Save Energy Dollars with DOE Operations and Maintenance Guide

By Margo Appel

At budget-crunching time, school administrators and business officials sometimes find themselves trimming the district's budget for teachers, textbooks, and technology in order to cover ballooning energy costs. It doesn't have to come to that.

Nearly one-third of the energy consumed in the average U.S. school is wasted. The country's least efficient schools use four times more energy per square foot than the most efficient schools. Districts with energy-efficient operations and maintenance (O&M) programs can save as much as 20% on energy bills—their second-largest expense. And that's even without any significant capital investment.

Clearly, schools are spending a lot of money that can be redirected to their primary mission: education.

Because strong O&M programs play such a vital role in school energy efficiency, the U.S. Department of Energy released the *Guide to Operating and Maintaining EnergySmart Schools*. Developed as a resource of the Department of Energy's EnergySmart Schools Program, it is designed to help districts integrate energy-efficient practices into their O&M programs and to fit O&M into their broad mission and into their overall energy management plan. The guide includes sections that are useful to school board members, senior administrators, business officials, and facilities managers and staff.

Quick Tips from EnergySmart Schools

LIGHTING QUICK WINS

In a typical school, lighting consumes 30 percent of total energy. Lighting is considered the "lowhanging fruit" of energy efficiency plans because improvements are usually easy to implement and costeffective. A complementary activity is to educate students and teachers about lighting techniques, control systems, and energy conservation.

- Swap incandescent bulbs with compact fluorescent bulbs (CFLs) wherever possible. CFLs use about 25 to 30 percent of the energy of incandescent lamps and last up to 10 times longer. Energy savings depend on the electricity rate, but they can be higher than anticipated because CFLs produce less heat than incandescent bulbs, therefore decreasing the cooling load.
- Upgrade fluorescent bulbs from T12 to T8. This investment saves up to 30 percent of lighting energy and decreases the electric bill by as much as 6 percent. Use an electronic ballast, rather than a magnetic ballast, to realize the fixtures' full energy savings. The payback period, depending on electricity rates and incentives, is typically less than three years.
- Replace conventional incandescent exit signs with LED (lightemitting diode) exit signs. LEDs use at least 75 percent less energy than incandescent bulbs. The payback period for LEDs decreases further because the lamps last longer and require fewer replacements than incandescent lamps.

HVAC QUICK WINS

Heating and cooling account for more than half the energy consumed in school buildings. The HVAC system is a primary target for energy savings, much of which can be achieved at little cost.

- Maintain HVAC units regularly. Clean burners and air conditioner coils, clean or replace air filters, and check ducts and pipe insulation for leaks and wear.
- Upgrade to programmable thermostats to control room temperatures more efficiently. The devices range from $50 to $200 but will save money in the long run because they prevent the conditioning of unused spaces. If building occupants have access to controls, they should be trained to avoid changing downtime temperatures.
- Perform annual maintenance and tune ups on boilers. This can lower energy consumption by 10 to 20 percent and increase occupant comfort.
- Inspect ducts, pipe insulation, and steam traps for damage and replace as needed. These smaller components of the heating system can be overlooked, but they are a significant source of wasted energy.
- Consider establishing boiler shutdown policies at temperatures recommended by the equipment manufacturer. For example, during unoccupied periods, boilers can be turned off when there is no danger of freezing. Be mindful of the recovery time needed to get the building back to the desired temperature.
- Install an economizer, a set of automatically controlled dampers, to save energy. Economizers draw outside air for free cooling and close vents when the outdoor temperature is too high or low. If an economizer is already installed, check it for proper operation.

From: *EnergySmart Schools Tips: Retrofitting, Operating, and Maintaining Existing Buildings.* Available at www1.eere.energy.gov/buildings/energysmartschools/maintain.html

