



Missouri Energy Smart Schools *Energy Tips and Information Bulletin #1*

Common Questions about Energy-Efficiency Projects

Missouri Energy Center and EarthWays Center fact sheet - 10/2007

School districts across the country are challenged to maintain healthy and effective learning environments using very limited resources. Aging facilities, increased student enrollment and tight budgets compete for attention. An energy-efficiency project can address many of these issues. Here are answers to some basic questions to get you started improving your district's energy efficiency.

Why should energy efficiency be a school district priority?

Spending less on energy frees up valuable tax dollars to meet more important district priorities such as textbooks, equipment or facilities that help improve student performance. Energy efficiency also improves classroom comfort and appeal. Studies show that students perform better in rooms with daylight. Through cost-effective energy-efficiency improvements, many schools can reduce energy expenses by 30 percent. Simply stated, the more your district doesn't expend on energy costs, the more your district can spend on other district priorities.

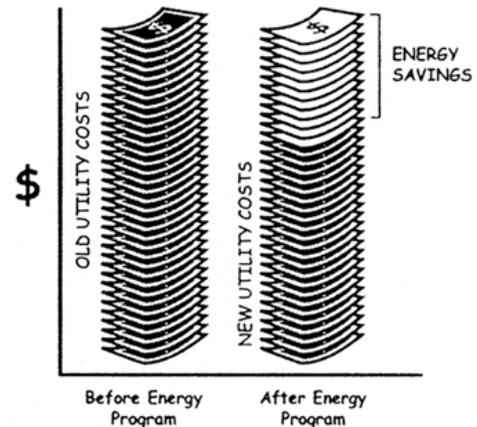
Energy costs are only 1 to 2 percent of my district budget, so what is the real potential dollar savings?

Through cost-effective energy-efficiency improvements, many schools can reduce their energy expenses by 30 percent. In districts with a total utility cost of \$60,000, this translates to \$18,000 in annual savings; with a total utility cost of \$100,000, it means \$30,000 in annual savings.

What types of building improvements will yield these savings?

Lighting may account for 50 percent or more of a facility's total electricity consumption. For most energy-efficiency retrofits, high-efficiency lighting is key to reducing operating costs. Improvements often include the use of T8 fluorescent tubes, compact fluorescent bulbs and electronic ballasts. Additional energy-efficiency improvements may include new, high-efficiency heating and cooling systems, added insulation and double-paned windows.

BENEFITS OF ENERGY EFFICIENCY



School districts can save 20-30% of their utility costs through energy efficiency.

How do I address energy efficiency in my district?

The best first step in any energy-efficiency program is becoming knowledgeable about utility use in your district. Find out how much energy your district uses; how much you pay for gas, electricity and other fuels; how much you pay per square foot of building space. Study changes in energy use over time.

To assess potential savings quickly, find out the age and efficiency of your energy-consuming building systems. Compare this information to the energy efficiency of new equipment. Then get more detailed information about potential efficiency projects and savings through an energy audit performed by district staff or by an energy consultant.

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Limited funds only allow me to consider lighting projects. Shouldn't I do those measures first? All energy-efficiency projects benefit schools by saving scarce tax dollars. However, you should consider various factors when choosing projects such as overall project cost, available financing, and the period needed to recover costs through energy savings. A high-efficiency lighting retrofit may pay for itself in four years or less, whereas an HVAC replacement or an energy management system may require 15 years. The shorter lighting payback can subsidize the cost of the longer payback item. This provides a total payback period of perhaps seven to ten years, after which the savings continue year after year.

Sounds great, but how does a school district find the funds to pay for these improvements? Financing methods include bond money, tax-exempt leasing or loans. In Missouri, school districts can apply for a low-interest loan from the Missouri Energy Center. School districts can initiate financing options on their own or within the context of a performance contract with an energy service company. Performance contracts require no up-front costs to the building owner, and energy savings pay for the financing.

