



Managing energy costs in schools

A guide to energy conservation and savings for K-12 schools



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Managing energy costs in schools

Today's school plant managers and administrators have more on their plates than ever before.

Budgets are tighter. Energy costs are on the rise. Everyone's worried about climate change and environmental impacts. And more than ever, the public is looking for ENERGY STAR® or other environmental designations.

According to the Department of Energy (DOE), our nation's K-12 schools are failing Energy 101. They're challenged to serve growing student populations and rising community expectations with aging buildings, constrained operating budgets, and ever-increasing energy bills. Each year, taxpayers spend \$6 billion on energy for these schools — about 25 percent more than necessary — more than is spent on textbooks and computers combined.

What you may not know is that:

- The least efficient schools use three times more energy than the best energy performers; and
- Top performing ENERGY STAR labeled schools cost forty cents per square foot less to operate than the average performers.

This brochure will help you decipher many of the energy-related conservation options available for K-12 schools. You'll find long- and short-term ways to cut energy bills, see real-life examples and even learn how to earn environmental and other recognition along the way.

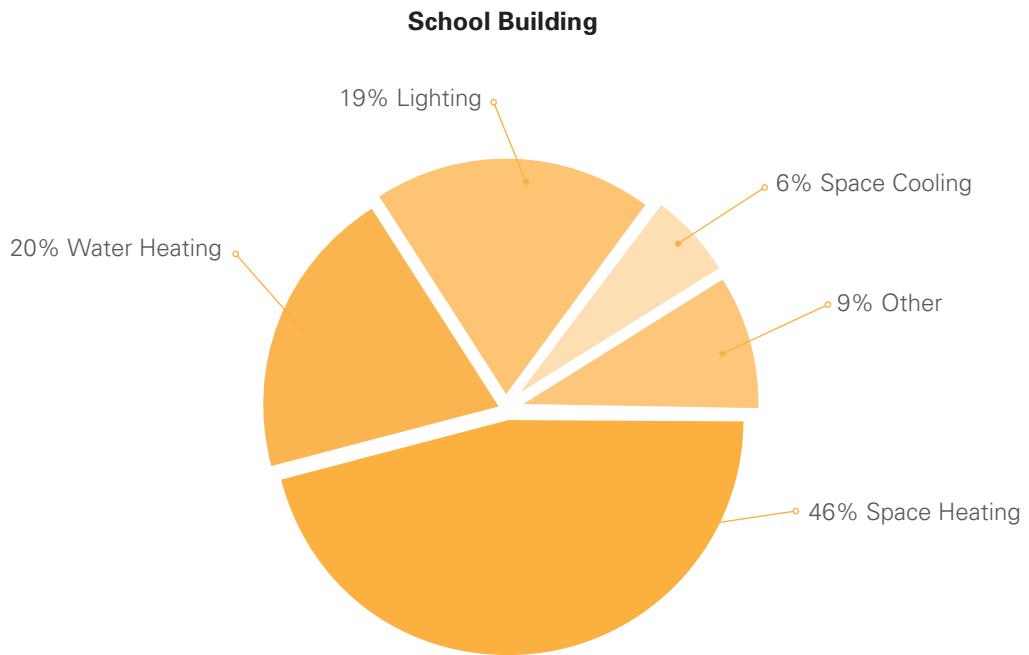


How much do you spend on energy?

U.S. school districts spend \$6 billion each year on energy — second only to salaries. On a more local basis, kindergarten through high school buildings in the U.S. spend an average of 67 cents per square foot (ft^2) on electricity and 19 cents/ ft^2 on natural gas annually. In a typical school building, lighting, space heating, and water heating represent the bulk of total use, making those systems the best targets for energy savings.

Top energy-performing schools use three times less energy than the least efficient schools

Energy accounts for about 2.2 percent of a school's expenditures. Although this represents only a small percentage of total costs, it is one of the few expenses that can be decreased without affecting classroom instruction.

