment only after it breaks.

It’s certain progress that many healthcare facilities have moved away from reactive maintenance models. Still, few have moved beyond preventative models – which while more stable than their reactive counterparts, remain unnecessarily expensive and wasteful – to predictive and prescriptive regimens.

Though it may not be easy for stuck-in-their-ways Facility Managers to accept out of hand, systems and devices can in fact operate reliably without preventative maintenance. There is a significant opportunity to be seized by transitioning to predictive maintenance. With more data-informed processes in place, the conscientious healthcare Facility Manager can predict and prevent equipment failures, eliminate extraneous labor costs, reduce downtime, and minimise inventory investments.

A study published by the Journal of Healthcare Engineering suggests that – while legacy systems may still benefit from preventative maintenance – the kind of new high-tech devices increasingly deployed in healthcare facilities are best served by predictive maintenance.

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Complex buildings with patchwork systems

Healthcare centres often feature a sprawling campus with a patchwork of connected and interdependent buildings and systems. While the medical devices may be new, the building infrastructures that house them are as likely to be 150 years old as they are to be 15.

This layout typically lends itself to significant inefficiencies and hidden incompatibilities. Common examples include wasteful lighting systems, constant-volume heating and cooling, asynchronous compressor functioning, overloaded circuitry, poorly distributed capacity, and inconsistent building and electrical insulation resulting in inconsistent demand and diminished effect.

While many may take these inefficiencies as a given, they don’t need to be. This common chaos stems from an operational knot so tangled that it’s extraordinarily difficult to untie. But you don’t actually have to untie it in order to rein in the waste. With detailed mapping of all the threads involved, you can know with certainty where to tug when and with how much force to keep all systems purring.

In practice, this means that being aware of the dependencies underlying energy patterns – for example – allows a Facility Manager to better manage systems and components at every level. In the connected labyrinth of healthcare campuses, changing a single variable may optimise multiple devices across different system environments. With improved visibility comes operational clarity.

There are a number of different technologies that are being deployed in healthcare facilities around the world to achieve that visibility. Advanced energy monitoring is perhaps the most powerful example but there’s no reason why a facility can’t use multiple tools. Thermal and structural analysis has also proven useful in optimising daylighting design and air flow dynamics while strengthening the building envelope.

Of course, it must not be overlooked that sometimes, the situations that seem most complex benefit from the simplest solutions. Energy efficiency plans for healthcare facilities often include an element of behavioral correction. Facility Managers are encouraged “to select actions that are easily achievable and can be performed in less than two minutes in order to avoid interfering with staff’s fulfillment of primary job duties.”

As one Facility Manager from the world of pharmacology put it:

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We were pleasantly surprised with the amount of data that we could act on to make measurable changes at our facilities from an energy operations and maintenance perspective – positively impacting our bottom line.”

Confluent Performance Metrics

While some healthcare facilities use submetres to monitor consumption at the building level, very few have access to visibility of energy consumption at the device level. Because they are not armed with granular data to pinpoint to sources of waste and dysfunction, healthcare facilities are ill disposed to act.

With an advanced energy monitoring solution, Facilities Managers can track consumption and set data informed benchmarks. Drawing on the data aggregated from systems, machine types, and individual units over time, an energy management system (EMS) can powerfully redefine your managerial acuity.

While manufacturer specified performance standards are forced to accommodate significant standard deviations between units, a duly advanced energy monitoring system can refine your expectations considerably.

If a machine that typically performs at the high-end of manufacturer standards suddenly shifts to the low-end it can be an important early indicator of a critical degradation that would otherwise escape notice. In this manner, such a solution can quickly identify countless unseen opportunities for operational improvement.



Healthcare facilities have added incentive to integrate new technologies as a means of promoting patient satisfaction. In fact, according to The National Center for Biotechnology Information:

“Patient satisfaction affects clinical outcomes, patient retention, and medical malpractice claims. It affects the timely, efficient, and patient centered delivery of quality health care. Patient satisfaction is thus a proxy but a very effective indicator to measure the success of doctors and hospitals.”

For this reason, in addition to the fact that patient satisfaction is now tied to financial reimbursement, healthcare facilities place patient satisfaction high on their agenda. And it must not be overlooked that the physical environment that falls under the supervision of the Facility Manager plays heavily in patient satisfaction.

Making healthcare facilities smarter

Facility Managers can become wiser by arming themselves with data and automated insights derived from real-time consumption information.

To make a Facility Manager even smarter is to make the facilities themselves smarter. Using technology to optimise operations and increase efficiency aligns the goals of patient satisfaction, profit increase, and corporate sustainability.

Business Strategy: Global Smart Building Technology Spending 2015–2019 Forecast expects smart building technology spending to grow from \$6.3 billion in 2014 to \$17.4 billion in 2019, registering a compound annual growth rate of 22.6%.

