



ENERGY MANAGEMENT GUIDE FOR SCHOOLS

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NEED Mission Statement

The mission of the NEED Project is to promote an energy conscious and educated society by creating effective networks of students, educators, business, government and community leaders to design and deliver objective, multi-sided energy education programs.

Teacher Advisory Board Vision Statement

In support of NEED, the national Teacher Advisory Board (TAB) is dedicated to developing and promoting standards-based energy curriculum and training.



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Section 1: Introduction

ABOUT THIS GUIDE

NEED's *Energy Management Guide for Schools* is a tool to assist school leaders in making decisions about energy usage in their buildings. By choosing energy smart options, schools reduce consumption and can save money while providing healthier, more effective learning environments.

The Goals of an Effective Energy Management Program are:

- to maintain a healthy learning environment,
- to develop and implement an ongoing schoolwide energy plan,
- to promote energy efficiency through education, and
- to reduce energy consumption at school.

This guide is designed to walk school districts through the necessary steps to achieve these goals.

Section 1 defines the steps in implementing a successful program.

Section 2 describes each of the steps in depth.

Section 3 provides resources and strategies that enable all district departments to contribute to the success of the program.

Through simple **no cost, low cost** strategies, schools can reduce their energy consumption by as much as 25 percent while still maintaining comfort levels and a healthy, safe learning environment. Additional energy-efficient improvements can lower a school district's utility bills and maintenance expenses, or offset energy cost increases enabling the district to redirect more of its financial resources to other pressing needs. One misconception is that implementing an energy program will always reduce utility bills. While energy conservation programs will reduce consumption, this may not in turn lower utility bills because of ever increasing energy prices, but utilities will cost school districts even more if they choose to do nothing.

The School Building as a System

A school building is an energy system made of many interrelated components. Some of these components are obvious, such as walls, roofs, lights, doors and windows. Occupants—students, teachers, and other building users—are also an important part of the system. The energy use of the system affects everything from the school budget to the global environment. It is important to understand how all of the system components can work together to create an environment that is conducive to learning.

A school building's energy system includes these five components:

- **Building Shell:** This component includes everything that creates the boundaries between indoors and outdoors: walls, floors, roofs, windows, and doors.
- **Heating, Ventilation, and Air Conditioning (HVAC) Systems:** This component includes the equipment designed to provide heating, cooling, hot water, and fresh air. It also includes the devices that control the HVAC equipment, such as thermostats and sensors.
- **Lighting:** This component usually includes several types of fixtures that provide light for all of the activities in the school.
- **Electrical Devices and Appliances:** This component includes everything plugged into electrical outlets, such as refrigerators, copiers and computers, as well as appliances that are wired directly into the school's electrical system, such as ovens and refrigeration equipment in the cafeteria.
- **Occupants:** When you get right down to it, buildings don't use energy, people do. The actions of the building occupants will dictate how much energy is used by the other system components. The other four components all include points of human interface.

It is important to be aware of the ways that energy consumption by one component of the system can affect usage by another component. In some cases, reducing energy use by one component can increase use by another. Lowering building temperatures, for example, might lead building occupants to start using electric space heaters, increasing the electric load in the building.

THE NEED FOR CHANGE IN SCHOOL ENERGY MANAGEMENT

Every school day, more than 54 million students across the nation head to class to learn. The quality of their education depends on more than the teacher in their classroom. A high-quality learning environment, including the buildings and rooms where classes are held, has been recognized as a crucial element to the education process. One of the critical, but often overlooked, pieces of the school facilities puzzle is energy management.

A study presented by the General Accounting Office of the United States (GAO/HEHS-95-61) found our nation's school buildings to be lacking in many areas, including heating, ventilation, and air conditioning (HVAC), electrical lighting, and energy efficiency. This means that millions of students are attending classes in buildings with unsatisfactory environmental conditions every weekday. The General Accounting Office reported that our nation's schools need \$112 billion in improvements to achieve good overall conditions. However, more recent estimates by the National Education Association exceed \$275 billion needed for necessary upgrades and energy efficiency improvements. Additionally, the report included the following:

- 41percent of all schools reported unsatisfactory energy efficiency in their building.
- 36 percent of schools reported needing repairs to HVAC systems.
- 25 percent of schools need repairs to electrical lighting.

The study also suggested that if conditions are not corrected, they could negatively impact students and their learning, reduce energy efficiency, and increase maintenance costs.

Sustainability

Efficiency and conservation are key components of sustainability—the concept that every generation should meet its needs without compromising the needs of future generations. Sustainability focuses on long-term actions that make sure there is enough energy to meet today's needs as well as tomorrow's. Sustainability also includes the development of new technologies for using fossil fuels, promoting the use of renewable energy sources, and encouraging policies that protect the environment. Just as we consider the school building to be an integrated system, the concept of sustainability asks us to see the earth as an integrated system.

When we follow the guidelines of sustainability we must ask ourselves if the actions we are taking to save energy at school lead to unintended consequences that somehow negatively impact the environment. While this guide is focused on energy management, it can easily be applied to broader programs focused on sustainability. Districts that embark on energy management initiatives are encouraged to go further and expand their efforts to include water conservation, solid waste management (reuse, reduction and recycling), reduction of the use of hazardous chemicals, and other aspects of school operations that impact long-term sustainability. ***(Sustainability resources are included in Section 3, Appendix H.)***

What is Energy Management?

The term energy management refers to the management of energy consumption through improving the efficiency of powered devices and using renewable energy sources. The goal of energy management in schools is to reduce energy consumption and improve the learning and teaching environment for students and teachers.