What about restructuring of the electricity industry? Is it going to happen in Missouri, and if so, how should a school district prepare? Uncertainty continues about if, and how, restructuring, or "deregulation", may occur in Missouri. However, school districts should closely track utility costs, monitor energy use and upgrade buildings to operate at maximum efficiency. Knowledge about your district's utility profile will allow your district to make appropriate decisions when presented with the potential choices that will accompany a restructured utility industry.

Missouri Energy Smart Schools - Case Study

St. Louis Public School District, St. Louis, Missouri



Project Size: 60 buildings

Project Scope: Lighting upgrades, building controls and automation, water conservation measures, boiler replacements and energy education programs.

Project Cost: \$10,000,000

Utility Savings: \$1,000,000/year

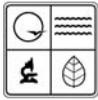
Simple Payback: 10 years

Project Funding: DNR low-interest loan
Conventional loan
Performance contract

Additional Benefits: Improved comfort, and reduction of maintenance staff demands. Energy savings paid for a project-wide energy education program.

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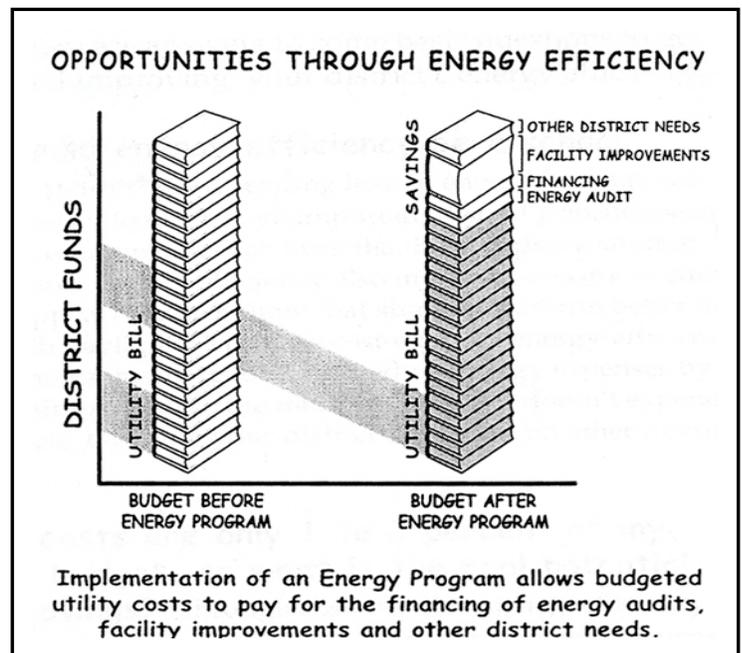
Working with Energy Consultants

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Spending less on energy frees up valuable tax dollars that can finance important educational or capital projects. Through cost-effective energy-efficiency improvements, schools can reduce energy expenses by 30 percent. The more your district saves on energy costs, the more you can spend on education and facilities.

Energy Consultants provide additional resources to school districts implementing energy-efficiency projects. Maintaining effective communication and monitoring projects are essential to ensure project success. Consider the following important issues when working with consultants:

- Name a specific district staff person to be responsible for the project.
- Monitor work of the consultant and contractors regularly.
- Establish a communication protocol for all project players to follow.
- Check on the subcontractors that consultants hire. The quality of work of the subcontractors and the equipment they install can dictate long-term project success.
- Be aware of state requirements for procurement of services and prevailing wage laws.
- Determine the cost responsibility and laws covering waste disposal.
- Find out up-front details about financing options proposed by the consultant.
- Learn about the project documentation and invoices required by the financing sources.



Performance Contracts

Many districts have entered into **performance contracts** with energy service companies (ESCOs). A performance contract is an arrangement by which energy service companies agree to finance, implement and maintain energy efficiency improvements. The ESCO financing is repaid by an agreed-upon percentage of the savings generated by the improvements.