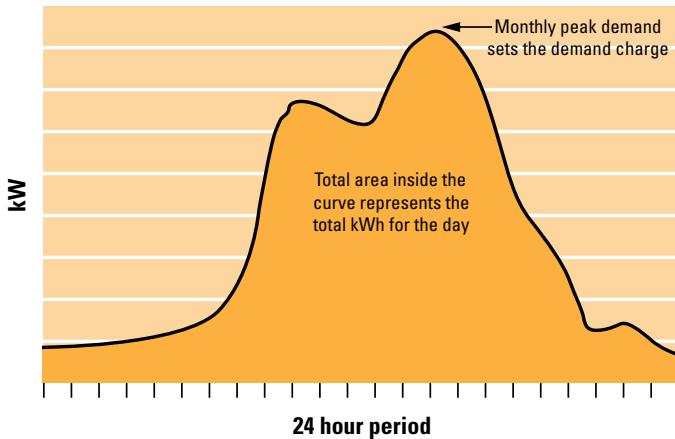


Source <http://www.eere.energy.gov/buildings/info/schools/index.html>

Know how you're charged for energy

In order to better manage your building's energy costs, it helps to understand how you are charged for those costs. Most utilities charge commercial buildings for their natural gas based on the amount of energy delivered. Electricity, on the other hand, can be charged based on two measures: consumption and demand (Figure 1).

Figure 1: Diagram of a hypothetical daily load shape



The consumption component of the bill is based on the amount of electricity in kilowatt-hours (kWh) that the building consumes during a month. The demand component is the peak demand (in kilowatts) occurring within the month or, for some utilities, during the previous 12 months. Demand charges can range from a few dollars per kilowatt-month to upwards of \$20 per kilowatt-month. Because it can be a considerable percentage of your bill, you should take care to reduce peak demand whenever possible.

As you read the following energy cost-management recommendations, keep in mind how each one will impact both your consumption and demand.



Have more questions?

Ready to begin?

Contact your Xcel Energy account manager or our Business Solutions Center at 1-800-481-4700.

Sign up for conservation-related e-mails about rebate programs, bonus offers and special events at xcelenergy.com/subscribe

Quick fixes

Many schools have tight facility budgets, so low- or no-cost energy expenditure reductions are especially important.

COLORADO SCHOOL DISTRICTS EARN ENERGY STAR® LABELS AND SAVE WELL OVER \$6.5 MILLION.



By following ENERGY STAR and EPA guidelines, Colorado school districts can take control of energy costs, demonstrate sound fiscal management and help protect the Environment.

Did you know that over 86 schools in Colorado have achieved the ENERGY STAR label?

- Poudre School District completed 139 energy efficiency projects from January 1994 to October 2007. On-going yearly savings from these projects reached \$434,000. And, accumulative savings from 1994 to 2007 are over \$1,876,000. Poudre School District also earned the 2003 ENERGY STAR partner of the year award.
- Jefferson County School District joined as an ENERGY STAR partner in 2001. In the first year, over 41 of their schools gained efficiencies that helped improve the quality of the environment and cost measurably less to run.

Xcel Energy's Energy Analysis Program helps schools determine conservation opportunities that will save them money on their energy bills and help them earn ENERGY STAR ratings. Energy Analysis offers online assessments, on-site energy audits and engineering study funding.

Turning things off

Turning things off seems simple, but remember that every 1,000 kWh that you save by turning things off equals \$100 off your utility bill (assuming a national average electricity cost of 10 cents/kWh).

Computers

Computers are used intermittently in schools and should employ sleep-mode settings when the machines are not in use. The typical desktop computer, monitor, and shared printer draw about 200 watts, with the monitor alone drawing about 100 watts. “Smart” power strips with built-in occupancy sensors are available to shut off plugged-in devices like printers and monitors when no users are present. When buying new equipment, choose models that meet ENERGY STAR guidelines for energy savings.

Lights

Turn off lights when they are not in use. Occupancy sensors or lighting controls can help, but a less-expensive alternative would be to assign students as “energy monitors” to ensure that switches are off when the lights aren’t needed and to train custodial staff to also switch off light.

ENERGY CONTROLS MAKE SAVING EASY AS 1-2-3

Aurora Public Schools is in the process of adding energy controls to their schools. Soon they’ll have network-controlled thermostats that enable setbacks and control of the HVAC systems at 75 mobile teaching facilities. Their estimated annual savings will be nearly \$6,500 and they stand to gain approximately \$9,930 in rebate dollars. They’ll also save enough to recover the cost of this improvement in two years.

Xcel Energy’s Energy Management System rebate program offers cash back for customers who install energy management, an energy management system in an existing building or add points to an existing system.

Turning things down

Some equipment cannot be turned off entirely, but turning it down to minimum levels where possible can save energy.

HVAC temperature setbacks

Turn down temperature settings after school hours but be wary of nights when after-school activities such as sports or theater occur.

