

# SEDAC ENERGY SMART TIPS

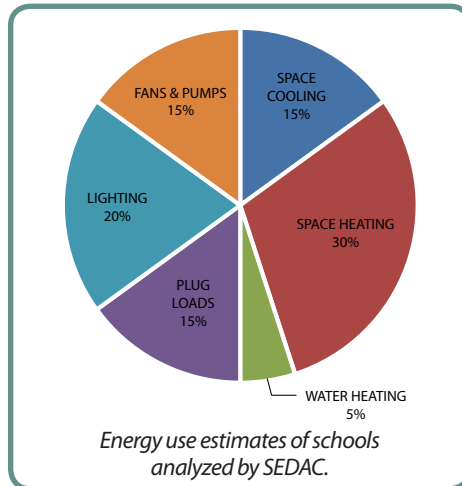


## Schools



Primary and secondary schools in the U.S. spend a total of \$8 billion per year on energy<sup>1</sup>. This expense is larger than the amount spent on computers and textbooks combined. Many schools are less efficient than they could be. The Smart Energy Design Assistance Center (SEDAC) has analyzed the energy usage of many schools in Illinois and found that the least efficient schools consume approximately three times more energy per square foot than the best performing schools. Reducing energy costs will save money for other uses, like educational materials, salaries, and school supplies.

Though the energy needs of schools vary, lighting and heating account for the majority of energy consumption in most schools. Cooling contributes less to the total energy consumption since most schools do not operate during the summer.



Heating and lighting loads can be significantly reduced by selecting the correct systems and lighting, and making sure that systems are maintained. Implementing energy-efficient operations and maintenance schedules can help existing schools save as much as 20% on their annual energy costs.

The best way to achieve energy efficiency in a school is to design the building properly from the beginning. Retrofitting a poorly-operating element is always more expensive than designing it properly the first time. However, there are many energy-saving strategies that can lead to big savings. This guide provides an overview of SEDAC's most commonly recommended energy cost reduction measures for schools.

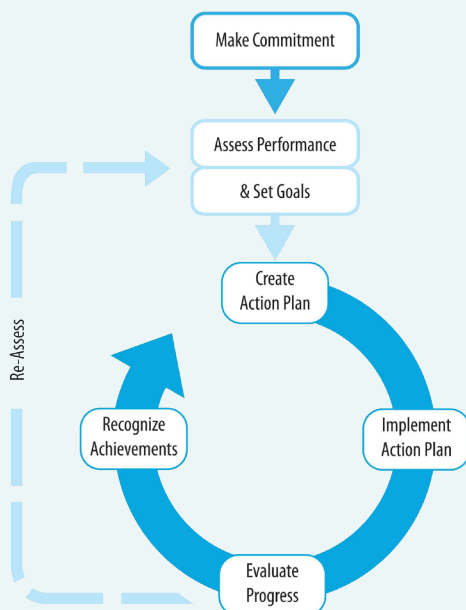
SEDAC understands the challenges of balancing energy improvements with available financial resources. Our goal is to assist schools in making the best decisions in this process. We help identify the most cost-effective strategies for retrofitting and repairing existing buildings. SEDAC recommends cost-effective strategies with short payback periods, and most buildings see 30% in energy savings when they adopt our recommended strategies. We also help schools identify sources of funding to reduce the cost of implementing these improvements.

<sup>1</sup> According to ENERGY STAR® data

The Smart Energy Design Assistance Center performs energy assessments on various building types. Each building type has different energy requirements. SEDAC's Smart Energy Tips help building operators identify energy cost reduction measures.

# ENERGY STAR®'S 7 STEPS OF ENERGY MANAGEMENT

- 1 Make a Commitment**  
Recognize that the economic, environmental and political impacts of energy consumption are sufficient motivation to change our energy use patterns.
- 2 Assess Performance**  
Make a personalized accounting of energy use and costs. Benchmark your facility by comparing its energy performance with similar sites.
- 3 Set Goals**  
Review your objectives and constraints. Establish priorities and set measurable goals with target dates.
- 4 Create an Action Plan**  
Define the technical steps. Apply proven methods to increase energy efficiency or get specialized guidance. Assign roles and resources. Consider rolling savings from earlier efforts into future, more complex initiatives.
- 5 Implement Action Plan**  
Install equipment and change operational procedures. Establish a maintenance schedule. Train equipment operators and building occupants on the changes. Track and monitor conditions.
- 6 Evaluate Progress**  
Compare current performance to established goals. Understand what worked well in order to identify best practices. Adjust procedures and goals, and schedule the next evaluation.
- 7 Recognize Achievements**  
Provide internal recognition for the efforts and achievement of individuals, teams, and facilities. Seek external recognition from government agencies, media, or third party organizations.