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Performance contracting

In a performance contract, the cost of the audit is included with the cost of the efficiency projects. The total project financing will cover all project costs, so no up-front dollars are needed. In addition, the ESCO guarantees energy and operational savings and assumes the technical and financial risks.

The following is a sample of Missouri school districts that have implemented energy efficiency projects utilizing a performance contract:

- Bayless School District
- Crawford R-II School District
- Independence School District
- Mehlville School District
- Neosho School District
- Nevada School District
- No. St. Francois School District
- Riverview Gardens School District
- Raytown School District
- Special School District
- St. Louis Public School District
- St. James School District

Performance contract issues

In addition to general consultant questions and issues, the following need consideration when working with a performance contract:

- Unbundle all costs (equipment, services, guarantees) in the contract. A change in project scope may affect interactive savings.
- Consider the cost of legal consultation in your total project budget.
- Evaluate the cost of a performance guarantee versus the risk of not purchasing the guarantee.
- Understand all assumptions made in establishing an energy baseline, and check and verify any baseline changes.
- Request that percentage of savings guaranteed and annual cost of the guarantee be included in the contract.
- Request that operations and maintenance savings result in actual budget reductions

Missouri Energy \$mart Schools - Case Study

Independence 30 School District, Independence, Missouri

District Size: 22 Buildings

Simple Payback: 10 years

Project Scope: Lighting replacement, new chiller, boiler replacement, energy management system

Project Funding: Performance contract
Conventional loan

Project Cost: \$3,073,000

Additional Benefits:
Maintenance staff can monitor and control mechanical system from one central site.
Improved environmental comfort levels.

Utility Savings: \$373,000/year



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Missouri Energy Smart Schools *Energy Tips and Information Bulletin #3*

Financing Energy Projects

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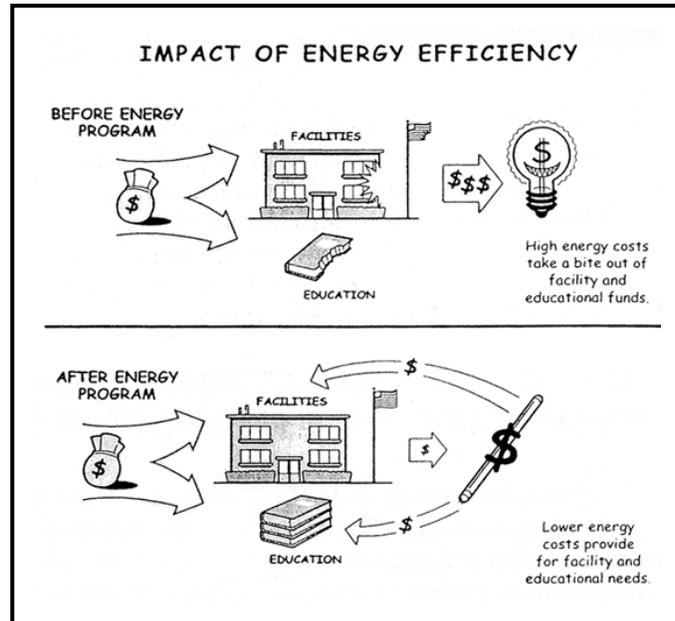
Spending less on energy offers advantages to school districts because it frees up valuable tax dollars. These savings can finance important educational or capital projects such as textbooks, other learning aids or needed facility improvements that help make buildings more comfortable and improve student performance. Through cost-effective energy-efficiency improvements, schools can reduce energy expenses by 30 percent. The more your district saves on energy costs, the more you can spend on education and facilities.

Financing energy projects allows school districts to tap into energy savings available in their facilities. Here are some options:

Cash: If a district has large capital reserves or is planning simple, less-expensive efficiency measures that have a quick payback, it often makes sense to pay for the project with cash.