Special-use rooms

Certain parts of a school — like auditoriums, gymnasiums, and cafeterias — are only used during specific times of the day or week. Make sure that HVAC settings are at minimum levels during nonuse periods.

Water heaters

Turn water heaters down on weekends if possible.



Checklist

Cleaning and maintenance checklist

- Use an economizer** - Many air-conditioning systems use a dampered vent called an economizer to draw in cool outside air, when it is available, to reduce the need for mechanically cooled air. If not regularly checked, the linkage on the damper can seize up or break.
- Service economizers** - An economizer stuck in the fully opened position can add as much as 50 percent to a building's annual energy bill by allowing in hot air during the air-conditioning season and cold air during the heating season. Have a licensed technician check, clean, and lubricate your economizer about once a year and repair it if necessary. If it's still operating, have the technician clean and lubricate the linkage and calibrate the controls.
- Check air-conditioning temperatures** - With a thermometer, check the temperature of the return air going to your air conditioner and then check the temperature of the air coming out of the register nearest the air conditioning unit. If the temperature difference is lower than 14 degrees or higher than 22 degrees, have a licensed technician inspect your air-conditioning system.
- Change filters** - Filters should be changed on a monthly basis — or more often if you are located next to a highway or construction site where the air is much dirtier.
- Check cabinet panels** - On a quarterly basis, make sure the panels to your rooftop air-conditioning unit are fully attached with all screws in place, and verify that gaskets are intact so no air leaks out of the cabinet.
- Clean condenser coils** - Check condenser coils quarterly for either man-made or natural debris that can collect there. At the beginning and end of each loading season, thoroughly wash the coils.
- Check for airflow** - Hold your hand up to air registers to ensure that there is adequate airflow. If there is little airflow, or if dirt and dust are found at the register, have a technician inspect your unit and ductwork.

Longer-term solutions

Longer-term solutions should also be considered. Although the actions covered in this section require more extensive implementation, they can dramatically increase the efficiency of your facility without compromising — and possibly even improving — the learning environment. Ask your Xcel Energy representative for more information about initiating such projects.

Commissioning (or Recommissioning)

Commissioning is a process in which engineers observe a building to ensure its systems are operating appropriately and efficiently. Studies have shown that continuously monitoring a building's energy systems can lead to reductions of 10 percent to 15 percent in annual energy bills.

For the typical 100,000-ft² school building, that's equal to about \$14,000 in savings per year! Savings typically come from resetting existing controls to reduce HVAC waste while maintaining or even increasing comfort levels for occupants.

RECOMMISSIONING COULD SAVE FRONT RANGE

COMMUNITY COLLEGE \$25,840

Front Range Community College officials noticed that their energy bills seemed unusually high, which prompted a Recommissioning study.

The study found that the college could save \$25,840 in annual electric energy savings. Recommended measures included, optimizing the minimum percentage of outside air and updating the start/stop schedules on the multizone systems and air handling units, restoring chiller sequencing and implementing condenser and chilled water resets.

Xcel Energy's Recommissioning program provides study funding, plus rebates for implementing suggested improvements.

Upgrade to more efficient lighting

Take advantage of daylighting where possible to reduce the need for electric light — proper design is critical to avoid glare and overheating. According to the DOE, studies show a connection between the use of daylighting and improved student performance. Recent studies conducted by the California Board of Energy Efficiency, involving 21,000 students, shows test scores were 15 percent to 26 percent higher in classrooms with daylighting.



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If your facility uses T12 fluorescent lamps, relamping with modern T8 lamps and electronic ballasts can reduce your lighting energy consumption by 35 percent. Adding specular reflectors, new lenses, and occupancy sensors or timers can double the savings. Paybacks of one to three years are common.

Compact fluorescent lamps (CFLs) can replace incandescents in many applications, reducing energy use by two-thirds and yielding savings of up to \$20 per lamp per year.

SCHOOLS ARE LIGHTING THE WAY TO A CLEANER ENVIRONMENT

Lighting in schools is often taken for granted, but Westridge Elementary School's recent lighting upgrade has received the attention of accountants and administrators. The school planned a large lighting retrofit throughout the school and saved a total of 21kW, 66,896kWH, and received \$6,016 in rebate dollars.

William Roberts School, a new K-8 addition to the Denver Public School District, was designed with energy efficiency in mind when it was built in 2006. Their lighting system saves 223kW and 712,964kWh. Through installation of fixtures like High-Bay T5HO and Hardwired CFLs they secured a rebate of \$12,513.