The trend promises increased efficiency in healthcare facilities and those who join the efforts early will reap the rewards early.

For example, dynamic glass – also known as “smart windows,” has multi-layered benefits in healthcare facilities. When Toronto’s Humber River Hospital, one of Canada’s largest acute care hospitals and the first fully digital hospital in North America, took on this initiative, they realised the following benefits:

- **Obviation of the existing motorised blind system**
- **Improved patient sleep patterns and quality**
- **Reduced patient depression and agitation by way of increased natural light and views of the outdoors**
- **Increased medical staff alertness and effectiveness (decreased fatigue and stress) owing to greater natural light exposure**
- **Reduced artificial air conditioning reliance**



22.6%

Smart building spending:
expected compound
annual growth rate
2015–2019



\$17.4
billion

Expected smart building
spending in 2019



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Having missed out on the wave of technological advancements that washed over the rest of the market place some years ago, smart Facility Managers are eager to make up for lost time. Today, forward-thinking healthcare facilities are deploying new technologies not only through infrastructure projects but also through more peripheral investments the like of Hospital-grade smart TVs.

Designed to enhance the patient experience, these TVs serve medical interests by offering entertainment – improving moods and medical outcomes – engaging patient faculty, providing access to the outside world, hosting patient-specific interactive education programs, and contributing to a structure and routine that are helpful to patient recoveries.

With pillow-embedded Bluetooth speakers, these devices also represent a marked improvement over their predecessors in the important category of patient comfort. In time, such devices will be outfitted with motion sensors, allowing for tailored exercise experiences – devised to hasten patient rehabilitation.

Of course, the increasing proliferation of electronic devices in healthcare settings, both for essential and non-essential purposes, only underscores the industry’s increasing and increasingly fundamental energy dependence. With energy now inextricable from even the most basic healthcare services, efficiency improvement strategies take on a new level of urgency.

Renewables can play a role in reducing energy costs, increasing operational resilience, and improving sustainability. The New Weed Army Community Hospital in the US boasts “renewable energy systems, including a photovoltaic array and a solar thermal array of panels, take advantage of the hospital site’s harsh desert sun; though the hospital will draw on the local power Grid during the night, it will more than make up for its daytime electricity consumption by harnessing the power of sunlight.”

As if to emphasize the point that medicine is ever-more completely energy-dependent, the hospital’s website declares that its “integrated operating rooms feature robotic and information systems for careful,

efficient management of patient data. These expanded rooms accommodate the newest equipment including digitised radiological equipment. Recovery rooms feature patient lifts and family areas. The project also includes installation of an intrusion detection system and provides connection to the energy monitoring and control system.”

Regardless of the devices or the energy sources used to power them, reducing energy waste in healthcare facilities is a high value objective. Most of the time, working towards that objective comes down to visibility.

A Facility Manager must be aware of the energy consumption of each device and system on his or her Grid to be able to fine-tune operations.

Not only is it profitable, but with recent technological advancements, intelligent energy management is also easy. A simple sensor on the power line of each device can wirelessly send real-time consumption data to the Cloud to be processed by a powerful analytics engine before relaying actionable improvement recommendations to the Facility Manager.

One giant leap for healthcare

Initiatives that start with a small step for a Facility Manager will end up shifting the paradigm for the healthcare industry as a whole. In fact, the steps we take today, like device-level energy monitoring, are powered by advancements in the Internet of Things (IoT), which is “likely to continue to grow in popularity as hospitals leverage technologies in multiple ways to increase efficiency.”

Energy monitoring through the Internet of Things is revolutionary. It helps Energy Managers better control their environments and increases their capacity to optimise systems and devices in multiple buildings – or even multiple campuses.

As Andrew Quirk, Senior VP at the Health Care Centre of Excellence in Nashville, puts it, “All these systems are going to have an incredible impact on care efficiency and without spending a lot of extra money.”

For the healthcare sector as a whole, IoT presents an opportunity to connect disparate systems in order to collect information and increase control over processes and outcomes. According to Forbes, “the healthcare Internet of Things market segment is poised to hit \$117 billion by 2020.”

After years of operational technology inertia, healthcare facilities – led by conscientious Facility Managers – are now in the midst of an innovation bonanza. With so much noise and commotion engulfing the industry, wise operators will do their research before investing in any solution. After all, the stakes couldn't be higher.



Healthcare Internet of Things expected market segment by 2020

Footnote Citations:

¹ Managing Energy Costs in Hospitals, Business Energy Advisor

² The Problem in Healthcare Energy Reduction & Efficiency, Premier Safety Institute

³ 7 Ways Healthcare Facilities Can Boost Energy Efficiency, Sain Engineering Associates, Inc.

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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