Bonds: School districts may issue bonds for design and implementation of energy-efficiency projects. However, you can stretch capital improvement dollars by separating energy projects from the bond financing projects. Use alternative financing for energy projects. Savings from reduced utility bills repay the financing so energy projects don't count against a district's debt limit. More bond dollars are then available for capital projects that have no savings to repay construction costs.

Tax-Exempt Lease-Purchase: A lease-purchase agreement enables a school district to purchase new equipment during a fixed term with fixed payments and to own the asset at the end of the term without creation of debt. Leases can be structured so the savings generated by the building upgrades cover the lease payments.



Equipment vendors can often arrange this kind of financing.

Loan: Schools in Missouri can apply for a low-interest loan from the department's Energy Center for energy-related facility improvements or new construction. Many districts also can secure loans from local lending institutions.

Performance Contracting: In a performance contract, the total project cost includes the cost of the initial energy audit, so the district needs no initial cash investment to pursue energy efficiency. The energy savings pay for the financing. The energy company obtains the financing and guarantees that the project will save a specified amount of energy, based on the results of the audit. Therefore, the energy company assumes the technical and financial performance risks associated with the project. Financing can include state loans and tax-exempt lease purchase arrangements.

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State of Missouri Energy Loan Program

The Department of Natural Resources' Energy Center operates a loan fund to finance energy-efficiency improvements in public schools. The Energy Center provides technical and financial assistance to implement cost-effective energy-efficiency upgrades. New construction is also eligible if the design and equipment will be significantly more efficient than similar, typical buildings. Savings from the more efficient design can be used to repay a loan for the incremental costs of the high-efficiency measures.

The loans offer a below-market interest rate and can finance eligible projects up to eight times the estimated savings. All of the projects implemented through the loan funds are repaid from the savings generated by energy-efficiency capital improvement projects. The loan funds are considered off-budget and are not considered debt obligations.

Here are some districts served by the energy loan program in the 2006-07 school years:

- Bayless
- Cainsville R-1
- Cole Camp R-1
- Madison C-3
- Osceola
- Phelps County R-3
- Republic R-3
- Salem R-80
- Smithton R-6
- Willow Springs R-4

Missouri Energy Smart Schools - Case Study



Webster Groves School District, Webster Groves, Missouri

- **District Size:** Nine buildings
- **Project Scope:** New lighting, boiler upgrades, insulation, HVAC controls replacement, building automation
- **Project Cost:** \$650,000
- **Utility Savings:** \$92,857/year
- **Simple Payback:** Seven years
- **Project Funding:** DNR low-interest loan, bond funds

How to Stretch Your Bond Money!

The Webster Groves School District paid for a comprehensive energy audit of its entire district. The audit identified approximately \$650,000 worth of energy-related facility improvements such as new lighting, boiler upgrades, roof insulation, HVAC control replacements and a building automation system. If implemented, these improvements would pay for themselves in seven years as a result of energy savings.

During the same time, Webster Groves taxpayers approved a \$5 million bond program that included many of these energy-saving building improvements. The district decided that by financing the energy-related facility improvements using the state's low interest loan program, approximately \$500,000 of bond money became available to address other district needs such as ADA improvements.

"By combining the Energy Center loan with a bond issue, Webster Groves School District was able to combine projects and accomplish more work. This is an excellent way for a school district to stretch its dollar."

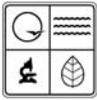
- Diane Vaughn, Webster Groves School District, Business Manager

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Missouri Energy Smart Schools

Energy Tips and Information Bulletin #4

Energy Savings Beyond the Boiler Room

Missouri Energy Center and EarthWays Center fact sheet - 10/2007

Changing Behavior Works!