Energy Management is a process by which a school district develops an understanding of:

- how school buildings are utilized,
- how energy is consumed,
- the types of the energy systems installed, and
- how to reduce energy consumption.

The district then implements systems, services and educational programs that provide healthy, comfortable conditions conducive to learning—while reducing energy consumption.

Why Is Energy Management Important?

Energy costs are often the largest controllable item in a school district's budget. They are usually the second largest expense after personnel costs. Through district policies and the actions of decision-makers, occupants and students, energy consumption can be reduced, resulting in immediate cost avoidance. These savings can be sustained through on-going monitoring and energy awareness training.

In addition to lowering utility bills or offsetting energy cost increases, management of energy consumption can improve the indoor environment of the school. Studies have shown that students learn better and teachers teach more effectively when their environment is healthy and comfortable.

The indirect benefits of a school's energy management program are realized as the positive effects migrate outward to the larger community. As staff and students become educated about ways to use energy more efficiently, the energy consumption of family homes and area businesses is reduced. District energy policies can serve as models to be adopted by local government, industry and small businesses that may be inspired to implement energy saving practices and include energy-efficient technologies in future building projects.

The School Building is a System

When managing the systems of a school to minimize energy consumption, it's important to maintain an environment conducive to learning. After all, the reason energy is being used in the first place is to provide a healthy learning environment. There are specific recommendations for temperature, relative humidity, and general air quality, as well as requirements for the quality and quantity of lighting.

When the building is treated as a system, energy is saved while maintaining or improving the indoor environment, because those managing the system are aware of how decisions regarding energy use – particularly with HVAC systems – affect the indoor environment. To help schools manage indoor air quality effectively, the EPA offers the **Tools for Schools** program, which provides detailed guidance, as well as links to other information resources. The program helps districts design new schools and repair, renovate and maintain existing facilities. *(More information can be found at www.epa.gov/iaq/schools/.)*

From the Environmental Protection Agency (EPA)

Twenty percent of the U.S. population, nearly 55 million people, spend their days in our elementary and secondary schools. In the mid-1990s, studies show that 1 in 5 of our nation's 110,000 schools reported unsatisfactory indoor air quality, and 1 in 4 schools reported unsatisfactory ventilation — which impacts indoor air quality. Students are at greater risk because of the hours spent in school facilities and because children are especially susceptible to pollutants.

Environmental Impact

Reducing energy use with an energy management plan also reduces the school's impact on the environment. With increased energy efficiency and conservation, schools will reduce their energy consumption. Less energy used means less pollution from the production of electricity and combustion of fossil fuels. Below are some of the impacts associated with the energy sources we rely on for our electricity:

- Fossil fuels release greenhouse gases released when they are burned. It is now widely accepted that these gases are causing climate change.
- Oil and natural gas mainly come from offshore sites. Oil can enter the sea from spent drilling sites. Oil refineries can also discharge oil into the environment as waste.
- Water flowing through coalmines and mining spoil can become polluted. This in turn can contaminate any other water sources the polluted water comes into contact with.
- Methane gas can be released into the air from coalmines and leaks in gas pipelines. Once methane is in the atmosphere it can contribute to climate change.
- Nuclear power creates long-term radioactive waste that needs to be disposed of safely.
- Dams built for hydroelectric power can rob downstream areas of sediment that degrades riverbanks and impacts habitat for the species that live there.
- While the environmental impacts of solar and wind power are small compared to those above, their impacts include environmental damage from silicon mining, the use of toxic chemicals in the production of solar cells, and pollution caused by the manufacture of steel, concrete, and other materials used in wind turbines.

School energy management programs have positive effects that reach far beyond the school's walls. When students walk out the school doors having learned ways to conserve energy at school, they bring what they've learned about being energy-conscious consumers with them into their lives outside of school. By educating the next generation to be more conscientious about the energy that they use, the school will exponentially increase the positive impact of its energy management program.

STEPS TO DESIGNING YOUR ENERGY MANAGEMENT PLAN

The primary goal of schools is to provide a teaching and learning environment for teachers and students to perform at their best capacity. A quality energy management plan offers a healthy environment for students to gain knowledge, provides opportunities for financial gain, and promotes environmental stewardship. Energy management is good business for schools.

There are many methods for implementing energy management plans. The EPA's ENERGY STAR® program developed the following action steps for successful energy management. The diagram illustrates a circular process in which performance is re-assessed on a continual basis. In this way, energy management is a living process where the action plan is periodically revised based on the evaluation of past progress.

STEP 1: Make a Commitment to Energy Management

All successful plans have a strong group of committed leaders ready to implement them. The first step is the adoption by the School Board of an Energy Management Policy for their Policy Manual. After the Board has adopted an Energy Management Policy, individual school energy management plans can be developed and implemented with sound footing. In order for energy management practices to be successful, especially building-wide, a commitment needs to be made to put the plans into action. Specifically, administrative commitment and support are key.

Putting together a dedicated energy team with representatives from the fundamental sectors of the building—administration, facilities, and education—shows commitment and support, and will help ensure success. If energy efficiency and conservation are core values in a school, an energy management plan will be sure to succeed.

STEP 2: Assess Performance and Set Goals

To determine possible energy improvements, begin by benchmarking the energy usage of the building. Determine baselines by gathering data with the help of assessment tools, energy audit professionals, and trained building users. Baseline data will provide the opportunity to compare energy use at a later date. Benchmarking allows your district to compare a school's energy use in relation to schools with similar characteristics across the country.

