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Reducing Energy in Older (not Just) Health Facilities

Balance of efficient technologies and modified occupant behavior is needed

If we accept that the energy intensity and, thus, the greenhouse-gas (GHG) emissions of hospitals are two-and-a-half times those of commercial office buildings, then hospitals consume around 836 trillion Btu of energy a year. In 2007, more than half of that energy—458 trillion Btu, or approximately 5.5 percent of the total delivered energy consumed by commercial buildings—was used by large (greater than 200,000 sq ft) hospitals, of which there were just over 3,000.[1]

Lighting, HVAC, and hot-water heating account for 60 to 80 percent of the electricity and even more of the natural-gas consumption of hospitals. Given the number and size of these facilities throughout the United States, modest improvements in efficiency can save a great deal of energy resources. However, hospitals pose unique challenges for efficiency projects, including:

- From operating suites and laboratories to various patient (intensive care, recovery, outpatient) and office areas (medical, administrative), hospitals represent a variety of environments with differing control requirements.
- Hospitals often feature a wide range of engineering designs from years of additions and major renovations. Frequently, optimization projects require several unique strategies.
- Reduced energy consumption, costs, and GHG emissions never can take precedence over the safety and comfort of patients, staff members, and visitors.

Just as medicated gum or patches cannot by themselves stop a person from smoking, technology alone cannot be expected to eliminate energy waste. Behavior modification is critical.

So, where do we start, and, more importantly, to where are we trying to get? Usually, I suggest starting with some sort of benchmark and energy assessment (e.g., the U.S. Environmental Protection Agency's [EPA's] Portfolio Manager) and using the results to determine the level of energy audit that should be performed (if any energy audit at all). In other words, use those tools to establish a road map for reducing energy consumption and perhaps focus attention on opportunities with relatively short simple payback periods.

ASHRAE has a very helpful publication, "Procedures for Commercial Building Energy Audits," that describes the various levels of energy audits. My definitions are simpler:

- Level 1: Generally, an analysis of utility consumption and a brief survey of the facility. Resulting recommendations generally are more qualitative than quantitative (i.e., not based on detailed cost and return-on-investment [ROI] analysis).
- Level 2: A more detailed analysis of energy consumption and a more comprehensive inspection of the facility, with identification of specific energy uses. Recommendations include estimated costs of implementing specific energy-conservation measures (ECMs) and a quantitative ROI analysis.
- Level 3: An investment-grade energy audit including a thorough inspection of the facility, rigorous analysis of energy use and potential improvements and ECMs, and a detailed report estimating life-cycle and ECM costs and ROI.

Regardless of the level of energy audit performed, if an energy audit is performed at all, there always is "low-hanging fruit"—low- or no-cost measures—to pursue first:

- If you are not using it, turn it off.
- If you cannot turn it off, turn it down.
- If you are going to run it, keep it clean and serviced.

After low/no-cost improvements are made, lighting typically is addressed. Any building—hospital or otherwise—that still has T-12 fluorescents is missing a huge opportunity for energy (and maintenance) savings. High-efficiency T-8s, T-5s, and a variety of LED products are available. And induction lighting, which is great for difficult maintenance areas (e.g., parking structures), offers extremely long life (100,000 hr of operation is not unusual).

It is difficult to identify some energy-saving opportunities and even more difficult to validate the savings resulting from implementation without some type of metering/submetering strategy. For example, chiller-plant optimization is a relatively common recommendation for older hospitals with large central energy plants.

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However, without the ability to accurately calculate kilowatts per plant ton, it is difficult to quantify improvements as simple as changing control strategies.

Lastly, just as medicated gum or patches generally cannot by themselves stop a person from smoking cigarettes, technology alone cannot be expected to eliminate energy waste—an addictive behavior for millions of Americans, I believe—and make our buildings more sustainable. Behavior modification is critical.[2]

Although the focus of this article was hospitals, the strategies are applicable to other types of buildings. The EPA's ENERGY STAR program has a good deal of useful information for commercial-building owners wanting to save energy, much of it in the form of best practices for specific types of facilities (*www.energystar.gov/benchmark*).

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