

Toward Greater Energy Efficiency:

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You've Already Made Some Crucial Decisions, Whether You Realize it or Not

Are you going to make a decision about energy efficiency?

Whether you know it or not, you actually have made a decision on energy efficiency. Whether you have decided to do nothing, pursued a traditional process of repairing/replacing systems and equipment, or hired an expert to help you make your energy decisions, decisions have been made.

Have you made the right decisions? Are you as energy efficient as you could be? Are you doing everything you can to make sure your organization is successful? To get an idea how you compare, consider your school building's energy consumption over the last year. Input your building's information into the following formula:

$$[(\text{___ Kwh per year} \times 3.413) + (\text{___ MCF per year} \times 1,000) + (\text{___ gallons of propane per year} \times 91.5)] / \text{square footage} = \text{kBTU/sq. ft.}$$

The first part of the equation is:

- The number of kilowatt-hours (Kwh) per year multiplied by 3.413; plus
- number of thousand cubic feet (MCF) of gas per year multiplied by 1,000; plus
- number of gallons of propane burned each year multiplied by 91.5.

Then, divide that sum by your building's square footage for an energy-efficiency score of kBTU (thousands of BTU) per square foot per year.

An energy-efficient school building should have a score of between 30 and 50 kBTU (30,000 to 50,000 BTU) per square

foot. The table below shows where we see many Missouri Schools perform.

Most older buildings were not designed with efficient use of energy in mind. In fact, even many of the newer buildings that were designed to be energy efficient are not constructed or operated as intended. Not only does this inefficient operation result in a larger "carbon footprint" but the fact is, inefficient buildings cost more money to run and are less comfortable for occupants. Whether buildings are new or old, they can be energy efficient. Many schools have begun the transition from doing nothing to having their own staff implement energy-efficient strategies, to hiring contractors or maybe hiring an Energy Service Company. Each of these options may have different benefits, but all are better than doing nothing.

Many schools find themselves doing nothing and choose to close their eyes on the fact that their costs for utilities are high and continue to increase every year. Even though the potential for savings is there, they continue to have utility costs eat further and further

kBTU / square foot / year					
EUI	< 40	40 - 50	50 - 80	80 - 100	> 100
Rank	Energy Efficient	Good	Average	Poor	Very poor

TABLE 1: Energy Efficiency Scores

into their budgets. They choose to not take the time to understand how much they spend on energy and how that compares to what they should be spending. There may be other priorities and decisions that need to be made on things that feel more pressing. They continue to do nothing until they find themselves in a spot where other things are not as pressing, they get in financial difficulties, have pressing facility issues or learn something new that causes them to realize their energy costs are a problem.

How and Where to Start

First, take some time to try and understand your problems. Why are you interested in doing something about this? Did you put your information into the formula at the beginning of this article and decide you are spending too much on energy? Do you have other places you would like to spend that money? Talk to your administrators, facility staff and others that are impacted by the energy consuming systems you have in your buildings. Consider talking to other professionals to get their perspectives. Architects, engineers, contractors and Energy Service Companies can provide you with knowledge and experience from their fields of expertise. Take the things you begin to learn and set out on a plan.

The next step involves defining a plan and approach. Do you want help from others or do you want to consider having others help you define a plan and create an approach. Some want help, others feel they can do it cheaper themselves. If this is you, you may be right. Here is a way for you to think through your situation.

It is true that architects, engineers, contractors and Energy Service Companies will charge for their services. Ask yourself if you believe their expertise can provide a better long-term value. The money you are saving by doing it yourself may be eaten up by sub-standard solutions and lost savings while you wait for projects to be completed. Or there could be significant ideas or strategies that will provide savings that you haven't learned about. A professional with significant experience may be able to help you achieve greater savings, more quickly that are more sustainable. Ask yourself these questions:

Energy Knowledge

- Do you know how much energy your facilities consume?
- Do you understand how and why energy is used in your facilities?
- Are you familiar with the latest energy saving equipment, systems and strategies?
- Do your energy saving ideas have many details that need to be evaluated and

understood for proper implementation?

Systems and Equipment Knowledge

- Do you have the ability to identify the real problems or determine the best solution?
- Do you know what the issues are with your current equipment or systems?
- Do you have the time and technical ability to investigate many products/solutions and determine which ones are the best?
- Do you have the time and ability to put out an RFP and evaluate the proposals you get back?

Implementation Knowledge

- Do you know how to manage the implementation of the solutions you decide on?
- Does your staff have the time to install the equipment?
- If it takes you longer to implement the solution how much will you lose in savings?
- Are you comfortable managing contractors and vendors to make sure you are getting what you are paying for?
- If they don't do something correctly will you know?
- What things will you hold your staff or the contractor accountable for? Schedule? Quality? Savings?

Operation Knowledge

- Do you know how to maintain the solution appropriately?
- Do you know how to operate it in the most efficient manner?
- Will you know if it is not operating correctly or achieving the energy efficiency you expect?
- If your bills don't show the savings what will you do?

If you believe energy efficiency is important and are interested in having your district operate more efficiently, consider the accompanying Steps to Energy Efficiency. Whether you do them yourself or with a consultant, you can improve your situation. Each step builds on the preceding one to optimize your facilities into high-performance schools.