By benchmarking buildings using the **Portfolio Manager** tool from ENERGY STAR®, the district will also be able to compare their schools to one another. This ranking provides data that will help determine where district resources should be allocated to reduce energy usage and overall energy bills.

Specific, measurable goals for improving a school's energy performance help guide decisions made by users on a daily basis. They provide the foundation for measuring progress. Goals motivate building users to embrace the energy management plan and achieve success.

STEP 3: Create an Energy Management Action Plan

Detailed action plans ensure successful energy management. Action plans provide the steps needed to reach goals by implementing new practices or improving energy behaviors. Successful action plans include steps for all building users to complete, including teachers, students, administrative staff, and maintenance / custodial staff as well as members of the greater community who utilize school facilities after hours. One step that should be included in all action plans is the on-going monitoring of energy usage.

STEP 4: Implement the Energy Management Action Plan

Putting the action plan into practice requires the support and commitment of all building users. To gain that support, communicate the action plan and raise the awareness of energy use. The more informed building users are about the energy management plan, the more likely they are to apply energy-conscious behaviors. Training is an important aspect of informing and motivating staff. Incentives can also be considered to promote participation.



STEP 5: Monitor and Evaluate Progress

On-going evaluation is an integral part of successful energy management plans. It provides the opportunity to see improvements in energy use. It gives the chance to distinguish where energy performance and awareness stand in comparison to the goals. Evaluation determines the effectiveness of an action plan and allows for modification to continue energy performance improvement. Finally, evaluation of progress allows for and encourages the opportunity to recognize accomplishments. The basis of successful evaluation is an effective monitoring approach. All sectors of the school community can contribute to monitoring the program and providing information that is essential for the evaluation process.

STEP 6: Recognize Energy Management Achievements

For long-term success, recognition must be given to those who are implementing the energy management plan - not just the energy team, but all building users and participants. Recognition sustains the people who are putting the action plan into practice every day, provides an opportunity to positively expose the community to the energy management plan, and offers additional motivation for continuing energy-conscious practices.

BUILDING BLOCKS OF CHANGE

Successful energy management plans for schools require a whole-building approach. However, implementation of the suggestions below will positively impact the student learning environment as well as reduce energy costs. The following four major areas should be included in an energy management plan: Buildings and Equipment, Maintenance and Operations, Transportation, and Building Occupants.

The role of a school building is to provide a comfortable, healthy, and safe environment in which users can teach, learn, work, and play. In the following chapters of this guide are charts that offer a sampling of the myriad opportunities available for improving a school's energy performance, and the positive results that will accrue from making those improvements.

All energy improvements fall into one of four categories:

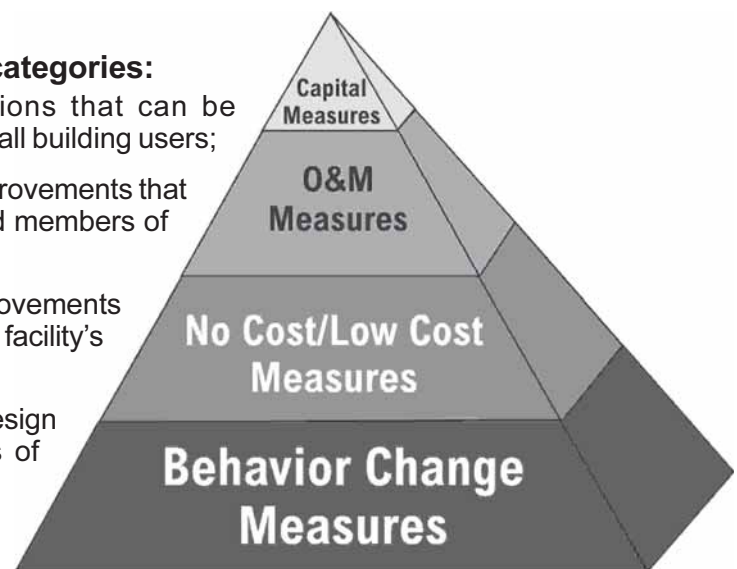
Behavior Change Measures: Energy-saving actions that can be immediately integrated into the school's daily routine by all building users;

No Cost/Low Cost Measures: Free or inexpensive improvements that can be made to specific energy systems by designated members of the school community;

Operations & Maintenance (O&M) Measures: Improvements to existing energy systems that can be undertaken by the facility's maintenance department;

Capital Measures: Energy-efficient technologies and design elements that are engineered into major renovations of existing buildings or construction of new buildings.

(Specific tasks related to each of these categories are detailed in Section 3.)



By first focusing on changing energy-related behaviors, schools build a solid foundation from which to grow a comprehensive energy management program.

BUILDING THE FUTURE

According to the US Department of Energy, "high-performance schools are facilities that enhance the learning environment for students while saving energy, resources and money. They can help students boost test scores, increase attendance rates, reduce operating costs, improve job satisfaction among teachers and staff members, and teach students and the community at large about environmental stewardship."

With expectations that student performance should improve each year, there are few better ways to invest in the future than to improve the buildings they learn in every day. Promoting and implementing an energy management plan invests in the future of the building, the students, and the community.

Section 2: Steps

This section provides an in-depth look at the six steps to designing an Energy Management Plan. It details a solid process for determining how best to navigate the time and space between your school's present energy use profile and your energy-efficient, future profile. It's just a matter of connecting the two points in the most effective way for your school community. This section assumes a district-wide approach; however, the steps are still valid for an individual building or for a subset of buildings within a district.

