How Long Since Your Last Energy Audit?

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ABSTRACT

Just as we get (or should get) an annual physical to assess our medical condition, buildings require an occasional reexamination to check for energy savings opportunities. Such audits cost money, however, so when does it make the most sense to perform that task?

ASK YOURSELF TWO QUESTIONS

The first question to ask is: has the building ever had an energy audit? While many commercial, institutional, and industrial structures were examined since the first energy crisis in 1974 to see if cost-effective ways existed to cut their energy bills, many others have never been reviewed, or else received only a cursory "walk-through" inspection.

A real energy audit (also called a feasibility study) involves examination of (at least) two years of utility bills, mathematical modeling of how much energy ought to be used were existing systems operating properly, a review of routine plant operations (e.g., discharge temperatures, occupancy schedules, etc.), and a listing of potential upgrades, along with their installation costs and savings. If that has not been done, it's time to do so. Even if the building is only a few years old, it should be audited because new systems do not necessarily operate efficiently upon installation.

If such an audit was performed years ago, the second question is: has anything changed since then? If the building systems (e.g., lighting, HVAC), structure (e.g., additions, new roof), or operations (e.g., conver-

sion to PC-based activities) are different, it's time to check the impact of those changes on equipment sizing and operations. Much has also changed in the last decade with regard to energy pricing, data acquisition and analysis, and energy technologies. Building equipment has, of course, also aged during that time, potentially approaching the end of its rated life. As a result, any audit over 10 years of age requires updating.

WHAT MAJOR FACTORS SHOULD BE REVIEWED?

In the past, utility tariffs were the dominant pricing structures against which the cost effectiveness of energy efficiency measures (EEM) were determined. Nowadays, there may be several other choices for pricing due to deregulation and/or other tariff options (e.g., real-time or market-based pricing). Peak demand charges have also risen in many areas, opening the door to devices that would not previously have been cost effective. Under such pricing, some EEMs that didn't make sense 5 years ago (e.g., thermal storage) may now be profitable.

Changes of building operating personnel are also often responsible for losses of the institutional memory needed to maintain some efficiency measures. When stocks of screw-in compact fluorescent lamps become depleted, for example, it is not unusual for a relamper to use whatever incandescent lamps he has readily available to relight a socket, regardless of the energy impact. The same thing happens when an occupancy sensor fails and is replaced with a standard light switch. Failures of controls may result in "jumping" out (i.e., wiring around) the problem rather than fixing it. The result may be a loss of control, with fans, lights, or chillers running continuously instead of under a Building Management System-controlled (BMS) schedule. If nobody reorders the right equipment and makes sure it's properly installed, energy usage will gradually increase.

Changes to space usage may also result in savings opportunities. When some offices previously filled with typists were replaced with people using personal computers, an opportunity for adjusting light levels may arise. The increased cooling loads of such equipment may, however, have resulted in the addition of window A/C units where an adjustment of air flow or balancing may instead do the trick. A space previously used as a cafeteria (requiring a large fresh air load) may now be a lounge

or office, allowing for most of that air to instead be recirculated.

Likewise, some new EEMs (e.g., automated dimming, dual-drive chillers) now make it possible to take better advantage of existing or new pricing structures. In many cases, the cost of sophisticated lighting and HVAC controls have come down at the same time as their simplicity and reliability improved, making them worthy of new examination.

Even the ability to analyze EEMs has greatly improved. Computer models that previously required access to a mainframe now run on a laptop. Submeters and data loggers that cost thousands of dollars a decade ago are now available for a fraction of that cost, making it possible to more closely determine how a system is operating. PC-based analysis tools (sometimes called energy enterprise software) are available to acquire and portray energy data while also controlling usage through signals sent to a BMS.

The efficiency of standard devices (such as electric chillers and motors) has improved to the point that the differential relative to an existing unit has widened, potentially reaching the threshold payback needed to justify replacement. Large chillers (over 500 tons) are now available with efficiencies at or below .5 kW/ton, while only a decade ago .65 kW/ton was considered efficient.

SO WHAT'S THIS GOING TO COST ME?

Maybe not as much as you think. A good energy audit of a commercial office building typically costs between $.08 and $.15 per square foot, with the lower end of that range applying to larger buildings. More complex structures (e.g., hospitals, industrial plants) may cost more due to the variety and number of systems involved. Don't be surprised if very low cost measures are found that, when implemented, pay immediately for a portion of that cost.

Even that price may be reduced if parts of the old audit (and data on any upgrades since it was done) are available to the new auditor. If, for example, a lighting upgrade has been performed, it should not be necessary for the auditor to make a full fixture count and examination since much of that information may be gleaned from installation records.

The advent of deregulation has, in some states, also created a funding source for energy audits and upgrades that disappeared over the last

decade. As part of utility restructuring, money was set aside for energy efficiency under a "universal service fee" or "system benefit charge." In some states, 50% or more of such costs may be reimbursed through state agencies and/or utilities. (See the *Tip of the Month for November 2000*, "Free Money from Electric Deregulation," for details).

In many ways, a reexamination of one's energy systems is much like a review of one's financial portfolio to ensure that it is maintaining acceptable profitability and risk. Just as changes in the stock market, interest rates, and other fiscal issues have prompted many of us to alter how we invest, now may be a good time to see if our energy systems are also doing their best.

This article appeared as one of Mr. Audin's "Tips of the Month" commentaries. More can be found at www.EnergyBuyer.org. They are brief excerpts from the Energywiz seminar "Profiting From Deregulation: Power Techniques for Power Purchasing," the only seminar focused on training customers and consultants to handle retail power procurement. For those interested in taking this course, more information is available at www.energywiz.com and www.energyseminars.com

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ABOUT THE AUTHOR

Lindsay Audin (CEM, CLEP, CEP, IES), is the president of Energywiz, Inc., an energy consulting firm serving the competitive energy market, government agencies, large end users, and other consultants.

Audin has been named Energy Manager of the Year by three different national or regional organizations, most recently by the Association of Professional Energy Managers in 1995. In 1993, the Association of Energy Engineers (AEE) named him their International Energy Manager of the Year, and in 1996 inducted him into its Energy Manager's Hall of Fame, the highest recognition in that field.

He served on the board of the New York Designer's Lighting Forum, the *Energy User News* Technical Advisory Board, and an ASHRAE 90.1 technical committee. His column on lighting and energy issues has appeared quarterly, in *Architectural Record* magazine since 1991.

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