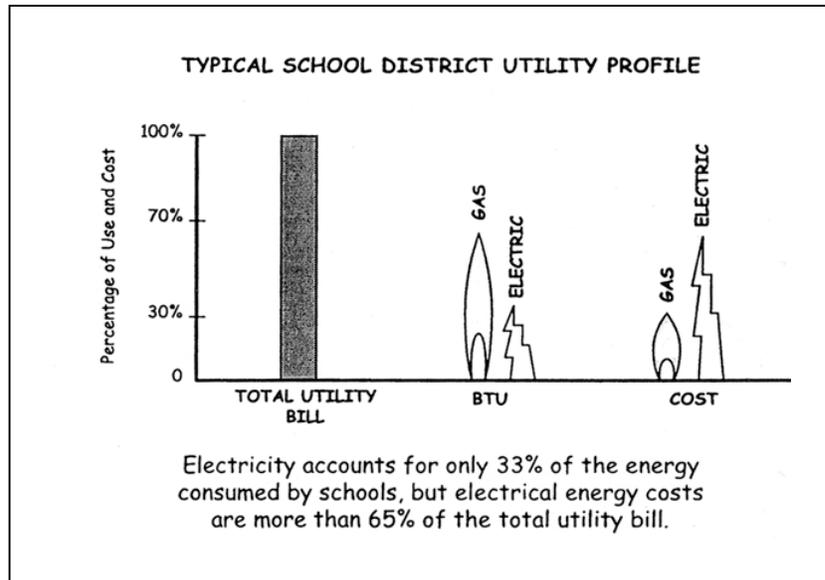
A study of Missouri school districts found that electricity accounts for one-third of the energy **consumed** by schools, but nearly two-thirds of their total utility costs. Simple changes in behavior can save substantial amounts of wasted energy, wasted natural resources and wasted money. It's often as simple as flipping a switch.

Lighting

Lighting accounts for 50 percent or more of the electrical energy used by schools. Turn lights off when not needed, and utilize daylighting whenever practical to save energy. Studies show that students perform better in rooms with daylight.

Heating and Cooling Systems

Heating and cooling systems draw large amounts of energy. Often systems are left running unnecessarily on weekends and during holiday seasons. Ask staff, or install automated



monitoring systems, to setback or shutdown these systems when the building is unoccupied. This garners immediate savings.

Energy Management Teams

Energy improvements in school buildings affect all building users including administration, teachers, students, maintenance staff and parents. Energy Management Teams, composed of representatives of each of these groups, can help you realize the full energy-saving potential of your project.

When building users understand the goals of an energy-efficiency facility project, they help monitor its success and help change the behavior of other users. In return, they provide valuable information to the administrators and facility consultants about comfort, malfunctioning systems and operational schedules that affect energy consumption in the building.

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- Office Equipment — from computers and monitors to imaging equipment, such as printers and copiers — that has earned the ENERGY STAR® helps eliminate wasted energy through special energy-efficient designs. They use less energy to perform regular tasks, and when not in use, automatically enter a low-power mode.
- ENERGY STAR® qualified office and imaging products use as much as 60 percent less electricity than standard equipment. And using less energy keeps utility costs down. Over the next five years, these products will save Americans more than 5 billion dollars, and they can save money for your schools as well.
- Consider adding an ENERGY STAR® requirement in your school's purchasing policy. For more information on ENERGY STAR® office equipment visit the Web site at: www.energystar.gov



Energy Education Is A Win-Win

Effective energy education programs not only provide students and teachers with basic facts related to the forms and sources of energy, energy transformations and energy efficiency, they can produce up to ten percent additional energy savings in your district. The EarthWays Center, a division of the Missouri Botanical Garden, designs and delivers energy education programs to school districts throughout Missouri. All activities are correlated to Missouri statewide education goals and assessments. Call (314) 577-0220 to learn more.