STEP 1: MAKE A COMMITMENT TO ENERGY MANAGEMENT

Committed individuals are the most valuable resource a school can have. A strong commitment to energy efficiency and conservation as a core value of the school community is *the* critical factor in the success of an energy management program. A committed leadership team made up of representatives from all stakeholder groups—administration, faculty, maintenance/custodial staff, student body, parents, and community members—will create momentum for a program that all aspects of the school community can buy into.

Look at any school district with a successful energy management program, and you will find two key elements firmly in place:

- An **Energy Policy** that has been mandated by the School Board, and
- An active **Energy Management Team (EMT)** with a dedicated Team Leader, receiving full support from the Administration.

Developing An Energy Policy

An energy policy provides the direction for the program. It functions as a demonstration of district commitment to energy management and as source of specific guidelines. There are many different approaches that can be taken when putting together an energy policy. **(Several examples are provided in Section 3, Appendix A.)**

Sections that may be included:

- **A commitment statement**
- **Goals**
- **Responsibilities**
- **General Practices**
- **Authorized Temperature Setpoints**

When should an energy policy be written? It can be produced by the administration prior to the formation of an EMT or the team can develop the policy. Either way, the policy should be a 'living document' that is visible to the community and open to revision when necessary. We have included the development of the energy policy as a part of Step 2, since its content is guided by the findings of the building assessments.

Building an Effective Energy Management Team (EMT)

A school district's annual operating budget line for energy costs is not just a numerical figure reflecting the sum of utility charges for every kilowatt and therm used in the buildings. It's actually the sum total of thousands of everyday decisions made by the *people* who use those buildings. Buildings don't use energy, *people* do.

The EMT sets goals to help the school achieve energy savings, plans and implements improvements, monitors energy performance, motivates participants, rewards effort, publicizes positive outcomes, and communicates with the school community as well as the larger community. A dedicated EMT is the brain that steers a successful energy management program, and the Team is the central *heart* of it, as well.

A district-wide program can form an EMT at the district level that includes members from each building, as well as from each sector of the school district community. Alternatively, a district energy manager or facilities director can oversee the plan at the district level with EMT's formed in each building. In either model, site-based EMT's are the most effective way to implement a plan, especially in larger districts. In either case, these committed individuals provide the human energy that will profoundly impact the flow of utility-provided energy in the buildings. Each member selected needs to demonstrate personal and professional dedication to the core value of energy efficiency and conservation.

The district's stakeholders should be identified and invited to participate by providing at least one representative. At a minimum, include representatives from administration, faculty, operations and maintenance (O&M) staff, operations, student body, parents and community groups who use the building.

Ensuring Effective Team Leadership

Choosing a Team Leader is an imperative. The team leader can come from any sector of the school community. In some districts, a volunteer Energy Coordinator rises from among the ranks of the selected Energy Management Team members. In other districts, the Energy Coordinator is a staff member appointed by the Administration. In still others, a part-time or full-time Energy Manager is hired. In any case, the Energy Coordinator must be given authority to implement the energy plan and allotted the necessary resources.

An Attractive Option: Hiring an Energy Manager

Energy Coordinators who are also teachers, custodians or other staff members can be effective, but only in the time they have available. Their ability to perform tasks is an ever-changing variable, influenced by the demands of their primary position. Part-time or full-time Energy Managers, on the other hand, have a reliable bank of dedicated time each week to accomplish their objectives, and they can be held directly accountable for performing specific tasks, adhering to timelines, and generating specific outcomes. For those reasons, many districts with successful Energy Management Programs have chosen to hire a part-time or full-time Energy Manager, allocating a portion of anticipated energy savings for the additional salary and overhead expenses.

The duties of an Energy Manager are diverse, and include some or all of these important responsibilities:
(Adapted from ENERGY STAR®: www.energystar.gov/index.cfm?c=continuous_improvement.appoint_director)

- Coordinating and directing the overall energy program;
- Acting as the point of contact for Administration and School Board;
- Increasing the visibility of energy management within the schools and school district;
- Drafting an Energy Policy;
- Forming the EMT;
- Serving as facilitator for EMT meetings;
- Benchmarking the school's energy usage;
- Reviewing technical energy audit reports and recommendations, assessing the value of recommendations, and summarizing for EMT members;
- Ensuring that teachers get grade-appropriate, NEED energy efficiency curriculum, as well as training on its use;
- Seeing that custodians and staff are adequately prepared for the program;
- Assisting teachers and students in designing ongoing monitoring programs and motivational components;
- Advising the students who will be implementing the ongoing monitoring plan;
- Creating a record-keeping system for tracking initiatives, implementations, and outcomes;
- Overseeing the design and implementation of district-wide awareness and motivational campaigns.
- Evaluating proposals from Energy Service Companies for performance-based contracting;
- Securing sufficient resources to implement energy management strategies;
- Assuring accountability and commitment from core parts of the District Administration;
- Developing key ally relationships with local government, area businesses, utilities, environmental organizations, state and federal programs, etc.;
- Researching grants and other financial incentives for installation of energy-efficient systems and renewable energy systems, as well as energy education; and
- Obtaining recognition for achievements.

(For a sample Energy Director Job Description, see Section 3, Appendix A.)

By establishing a Board Energy Management policy, setting up Energy Management Teams and appointing an Energy Coordinator, the district demonstrates a commitment to energy management. This commitment lays the foundation for the steps that follow.