ENERGY STAR®'s steps for energy management. Descriptions have been modified by SEDAC staff.

## HOW SCHOOLS USE ENERGY

School facilities can range from 100 year-old edifices to new high-tech buildings. Age and sophistication alone do not determine how much energy is used. Rather, what matters is how the systems are controlled and how well building managers understand these systems. Many older buildings use less energy than newer facilities, even when air-conditioned. In fact, the worst performers tend to be newer buildings that have control systems that do not function properly. Either equipment fails without being noticed, the wrong system for the building was installed, or the system is not controlled properly. These high energy-consuming buildings offer the greatest potential for savings.



## NO-COST & LOW-COST STRATEGIES

- Post a friendly reminder in each room to prompt students and teachers to turn off lights when not in use.
- Train custodians to turn off lights and set temperatures to minimum levels when rooms are unoccupied.
- Unplug appliances and equipment when not in use.
- Set computers to hibernate or sleep when not in use. Do not use screen savers since these programs consume rather than save energy.
- During the winter, keep doors and windows closed.
- During warm weather, open windows and doors (when A/C is off) to get cross-breezes.
- Promote recycling: use eco-friendly materials and place recycling bins in all rooms.
- Optimize thermostat settings for the lobby, corridors, classrooms, gym, cafeteria, and offices. Turn systems down at night when teachers and students leave.
- Start a school sustainability club and promote energy efficiency within the building and community.

## IMPROVE THE HVAC SYSTEM

*Heating, ventilation, and air conditioning (HVAC) systems affect students' and teachers' well-being and comfort in the school. Select a system that both reduces energy consumption and provides a healthy environment.*

- Install a central air-conditioning system rather than individual room units so building operators can control set-points and monitor performance. Selection of the appropriate system depends upon geographic location and building requirements, so consult an HVAC professional to determine which system is best-suited for your school's needs.
- If rooms have individual thermostats, limit the temperature range to avoid extreme temperatures. Providing users a 4° range (+/-2° from the setpoint) in which to modify the temperature is usually enough to accommodate individual preference.
- Install system controls: electronic thermostats adjust the temperature based on programmed occupancy periods. Computerized energy management systems control energy use based on occupancy, weather, time of day, etc.
- Add variable speed drives to control air handling motors and pumps.
- Conduct regular equipment maintenance. Prevent energy losses caused by dirt build-up in filters and pipe/duct leakage, and extend equipment life by regularly cleaning condensers, intake louvers, evaporator coils, and air filters. Develop a routine maintenance checklist to ensure peak efficiency.
- Plan now for future failure of older equipment. Have an engineer size and specify replacement boilers and chillers so when failure occurs, a new and more efficient system can be quickly installed.
- If the building uses a boiler, consider replacing it with several staged, high-efficiency modular condensing boilers.
- Consider retro-commissioning existing mechanical systems if any of these four situations apply: 1) the systems run all night and through the weekend; 2) the building is heated and cooled simultaneously; 3) the boiler runs in the summer; 4) bills are excessively high for the age or region of the school.

## GET STUDENTS INVOLVED!

Implementing energy smart practices in schools is a great way to teach students about the importance of energy efficiency in today's world. Not only will students help the school become more energy efficient, but they will also share these tips at home. Students who are involved at a young age will grow up to be more aware of energy and environmental issues.

Implementation can be fun! A great way to get students motivated is to create an energy team or club that promotes efficiency and recycling at school. You can also create a competition where classes compete for energy efficiency points in their classrooms.



## IMPROVE THE BUILDING ENVELOPE

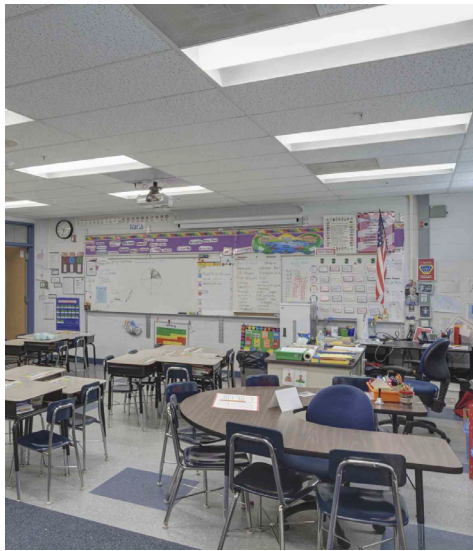
*The building envelope includes all portions of the building that separate the interior from the exterior, like walls, windows, floors, roof, doors, etc. Implement the following recommendations to improve the school's building envelope:*