Steps to Energy Efficiency and Optimum Performance

Type of Utility	Efficient Rule of Thumb
Electricity	5 to 10 kWh per square foot
Gas	0.15 - 0.20 therms per square foot
Total Energy (Electricity and Gas converted to kBtu)	30-50 kBtu per square foot
Water	10-15 gallons per square foot

TABLE 2: Energy Efficiency Rules of Thumb

Energy Consulting: Energy engineering can help transform your buildings into higher performing buildings that are environmentally friendly, more comfortable and less costly to operate. Beginning to monitor energy consumption is the first step to making a change. Utility rate structures and monthly usage patterns should be evaluated for anomalies and energy-saving strategies. Once your utility costs and usage are tracked you can begin to compare them to energy efficiency standards. Table 2 contains some rules of thumb for energy-efficient electricity, gas and water use.

Implement Energy-Efficient Equipment: Having equipment turned off is the most energy efficient. But when your equipment is operating, why not make sure it is operating as efficiently as possible? The biggest energy consumers in most schools are the lighting, heating, cooling and ventilation. These together often make up 70% or more of your energy bills. New equipment technologies can provide up to 50% savings over older technologies.

Lighting used to be fairly simple, but is becoming more complex with the increased use of LED lighting. There are many solutions and options to consider while prices continue to decline rapidly on some components. In the early '90s T12 fluorescent and incandescent lighting began to be replaced with T8, T5 and compact fluorescent light-

ing. These new solutions would often reduce lighting energy consumption by half. Now LED lighting is similarly cutting fluorescent lighting in half. This continues to improve opportunities to reduce energy.

Heating, ventilation and cooling is significantly more complicated. Are the systems designed for energy efficiency? Has the equipment been sized correctly and selected with energy conservation in mind? Is it implemented by the contractor and optimized to perform as intended? Too often the answer to those questions is "no." One of the biggest energy savings we find in schools is in the operation of heating, ventilation and cooling systems. This is often an issue with the temperature control systems for both old buildings and new.

Evaluate your existing systems and equipment and compare them to new similar equipment to determine if significant savings can be achieved.

Efficient Operating Plan: Schools often talk with architects, engineers and contractors who have knowledge in energy efficiency. They offer solutions around the implementation of facility improvements and can help implement systems and technologies that improve the energy efficiency of your buildings. Some even go as far as commissioning their systems to make sure they operate within the design intent, which we have found is critical to building performance.

While this is a benefit, there is often nobody taking responsibility for creating a plan to operate the buildings efficiently, continuously monitoring the building system operation or putting effort forth toward managing the behaviors of the people utilizing the systems.

How does your building use and energy consumption get impacted by the different departments in your schools?

Energy and Behavior Education: People tend to take energy for granted, and many are unaware of the opportunities they have to reduce energy use. Some claim to favor energy efficiency but do not follow through when it comes to their own behaviors.

The single most important part of this is a well-conceived district energy policy that defines clear expectations for building performance. It should provide the outline of a program and define broad performance objectives, but a detailed procedures manual should also be developed to provide specific guidance to facility staff. This should include heating, cooling and hot water temperatures, ventilation control and exhaust fans, off-hours scheduling, lighting levels, control of computers, vending machines and other plug loads, vacation and nighttime shutdown procedures, record keeping and energy system repairs. An energy committee can provide great value and insight for creating policies and obtaining school board and administration buy in. The energy committee can help

in developing the energy policy and then ask the school board to ratify it as a facility use and operational policy.

Program visibility and reporting is critical to keep energy awareness in the forefront. This includes the periodic reporting of program objectives and progress, on-going training and education, providing rewards for success, outreach to anticipate staff concerns and outreach to local media sources.

Commissioning: While some clients have had their systems commissioned to make sure they operate within the design intent, it only provides performance indicators at one moment in time under certain conditions. Continuous monitoring of the systems in operation and the interaction with the people utilizing the systems can provide great insight into additional performance problems that otherwise go unidentified. In traditional construction, the architect and engineer are challenged with designing an efficient building, but the contractor is selected in a low-

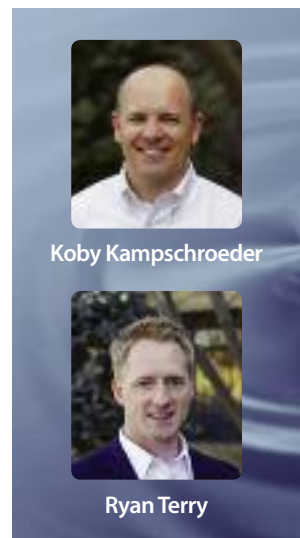
bid environment with a motivation to get this project signed off and get on to the next job. If the systems and equipment are providing heating when asked and cooling when required, the commissioning agent can appropriately check their boxes, then the contractor moves on. Many clients don't know how to ask, evaluate or validate the next level of questions to support a high-performance building. The end result of this is the achievement of substandard savings from an energy-efficient design or in many cases no savings at all.

Optimization: A holistic approach should be taken to evaluating and finding solutions to cover all aspects of how your buildings use energy. This includes energy supply, building systems, facility operation and human behavior. A high-performing building will need to integrate building system improvements with energy management programs and monitoring building analytics to reduce energy costs and provide optimum building performance.

The information that you learn about your building and how it consumes energy will continue to educate you on how to best utilize and optimize one of your most important assets.

Net Zero: Once your buildings become as efficient as you can get them and you want to take them even further, consider utilizing solar or other renewable energy sources to become net zero. This utilizes renewable energy to produce the full amount of energy your building uses and reduces your carbon footprint to zero.

What decisions will you make about energy efficiency? As this question arises in your organization, help educate others that what you do has a large impact on your overall financial success. Consult with outside professionals as appropriate, and continue doing all you can to improve the quality of education provided in the state of Missouri.



How are facility needs affecting your schools? Call us, we may be able to help.

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