STEP 2: ASSESS ENERGY PERFORMANCE AND SET ENERGY MANAGEMENT GOALS

In this step, the EMT becomes familiar with what your school or district's energy profile is at this time and articulates what it will be in the future, after the action plan is implemented. A thorough analysis of current energy consumption levels should be completed, based on a review of all energy-related assessments. This will allow the team to formulate a comprehensive action plan (Step 3).

Specific, measurable goals for improving a school's energy performance help guide decisions made by users on a daily basis. They provide the foundation for measuring progress. Goals motivate building users to embrace the energy management plan and achieve success.

To get started, it is necessary to take these actions:

1. **Benchmark Current Energy Usage**
2. **Baseline Historical Usage**
3. **Review Prior Energy Assessments**
4. **Conduct a Walk-Through Survey**
5. **Review Policies and Procedures**
6. **Conduct Interviews and Personnel Surveys**
7. **Summarize Findings**
8. **Set Measurable Savings Goals**

Action 1. Benchmarking

To assess possible energy improvements, begin by benchmarking the energy consumption of the buildings included in the program. An excellent on-line tool for benchmarking is **Portfolio Manager**, available on EPA's website at www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager. This tool benchmarks a school's energy use in relation to all other, similar schools in the country. The value to a district using the Portfolio Manager is that it will provide a ranking of the district's schools by energy consumption. This ranking provides data that will help determine where district resources should be allocated to reduce overall consumption.

By utilizing Portfolio Manager and following the procedures detailed on the website, your building can qualify as an ENERGY STAR® School. So, in addition to being an effective tool for evaluating progress, Portfolio Manager can be an important motivator and recognition vehicle for efforts undertaken by schools.

Remember that students should be involved as much as possible in this step. Their participation will create excitement and will motivate them to become actively involved in energy management efforts. Some of the information required by Portfolio Manager is easily gathered by students. If the benchmarking process is initiated by students, they can gather all information by interviewing and working with their building's operations staff. Working side-by-side with administrators and facilities staff will empower the students and give all participants a sense of accomplishment. **(A form that can be used for gathering benchmarking data is provided in Section 3, Appendix B.)**

Action 2. Baselineing

Baselineing involves determining how much energy a school is using *before* it starts its energy conservation program in order to:

- Measure progress and verify that your efforts are succeeding,
- Identify where to focus energy reduction efforts or zones that may need special attention, and
- Provide data for board report.

A baseline is the historical average annual energy consumption by a building or the district. Baselines for all utilities should be determined for each building in the program. You can establish baselines by gathering data with the help of assessment tools, energy audit professionals, and trained building users. Baseline data will provide the opportunity to compare energy use at a later date. The most accurate way to do this is to calculate the average consumption based on at least the previous twelve months of monthly utility data, however, it is better if you use up to three years of data, if there haven't been any major changes in the building over that time. This data is typically available through the district business office.

Major changes that have occurred during this period in the building structure, occupancy, and equipment need to be accounted for and in complex cases it may be necessary to involve an energy consultant to determine accurate baselines.

Once the buildings are baselined, it becomes possible to compare the performance of your building with their performance prior to implementation of your program. However, baselines need to be managed over time. It is important to make adjustments in the baseline any time major changes such as those mentioned above occur in the building.

This is an excellent time to review past bills to see if errors have been made. Districts who take the time to review bills sometimes find discrepancies, netting them significant refunds. Finding the discrepancies also ensures that future billing will be accurate.

The collection and synthesis of this baseline data may also be of interest to teachers and students. The energy team should discuss this step together in order to decide the best way to collaborate. Having all stakeholders involved in the initial benchmarking will spark interest in the energy conservation efforts.

Action 3. Review Existing Surveys

Have energy surveys been done on your buildings in the past? You may need to do some investigation. Sometimes these studies are forgotten or misplaced over time, but the information can be important to your efforts. Past surveys can help provide answers to questions about the current condition of buildings and can help guide your efforts when performing the walk-through survey.

Action 4. Conduct A Walk-Through Building Survey

A walkthrough survey is an opportunity to get better acquainted with how a building is using energy. The surveyor needn't be an engineer, but should have some basic background in building energy systems. Most facility operators should have the necessary background and this guide provides the tools and structures necessary. **(See Section 3, Appendix C.)** The survey will provide you with valuable information on current building conditions, the energy-related behaviors of occupants, and the state of O&M practices.

Since the purpose is to document what can be observed in a 2-3 hour period, there is no need to take extensive measurements or conduct testing. Some simple equipment, such as a light meter, thermometer, and hygrometer can be used, but are not necessary. **(A list of basic auditing equipment is in Section 3, Appendix C.)**

The following information is of primary importance when conducting the survey:

(Adapted from School Operations and Maintenance: Best Practices for Controlling Energy Costs prepared by Princeton Energy Resources International for the U.S. Department of Energy.)

- **Building use and occupancy schedules;**
- **Actions and behaviors by building users that affect energy consumption;**
- **Shutdown procedures during nights, weekends, holidays and vacations;**
- **Status of control strategies for major building systems;**
- **An inventory of major plugloads;**
- **Classroom lighting levels and fixture control;**
- **Boiler and cooling system efficiency and maintenance practices;**
- **Condition of steam, water or air distribution systems;**
- **Temperature control and setbacks;**
- **Condition of building envelope, windows and weatherstripping;**
- **Identification of prominent problems (indoor air quality etc.);**
- **Control of computers, vending machines and other plug loads; and**
- **Assessment of staff expertise.**

Some of this information can be gathered by students. Using the structures provided in NEED's **Monitoring and Mentoring** and **Learning and Conserving** curricula, students can participate in this data gathering. These activities provide meaningful connections to math, science, and technology concepts and are correlated to state and national science content standards.

