Healthcare Energy-Savings: What Road Are You On?

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As a youth, I remember my father telling me, “If you don’t know where you’re going, any road will get you there.” Later in life, when I entered the energy management field, I was told by my boss, “You can’t manage what you don’t measure.” Great words to remember when looking to target energy saving for healthcare facilities.

There are many documented procedures that will reduce energy consumption and cut utility costs. This leads to the fun part, where we roll up our sleeves and get our hands dirty installing, balancing, calibrating and programming all the high-tech “stuff” we’ve purchased to make our energy-savings dream come true....but wait a minute. How did we get this far without first convincing the decision makers to “buy-in” to our efficiency program financially? Sometimes, maybe more often than not, there is no buy-in and as a result no program.

According to The Association of Energy Engineers’ Economic Analysis Handbook, when it comes to securing a financial commitment from the key decision makers, the first step is to provide a complete and detailed Economic Analysis. This involves formulating, estimating and evaluating the economic outcomes of the various procedures available to accomplish a specific end or goal. The decision to select one (or more) of these choices will be made based on data, analysis and comparison of the costs and benefits of each choice. Those same decision makers need an Economic Analysis when deciding if a project is cost effective, and whether it will be implemented. One of the first steps in compiling the Economic Analysis is establishing a building’s Energy Usage.

Energy Usage Index (EUI) is defined as the total amount of energy used by a building (electricity and natural gas) per square foot of floor area (annually) and is used to establish the facility’s baseline energy use. Determining how much energy used is a critical first step in determining the savings possible. Simply identify all the energy used in the facility and add up all the Btu’s of energy. Next, find the total square footage of conditioned space and divide the total Btu used per year by the square feet of space. A building’s EUI value can be used in a similar manner as miles per gallon (MPG) is used to describe the efficiency of an automobile. It allows you to compare your facility’s total yearly energy use to industry standards or that of your peers. It can be a great help in recognizing if your facility is on-or off- the energy mark when compared to others.
For example, a facility with 10,000 square-feet of conditioned space uses 100-MMBtu of gas and 150,000-kWh of electrical energy in one year. What is the building EUI?

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\text{Btu (gas)} = 100 \text{ MMBtu} = 100 \times 10^6 \text{ Btu/yr.}
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\text{Btu (elect)} = 150 \text{ kWh} \times 3412 \text{ Btu} = 511.8 \times 10^6 \text{ Btu/yr.}
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\text{EUI} = (100 + 511.8) \times (10^6) / (10,000 \text{ ft}^2) = 61,180 \text{ Btu/square-foot/year}
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The yearly consumption of gas & electricity may be found by totaling the values for each, listed on your monthly utility bills.

### HEALTHCARE

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**U.S. Commercial Buildings Energy Consumption Survey (CBECS)**

**U.S. Energy Information Administration**

Primary Energy by Census Region and Principal Building Activity Intensity (Thousand Btu per Square Foot per Year)

The EUI establishes the facility's overall energy use that you can use to formulate your energy savings strategies. Some typical healthcare facility EUI’s are shown in the chart above by region of the U.S.

After calculating the building’s EUI, next determine specifically where the energy is being consumed so you can target savings in those areas that show the greatest use. Unless energy meters are already installed on each piece of equipment, this determination will be made using an industry average. Be sure to take local influences into account, as it will help your Energy Analysis by reflecting a more accurate estimate of the real savings potential.
The pie charts above reflect the typical hospital usage profiles found in the ASHRAE HVAC Design Manual for Hospitals and Clinics where Houston, Texas serves as the baseline for the South Central energy consumption data. This information provides insight into how much, and where energy is used throughout healthcare facilities located in this region. Use this information to help estimate a building’s actual electrical and gas consumption, and then determine a reasonable approximation of a building’s energy use per category shown.

Without definitive energy meter readings, this method may prove to be the best choice in arriving at this information.

Assuming the facility in question is well represented by the regional values, it’s now easy to determine the major energy consumers. In the electricity category, ventilation fans, space cooling and miscellaneous electrical loads top the list. For natural gas, it’s reheat, space heating and outside air heating. In this case, fan energy and heating (specifically reheating)
are the hospital's largest energy consumers and probably hold the biggest potential for energy savings. By applying resources accordingly, this will help afford the biggest return on any financial investments. Adding Variable Frequency Drives to constant speed fans, tuning boilers, calibrating temperature sensors, verifying scheduling (turning things off when they can be turned off) and making sure everything possible is being done to eliminate the requirement for reheat are all great places to start to reduce this building’s energy footprint.

Without first determining how much (and from where) energy is being used, there is no way to determine which efficiency measures should be studied, making it extremely difficult to define savings opportunities and partner with management for the project’s financial support.

Here is one word of advice to move forward: In order to work with financial decision makers, you should learn to speak their language. It’s critical to communicate in their terms - Net Present Value (NPV), Net Annual Value (NAV), Internal Rate of Return (IRR), Life Cycle Costing (LFC), Equivalent Uniform Annual Worth (EUAW) and Savings to Investment Ratio (SIR), just to name a few.

Take time to learn the methods and procedures necessary in order to present your energy-efficiency initiatives in a format that’s understood and appreciated by decision makers. Your project closing rate will go up and your healthcare facility will begin benefiting from the utility savings that you’ve been dreaming of.

**References:**

The Association of Energy Engineers; Economic Analysis Handbook

ASHRAE; HVAC Design Manual for Hospitals and Clinics

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