Xcel Energy's Lighting Efficiency program offers rebates for lighting improvements, new construction and redesign.

Efficient water use

Sink and shower controllers that automatically shut off after a certain time duration and low-flow faucets and shower heads can help conserve energy used to heat hot water.

Energy-recovery ventilation

Many schools struggle with ventilation efficiency. Bringing in fresh air helps students and helps meet code, but can raise HVAC costs. Energy-recovery ventilation uses waste exhaust heat to warm incoming air. For schools, energy-recovery ventilation tends to save more natural gas than electricity since schools aren't open during summer when they'd typically see electricity savings.

Demand-controlled ventilation

Many auditoriums, gyms, classrooms, and cafeterias are always ventilated as if they were at full capacity. Instead of leaving them this way, adjust the ventilation levels based on occupancy.

Demand-controlled ventilation manipulates an HVAC system to control the amount of outside air being supplied to a space based on occupancy, as measured by the amount of carbon dioxide present in that space. Less energy is consumed because the fans only run when outside air is needed.

Reflective roofing

If the roof needs recoating or painting, consider white or some other highly reflective color to minimize the heat that the building absorbs. This change can often reduce peak cooling demand and cooling energy use by 15 percent to 20 percent. For a list of suitable reflective roof-coating products, check out the U.S. Environmental Protection Agency's Web site at <http://yosemite1.epa.gov/estar/consumers.nsf/content/roofbus.htm>.

Energy-efficient roofs can qualify for *Conservation Wise* from Xcel EnergySM Custom Efficiency rebates. For additional information about Custom Efficiency rebates and preapproval requirements contact your Xcel Energy account manager or our Business Solutions Center at 1-800-481-4700 or go to www.xcelenergy.com/rebates.

NORTH MIDDLE SCHOOL UPGRADES LIGHTING THROUGH THE CUSTOM PROGRAM AND EARNS REBATE DOLLARS

North Middle School, part of Aurora Public Schools, upgraded their lighting with 3-lamp T8 fixtures, which gave them an annual electric savings of 18,073KWh. They received a \$1,500 rebate and will save \$1,500 annually with a payback of 4.8 years.

Xcel Energy's Custom Efficiency program offers rebate dollars for unique projects or improvements that don't fit into the prescriptive programs. Custom projects do require rebate pre-approval before purchase and installation, so pre-apply, when you're in the planning stage to ensure you earn any rebates that might be available.



New cooling considerations

As year-round use of school buildings has grown, so has the use of air conditioning beyond school-office window units. As use has grown, so have energy bills. Efficiency improvements of new equipment offer considerable savings. Growing use of cooling is contributing to high demand for power in the summertime months. Minimizing cooling loads not only reduces your bills, it also reduces the need for more power plants.

Plan to replace cooling systems more than 15 years old

If your cooling system is more than 15 years old, it uses up to 20 percent more electricity than new models, and it can be unreliable and hard to maintain. Efficiency upgrades often pay for themselves in energy savings in just a few years.

The little extra you pay for high efficiency will pay for itself several times over the life of the system.

Not convinced new equipment is a good idea?

Consider this:

- The average efficiency of all units now being purchased has risen by 14 percent compared to the 1992 U.S. federal standard
- The most efficient units now are 52 percent more efficient than the standard
- Air conditioning is the second largest consumer of electricity in commercial buildings (after lighting)
- Air conditioning is the largest contributor to peak electricity demand during hot weather

Build to save

Choosing energy-saving alternatives when building or renovating your school building will pay off in long-term energy and environmental savings.

According to the DOE, new high-performance schools — designed to save energy and reduce environmental impact — can cost 50 percent less to operate than traditionally designed schools.

High performance school designs integrate efficient lighting and daylighting systems, advanced windows, roofing, insulation, and mechanical and ventilation systems, as well as renewable energy systems, water conservation features, recycling and waste management systems, and use of environmentally-sensitive building products and systems. As an added bonus, teachers can incorporate their school's energy features into their curriculum, providing students with hands-on learning opportunities about energy and the environment.



Earning your ENERGY STAR® or LEED designation

With increasing concern for our environment, environmental designations such as ENERGY STAR® buildings or LEED (Leadership in Energy and Environmental Design) Green Building Rating System™ have become hot topics, and with good reason. According to the EPA, 89 percent of Americans are very concerned about the environment, and 93 percent agree that saving energy helps the environment. (Source: ENERGY STAR brand book)



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HIGH SCHOOL BUILDS ENERGY SAVINGS OF \$47,000 EACH YEAR

With tight construction schedules and limited budgets, it's tough to consider efficiency options.