Action 5: Review Policies and Procedures

Does your district already have an Energy Policy? If so, determine if it is outdated. As technology changes and more information is gathered, the EMT may determine that a new policy is needed. If it is a sound policy, it should be reviewed and revised as part of this step. What other policies are in place that affect energy consumption? Are there procedures or practices that actually encourage excessive use of energy? These questions will need to be answered as part of this step.

Action 6: Interviews and Staff Surveys

One of the most important sources of information is the staff of your building. Building Operators, in particular have crucial information that is available in no other way. Much of the information above can be gathered through interviews with building operators and by making use of tracking forms that they utilize. Other staff can provide important insights on building culture where it relates to energy consumption and attitudes towards energy conservation in general. Staff can also provide information on how office, kitchen, and education-related equipment is operated.

Students can play a meaningful role in this stage. Students can write and conduct interviews with building staff to obtain this information. Interviewing is an important language arts skill that allows the study of energy to be easily integrated into the curriculum.

Action 7: Summarize Findings

Once all of these steps have been taken, it will be important to analyze all of the data gathered. Benchmarking will give an idea of how buildings compare with other, similar buildings, while the walk-through survey will reveal some of the reasons for the scores achieved. Baselineing will provide details on how buildings perform over time, which may reveal further opportunities. The findings should be summarized in a manner that is complete and accessible to other district staff. The product of your research should provide clarity for the EMT with respect to your district's prospects for energy savings. Realize that these are preliminary findings due to your time constraints and limited technical expertise. A comprehensive engineering assessment will be required before making recommendations on major building or HVAC renovations.

Major Issues to Summarize: (*Adapted from School Operations and Maintenance: Best Practices for Controlling Energy Costs prepared by Princeton Energy Resources International for the U.S. Department of Energy.*)

- Profiles that show where the peaks and valleys of consumption are. This section should draw correlations between consumption patterns and building use.
- District Energy Costs and Comparison to Other Districts
- Identification of Areas of High Use
- General Strategies to Manage Operational Costs with improved O&M
- Opportunities for savings through actions of building occupants
- Identify gaps where more information is needed
- Success Stories in Other Districts
- Prevalent O&M Practices in Your District
- Availability of Adequate Information and Management Tools
- Prospects for Energy Cost Reductions
- Possible Sources of External Assistance

Action 8: Set Performance Goals

Determine Metrics to be Evaluated: When evaluating a program, it is necessary to determine what data will be evaluated and how it will be evaluated. The metrics chosen should connect strongly with the goals of the program. While utility data will be important to evaluate, by itself, it won't provide a complete picture. The data by itself, will only tell what the results are, but will not shed light on the reasons for the results. By adding additional metrics, you may be able to discover why the results turned out as they did, and provide data on less tangible areas such as participation and compliance. Was last month's lower-than-expected performance due to colder than usual temperatures, a change in building usage patterns, or a lack of program promotion?

Sample Data that can be monitored to help answer questions:

Energy and Water Consumption: This is the basic data on performance that should be standard to any program. These data can be compared to the baseline or periodically entered into Portfolio Manager to gauge progress. It is best obtained by using the utility bills paid by the district business office. Consumption data may include:

- Electricity
- Natural Gas
- Heating Oil
- Water

Goals can be presented in terms of a specific quantity or percentage decrease in energy use, such as a 10 percent reduction or a decrease of 300 million Btus. Goals can also take a *Best in Class* approach that aims for a certain level of performance compared to an established benchmark.

Behaviors and Conditions Observed: This data will be observational and will require tracking forms. This type of data can easily be gathered by students participating in the program. Forms should be easy to fill out and should reflect the data gathered in such a way that it is easily incorporated into the evaluation process. Data gathered could include observed conditions and behaviors related to:

- Lighting
- Computers
- Exterior Doors and Windows
- Thermostat Settings

Other Factors Affecting Building Consumption: Most of this information could be gathered by your building operator and much of it may be gathered and available already. Information that could be gathered includes:

- Outdoor Temperature During the Monitoring Period (*A record of daily average temperatures is available at www.engr.udayton.edu/weather/citylistUS.htm.*)
- Hours of Use
- Operations and Maintenance Activities
- Cleaning Schedules and Procedures

Student Performance: If energy education is integral to your program approach, then this data would be an important gauge of program success:

- Assessments on energy-related coursework
- Thoroughness of student monitoring activities

Health, Safety and Comfort: During the walk-through, issues related to health, safety and comfort were most likely identified. Where these issues intersect with energy consuming systems, goals should be set. Data related to these issues can be gathered in the following ways:

- Surveys and interviews of staff and students
- Measurement of airborne pollutants with air monitoring equipment
- Observation of conditions

Environmental Improvement: This goal translates energy savings into pollution prevention or reduction goals.

Setting Goals

Once the potential for improvement has been estimated and program metrics have been determined, goals can be established at the appropriate organizational levels. Energy performance goals should be formally established and recognized by senior administrators as a mission for the whole district. Specific goals for improving a school's energy performance help guide decisions made by users on a daily basis. They provide the foundation for tracking and measuring progress. Goals motivate building users to embrace the energy management plan to achieve success and let occupants know when their actions are being successful.