- For new construction, work with architects to insulate walls and roofs to energy-efficiency standards (see ASHRAE Standard 189.1 R-22 for walls and R-35 for roofs).
- Install high-efficiency doors and windows to avoid heat loss and infiltration. Choose windows with the following features: low U-factor (rate of heat loss), low-emittance coatings (coatings that transmit light and control heat gain/glare and reduce ultraviolet rays responsible for fading fabrics), and low-conduction gas filling.
- Replace worn weather-stripping and caulking to ensure windows and doors are air-tight. Check weather-stripping and seals around loading docks too.
- Reduce solar radiation and air conditioning costs by shading windows (add louvers or roof overhangs or plant trees near windows).
- Upgrade to a "cool roof" to reflect the sun's energy from the roof surface and reduce cooling equipment operation costs; apply a special coating or light-colored surface to reflect solar radiation and reduce roof surface temperature. Cool roofs are especially beneficial in hot, sunny climates and in cities since they reduce the heat-island effect.

# EFFICIENT LIGHTING SOLUTIONS FOR SCHOOLS

*In schools, energy usage for lighting can add up to 30% of total energy consumption. Efficient lamps, luminaires, and controls will save money and improve lighting in classrooms and other spaces.*

- Replace older T12 lamps and fixtures with high-efficiency T8 or T5 lamps with reflectors and electronic ballasts or LED lighting.
- 28-Watt T8s and electronic ballasts are typical replacements for T12s. If replacing the fixture, consider T5 lamps.
- Use direct/indirect lighting which supplies about 25 footcandles on a desk surface to provide a soft, even light without glare.
- In large open areas (lobby, cafeteria, gym, multipurpose rooms, etc), replace metal halide lamps with high-bay linear fluorescent fixtures.
- Install lighting occupancy controls to avoid lighting spaces when not in use (i.e., dual occupancy sensors in classrooms that sense motion and heat).
- For outdoor lighting, use high-intensity discharge lamps (i.e., low-pressure sodium, pulse-start metal halide, LED, or induction); install photosensors that automatically activate lamps when daylight diminishes; and place motion sensors in lesser-used areas. Consider using a timer to turn lights off after midnight.
- Conduct routine maintenance: clean and replace lamps and fixtures on a fixed schedule to avoid dirt build-up and to ensure full-light output.
- For new construction, strategically place windows in classrooms to take advantage of natural lighting. Control electric lighting based on available daylight.
- Retrofit existing exit signs with LED lamps. LEDs consume 2-Watts per fixture and have a lifetime of up to 10,000 hours maintenance-free.



## ENERGY SMART RESOURCES FOR SCHOOLS

### The New Guide to Operating and Maintaining EnergySmart Schools

Download checklists that walk you through implementation. Includes tips for daily activities and long-term upgrades.

[http://apps1.eere.energy.gov/buildings/publications/pdfs/energysmartschools/ess\\_o-and-m-guide.pdf](http://apps1.eere.energy.gov/buildings/publications/pdfs/energysmartschools/ess_o-and-m-guide.pdf)

### ENERGY STAR for K-12 School Districts

Read success stories about schools across the U.S. and find additional information on how you can save energy and earn recognition for your achievements.

<https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings>

### Lights for Learning

Education and outreach program that motivates students to take responsibility for energy efficiency in their schools and homes and helps students with implementation.

[www.lights4learning.org/](http://www.lights4learning.org/)

### SEDAC Energy Tips for Swimming Pools

Fact sheet on reducing energy costs for pools.

<https://smartenergy.illinois.edu/fact-sheets-building-type/pools>

### SEDAC Energy Tips for Restaurants

Fact sheet on reducing energy costs in cafeterias.

<https://smartenergy.illinois.edu/fact-sheets-building-type/restaurants>

### Financing Energy Efficiency Projects

Learn how to finance your school's energy projects.

[http://www1.eere.energy.gov/wip/solutioncenter/pdfs/financing\\_energy\\_upgrades\\_k-12.pdf](http://www1.eere.energy.gov/wip/solutioncenter/pdfs/financing_energy_upgrades_k-12.pdf)

## WHO WE ARE

SEDAC, the Smart Energy Design Assistance Center, provides program implementation, technical assistance, and educational services for buildings and communities seeking to become more energy efficient and sustainable. SEDAC also conducts energy and sustainability research.

SEDAC is a public-private partnership between the University of Illinois at Urbana Champaign and 360 Energy Group.

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## SEDAC SERVICES

- Quick Advice
- Energy Assessments
- Benchmarking
- Retro-commissioning
- New Construction Design Assistance
- Incentive Guidance
- Information Center (fact sheets, newsletters, call center)
- Workshops and online training



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