One high school, completed in 2003, participated in Xcel Energy's Energy Design Assistance program to get a full picture of different efficiency designs and technologies, extra costs, long-term savings and potential rebates.

From lighting controls to daylighting and window films, they were able to choose the improvements with the most conservation bang for the buck. The result: Less than one year payback for efficiency enhancements that save \$47,000 annually and earned a \$65,000 Xcel Energy rebate.

Energy Design Assistance, for new construction or major renovations over 50,000 square feet, offers energy modeling to help school officials make energy decisions for their short- and long-term budgets. Rebates help offset the cost of efficiency improvements.



Earning the ENERGY STAR is evidence of your social responsibility to the community and your organization's commitment to reduce its impact on the environment. By displaying the ENERGY STAR, you show that your building is one of the top performers for energy efficiency nationwide. In fact, more than 3,800 buildings that have earned the ENERGY STAR and use about 35 percent less energy than average buildings. Some ENERGY STAR buildings even use 50 percent less energy than average buildings.

There are six steps to earning your ENERGY STAR:

1. Determine if the building meets the eligibility requirements.
2. Login to Portfolio Manager at energystar.gov and enter the required energy and building information.
3. Determine if the building achieves a rating of 75 or above.
4. Determine if the building meets industry standards for comfort and indoor air quality. A Professional Engineer must verify the Statement of Energy Performance (stamped/embossed and signed) that each of the indoor environment criteria requirements have been met. This Professional Engineer must be licensed in the state where the building is located.
5. Read and understand the ENERGY STAR Identity Guidelines.
6. Mail the signed Letter of Agreement and signed and stamped Statement of Energy Performance (SEP) to EPA (post-marked within 120 days of the Period Ending Date). Please note: an official Letter of Agreement will be provided for download in Portfolio Manager. Do not mail to EPA a Letter of Agreement that displays a watermark that reads SAMPLE. Please do not use company letterhead to print the Letter of Agreement.

Learn more at energystar.gov – click on “buildings and plants”, then look for K-12 in the menu at left for resources, online tools and more. Contact Xcel Energy for help with steps 1 to 4 of the ENERGY STAR process that help you earn your designation and our rebates.

LEED

LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality. A project is a viable candidate for LEED certification if it can meet all prerequisites and achieve the minimum number of points to earn the Certified level of LEED project certification. To earn certification, a building project must meet certain prerequisites and performance benchmarks (“credits”) within each category. Projects are awarded Certified, Silver, Gold, or Platinum certification depending on the number of credits they achieve. This comprehensive approach is the reason LEED-certified buildings have reduced operating costs, healthier and more productive occupants, and conserve our natural resources. LEED for Schools is available for new construction and major renovations. Schools also can participate in LEED for existing buildings.

Learn more about LEED possibilities for your school at usgbc.org — look for K-12 resources on the site. Participating in Xcel Energy’s Energy Design Assistance program for your new building can help fund improvements that earn LEED energy points. While our rebate programs don’t tie directly into LEED points, they can help you earn the points you need to achieve your rating.



The bottom line

Almost all of the conservation measures discussed here represent good investments. Most will not only save money but will enhance both the aesthetics and the learning environment of your school building.

Assess your savings potential

From cost savings to environmental savings and ENERGY STAR building designations, Xcel Energy’s conservation experts can help you achieve your district’s energy goals.

- Contact your Xcel Energy account manager for help to determine your next conservation steps
- Or contact our Business Solutions Center at 1-800-481-4700 for additional assistance.



References

Xcel Energy thanks the U.S. Department of Energy, ENERGY STAR® and E Source for allowing us to use its information to provide you a comprehensive guidebook.

For a free copy of the resource booklet Putting Energy Into Profits, contact ENERGY STAR at 1-800-STAR-YES or visit energystar.gov.

Find information about ENERGY STAR designations for schools by visiting energystar.gov and searching for “k-12” or “schools” to see a list of current resources.

Visit www.xcelenergy.com/rebates for current information about Xcel Energy rebate programs and offerings, including expanded case studies for many of the stories cited here. You’ll also find valuable information at the Colorado School District Energy Managers Web site: casdem.org/



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