Performance goals drive energy management activities and promote continuous improvement. Goals should be clear, measurable, and realistic with specific target dates. This is critical for understanding intended results, developing effective strategies, and reaping financial gains.

To set goals, it is important to have an informed idea of what level of performance is achievable and what resources are needed. There are a variety of ways to determine the potential. The method you choose will depend on a number of factors, such as available resources, time, the nature of energy use at your facilities, and how the energy program is organized.

When setting goals, be sure to use the Energy Team's wide range of knowledge to help set aggressive, yet realistic goals. Be sure that your administration reviews your goals to enlist their feedback and support.

Methods used by leading energy programs include:

(Adapted from ENERGY STAR®)

- **Reviewing performance data:** Assessing performance and setting baselines should help to identify differences in energy use between similar facilities, giving a limited, point-in-time view of your potential improvement. Performance data spanning a longer period of time will be more useful for understanding improvement potential.
- **Benchmarking:** As mentioned above, benchmarking provides a yard stick for evaluating opportunity when enough data is available to show trends in energy use. Looking at the savings achieved by similar buildings can guide you in setting realistic goals for your building.
- **Evaluating past projects and best practices:** Evaluate past projects and best practices at higher-performing facilities to determine the feasibility of transferring these practices to other parts of the organization.
- **Reviewing technical assessments and audits:** Technical assessments identify opportunities to reduce energy use identified during technical assessments and audits of poorer performing facilities to serve as a strong basis for quantifying the potential for improvement.
- **Comparing goals of similar organizations:** Reviewing performance goals of other organizations can help to guide and inform you of the potential for your own organization.
- **Linking to organization-wide strategic goals:** Strategic as well as operational goals, such as cost reductions, can also help inform the goal setting process.

Estimating potential for improvement should provide you with a starting point for what is possible. However, some organizations set their final energy performance goals based on organizational factors other than what is technically feasible. Such factors will affect how energy performance goals are expressed. In addition to setting various performance goals the following can also be utilized:

- **Threshold Goals:** The minimum acceptable level of performance.
- **Stretch Goals:** Levels beyond the minimum or targets that are used to create an incentive for greater achievement.

Establish an Energy Policy

An energy policy provides direction for the program and functions as a demonstration of district commitment to energy management. According to EPA (www.energystar.gov/index.cfm?c=guidelines.guidelines_index), the experience of its ENERGY STAR® partners is that the energy policies of successful organizations cover four important criteria:

- 1. Stating measurable objectives;**
- 2. Establishing accountability;**
- 3. Ensuring continuous improvement; and**
- 4. Promoting performance goals.**

The visibility and vitality of the document is even more important than the document itself. The document needs to be publicized, provided to community members and referred to in communications from the EMT. It is essential for long-term success that the policy be a 'living document' that is visible to all community members.

What should be included in an Energy Management Policy?

1. Succinct articulation of the goal(s) of the energy management program;
2. Official establishment of an Energy Management Team (EMT) made up of stakeholders from all sectors of the school community, including the appointment of a team leader to act as the school's Energy Coordinator;
3. Authorization of the EMT to implement the Energy Management Program based upon an agreed-upon Action Plan;
4. A formal commitment to the Energy Management Program by the school/school district and/or administration, ensuring that 1) the efforts of the EMT and the entire school will be recognized, and 2) recommendations for change will be seriously considered;
5. Delineation of the basic roles and responsibilities of the Energy Team, i.e. media point person, lead teacher, school board liaison, PTA liaison, etc.;
6. Establishment of energy-related rules for school building users from the surrounding community, such as scout groups, recreation leagues, and adult night classes;
7. Clearly stated policy, specifying how any accrued energy savings will be used, including provision for rewarding each participating sector of the school community, in order to promote sustained effort over time.
8. Guidelines for energy use by all community members. Specific guidelines should be given for all building occupants that are related to areas such as lighting, computers, and personal appliances. Also included should be guidelines on Operations & Management (O&M) practices.

(Sample Energy Management Policies are included in Section 3, Appendix A.)

Step 3: Create an Energy Management Action Plan

Detailed action plans ensure successful energy management. Action plans provide the steps needed to reach goals by implementing new practices or improving energy behaviors. Successful action plans include steps for all building users to complete, including teachers, students, administrative staff, and maintenance and custodial staff. One step that should be included in all action plans is the continuous monitoring of energy usage. This is discussed in Step 5.

Creating A Detailed Action Plan

Using the baseline data and guided by their goals, the energy management team should work together to create a detailed action plan. A detailed action plan ensures successful energy management. It lays out the steps needed to reach each goal by implementing new practices or improving energy behaviors. **(Sample action plans are provided in Section 3, Appendix A. These sample plans can serve as guides for developing an action plan to meet the specific needs of the school.)**

As you meet to develop an action plan, be sure that you are guided by the goals of the program. These goals should be used later to evaluate the program. When writing specific action steps, it is important that they be designed to help reach the goals.

The action plan serves as a guide to support behaviors that promote energy efficient practices. The plan should include integrating energy education into the curriculum and making sure all school sectors understand the importance of their participation in the program.

The action plan should be regularly reviewed and updated. It is recommended that this be done on at least an annual basis, to reflect recent achievements, changes in performance, and shifting priorities.

Reaching maximum energy efficiency while providing a high-performance learning environment requires sustained effort over time. When determining strategies for your Energy Management Plan, remember that change is best implemented in increments. The energy improvements you make — both behavioral and technical — can then be more easily incorporated by building users, whose existing familiar routines are being affected. Rather than making sweeping changes all at once, plan to make smaller changes over several months' time. For example, instead of mandating a three degree reduction in building temperature effective immediately, ask facilities staff to lower the temperature by one degree for each of the next three months.