Help for All Programs

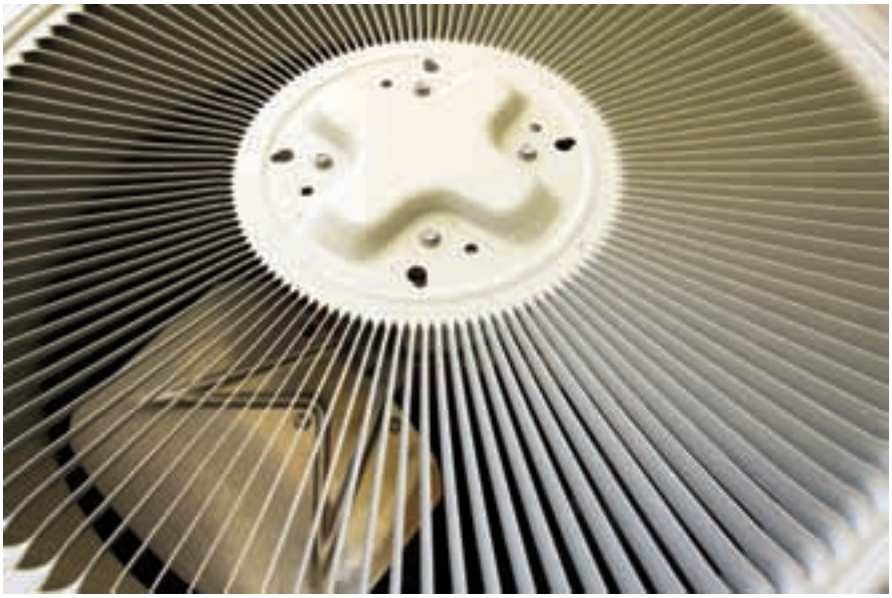
The country's approximately 13,900 public K–12 school districts are as different as the communities they serve. Districts vary in size, facility age and condition, financial situation, growth rate, and other factors. The guide helps you tailor your O&M approach to your culture and available resources.

Information is organized to accommodate all levels of experience: from schools that are just beginning to consider O&M as a tool for managing energy use to those that are ready to expand basic O&M into a more integrated energy-management strategy. The *Guide to Operating and Maintaining EnergySmart Schools* offers easy-to-follow suggestions, comprehensive checklists, downloadable templates and spreadsheets, and extensive references. The "action plan templates" are designed to help districts implement the guide's technical suggestions; they are also useful in scheduling O&M training and communication.

Districts with a new facilities manager, few buildings, an aging physical plant, and limited resources will find the guide as useful as districts with an experienced facilities team, hundreds of buildings, new construction in the works, and abundant financial support for high-performance energy goals.

Low- and No-Cost Money Savers

Schools in the early stages of energy management can implement small actions that have quick payoffs, such as installing programmable thermostats, ensuring that doors and windows are kept closed, and regularly cleaning and maintaining equipment. Because the average



U.S. school is more than 40 years old, preventative maintenance is a priority.

Techniques such as surveying and benchmarking can give districts a snapshot of their current practices and give them an idea of how their energy-efficiency results line up with those of similar schools. The guide offers guidance to help districts get buildings on track to becoming high-performance schools—those that improve the learning environment as they achieve maximum levels of energy performance.

Creating Sustainable Energy Management

The guide helps districts that are considering integrating energy-focused O&M into an overall energy management program to formulate and implement a plan. It explains how to prepare a convincing business case, which should include a clear narrative of current energy usage and cost, the benefits possible through energy-efficient O&M measures, and the steps needed (and level of investment required) to improve the energy efficiency of the district.

Primary points for making the business case are summarized, and tools to help planners come up with supporting facts and figures are included.

The publication discusses four general approaches to energy-focused O&M—quick fix and low cost, voluntary energy awareness, performance contracting, and energy tracking and accounting—and explores the pros and cons of each option in detail. It offers multiple examples and encourages schools to adopt the approach that best fits their circumstances—or to customize an approach out of the options provided.

Techniques such as surveying and benchmarking can give districts a snapshot of their current energy-saving practices.

An energy program is likely to be sustainable only with the support and backing of all stakeholders. The publication covers how to secure the buy-in of all parties, including school board members, teachers, and the community at large. It highlights nine critical factors needed to implement an energy plan—such as gaining visibility, providing education and training, and securing the assistance of utility companies—and offers detailed information about each.

Technically Speaking

Because building systems are interdependent, districts need to develop and coordinate energy-efficient technologies across every major building system. Energy efficiency upgrades must be considered together, in sequence, to ensure that building systems are the right size and are optimally used in order to avoid wasted improvement efforts and unnecessary expenses.

Best practices, case studies, and "lessons learned" are sprinkled throughout the guide's technical section. They enable schools to take advantage of the most up-to-date thinking for employing smart, energy-focused O&M in existing buildings and for incorporating it into new construction and major renovations.

There are trends toward expanding school calendars and using school buildings as community centers, disaster shelters, and adult education facilities. Unfortunately, this greater demand on school buildings comes at a time when costs are increasing exponentially and revenues are not keeping pace. High-performance schools can go a long way toward helping those responsible for budgeting bridge the funding gap.

Margo Appel is with the U. S. Department of Energy Building Technologies Program. Email: margo.appel@ee.doe.gov

The Guide to Operating and Maintaining EnergySmart Schools can be downloaded free of charge at www.energysmartschools.gov