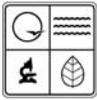


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Missouri Energy \$mart Schools
Energy Tips and Information Bulletin #5

Lighting Retrofits in Energy Projects

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Lighting can account for more than 50 percent of the electric bill in most schools. With computer use growing, many districts must add electrical capacity to meet the increased demand. By reducing the electrical load from lighting, many facilities can accommodate increased demand from computers and other equipment without expanding electrical capacity. School districts can select from any high-efficiency lighting products on the market today. Most lighting improvement projects include T8 fluorescent tubes, electronic ballasts, compact fluorescent bulbs and LED exit lights.

- Fluorescent lighting is about three to four times more efficient than incandescent lighting and lasts about 10 times longer.
- Replacing T12 bulbs and magnetic ballasts with T8 bulbs and electronic ballasts achieves approximately 30 percent savings. Oak Grove School District paid for its lighting project from energy savings in 4.5 years.
- Compact fluorescent tubes can replace incandescent bulbs that have three to four times the wattage, saving up to 75 percent of the lighting energy and reduce labor cost. They cost more to buy, but they last 10 to 15 times longer.
- LED lighting for exit fixtures lasts 10 times longer than compact fluorescent and 100 times longer than a typical incandescent bulb. Lee's Summit School District paid for district-wide exit light replacement from energy savings in less than two years.
- Turning lights off when not needed provides immediate savings. Educational programs that include lighting patrols have proved effective in delivering quantifiable savings.
- Use daylight whenever practical, and include daylight in new building design. In addition to saving energy, studies show daylight improves student performance.

Use Lighting Savings to Improve Overall Efficiency

A high-efficiency lighting retrofit may pay for itself in two years or less while an HVAC replacement or energy management system may require 15 years to pay back in energy savings.

If you combine the lighting improvement and HVAC replacement, the shorter lighting payback can subsidize the cost of the longer payback item. This setup provides a total payback period of perhaps seven to 10 years and captures greater total energy savings. Please see the Bayless School District case study (on back).

In addition, other costly capital improvements can be folded into a project to cover costs, or at least partially subsidize them, by the combined energy cost savings.

- Simple maintenance, such as keeping lamp lenses and reflective surfaces clean, will serve to improve light quality and allow for lower initial illumination levels.

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Missouri Energy Smart Schools - Case Studies

Bayless School District, St. Louis, Missouri

| | | | |
|-----------------------|---|-----------------------------|---|
| District Size: | Four Buildings | Utility Savings: | \$51,280/year |
| Project Scope: | District-wide replacement of all lighting, new automated building control system and an energy education program. | Simple Payback: | 10 years |
| Project Cost: | \$512,797 | Project Funding: | Conventional Loan Performance Contract |
| | | Additional Benefits: | Lighting levels were increased while energy costs were reduced. Three-year energy education program was paid for from energy savings. |

Lee's Summit School District, Lee's Summit, Missouri

| | | | |
|-----------------------|---|-----------------------------|---|
| District Size: | Seventeen Buildings | Project Cost: | \$20,518 |
| Project Scope: | District-wide replacement of all exit lights. 551 40-watt incandescent exit lights replaced with 3-watt LED exit light replacement kits. Half the lights were replaced immediately; the other half were replaced as lamps burned out utilizing only district staff. | Utility Savings: | \$13,573/ year or approximately \$25/light/year |
| | | Simple Payback: | 1.5 years |
| | | Project Funding: | EC low-interest loan |
| | | Additional Benefits: | Reduced long term maintenance cost since lamps will not need to be replaced for approximately 15 years. |

Oak Grove School District, Oak Grove, Missouri

| | | | |
|-----------------------|--|-----------------------------|---|
| District Size: | Four Buildings | Utility Savings: | \$18,590 |
| Project Scope: | District-wide replacement of all T12 bulbs and magnetic ballasts with T8 bulbs and electronic ballasts. Exit lights were replaced with LEDs. | Simple Payback: | 4.5 years |
| Project Cost: | \$73,643 | Project Funding: | EC low-interest loan |
| | | Additional Benefits: | Maintenance savings due to less frequent lamp replacement |

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