Action Plan Categories

The energy team should designate a person to be in charge of each of the following categories:

- **Education & Training:** Training sessions for all sectors, not only teachers and students, but the custodial staff, parents and even the community.
- **Monitoring:** Ongoing documentation of energy usage in the school building.
- **Promotion:** Informing the entire school of the program through activities and publications that raise awareness and serve as reminders of the program's goals and promote smart energy behaviors.
- **Evaluation:** Determining how closely the school came to meeting the energy team's goals.

To best integrate good energy management practices throughout the district, create an inclusive strategy. All sectors of the district community should have clear roles, responsibilities, tasks, and goals established. Include all aspects of the district by asking departments how they can contribute. Ask them to identify the tasks specific to their work that can contribute to program success.

Other ways to include all departments include developing marketing and communication strategies that inform all aspects of the community about the program, and providing channels for input on energy saving ideas and strategies. The EMT is an important vehicle for inclusion, and can serve as the main channel for bringing district personnel into the process.

You'll also want to identify those areas where you need outside help. Consultants, vendors, suppliers, and others may be valuable resources to move your program forward. However, some districts find that they are able to provide all the expertise they need in-house. Start by reviewing the strengths of your staff and identifying the knowledge gaps as related to the energy management plan. Be sure to establish clear performance guidelines for contractors and remember that the one thing that can't be outsourced is the administration of your plan.

Strategies

The actual strategies described in the Action Plan will be guided by the findings during your assessment. These strategies may be identified specifically in the Energy Policy. Strategies will fall into one of these categories:

1. **Behavioral Actions**
2. **Low Cost/No Cost Measures**
3. **Operations and Maintenance Procedures**
4. **Capital Measures**

Strategy 1: Behavioral Actions

As a result of the analysis, these behaviors can be easily identified. Most of these actions will fall into these categories:

- **HVAC:** Heating and Cooling Controls: If users have access to thermostats, it will be important to establish set points during occupied and unoccupied times as part of the Energy Policy. Users should be required to follow these guidelines.
- **Building Shell:** Exterior Doors and Windows – Ensuring that windows and doors are kept closed when heating or cooling equipment is running.
- **Lighting:** Ensuring that users turn off lights when spaces are unoccupied.
- **Electrical Appliances:**
 - Computers and Office Equipment:** Shutting down at the end of the day and enabling power management settings. It is important to work closely with your IT Department in determining these actions.
 - Electrical Devices & Appliances:** Some analyses will reveal high-use issues related to coffee makers, space heaters, and other plug loads. Behaviors related to these items are best worked out through discussion with the affected groups.
 - Kitchen:** The appliances in many school kitchens, such as walk-in coolers, dishwashers and ovens are large energy users. As a result of the analysis, there may be opportunities for savings related to kitchen operations.
- **Other:** Many buildings have unique features, cultures, or equipment that provide opportunities for behavioral savings. These will be identified during the analysis and should be incorporated into the action plan.

Strategy 2: Low Cost/No Cost Measures

Some simple equipment can be installed easily by existing staff at little or no extra cost. These measures also have the advantage of a short payback period, usually within a year or two. Some examples are listed below:

- De-lamping—removing lamps from overhead fixtures when lighting levels are determined to be higher than necessary.
- Setting domestic hot water (DHW) temperatures to the lowest acceptable setting.
- Installing Vending Misers—these devices manage the operation of vending machines.
- De-lamping vending machines.
- Installing timers on equipment.
- Installing weatherstripping.
- Caulking gaps around windows and doors.
- Repairing cracked or broken windows.



Strategy 3: Operations and Maintenance (O&M) Procedures

While there is some overlap between this category and those above, there are actions that can be taken specifically by building O&M staff that are uniquely in their domain. Remember that any action plan should be sure to include the activities of outside groups using the facilities. Actions fall into these areas:

1. Building and Equipment Scheduling
2. Lighting Strategies
3. Computers and Office Equipment
4. Building Envelope
5. Heating, Ventilation, and Air Conditioning
6. Water Heating
7. Kitchen
8. Swimming Pools
9. Vending Machines

An excellent source for specific O&M tasks is The School Operations and Maintenance: Best Practices for Controlling Energy Costs: A Guidebook for K-12 School System Business Officers and Facilities Managers (Prepared for the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Weatherization and Intergovernmental Program, Rebuild America EnergySmart Schools Program. Available through the Alliance to Save Energy at www.ase.org/uploaded_files/greenschools/School%20Energy%20Guidebook_9-04.pdf.)

Strategy 4: Capital Measures

Capital measures include energy-efficient equipment and design elements that are included in major renovations of existing buildings or construction of new buildings. Typically these involve major renovations or replacement of HVAC equipment and controls, lighting retrofits, and can include other measures such as new windows and roofs. These measures have the potential to cut energy costs 30-50 percent and typically require voters to approve a bond for the work. Another vehicle for financing these projects is through energy performance contracts (EPCs).

Working with an energy service company (ESCO), the work can be financed through loans secured by guaranteed energy savings. While doing the work through an EPC will add cost to the job, many districts have used this vehicle for the security of the savings guarantee and the flexibility it provides for financing. Since the financing is secured by the ESCO, approval by voters is not required. The analysis will reveal if there are opportunities for major equipment upgrades and if so, this course should be considered as part of the action plan. **(A list of common building improvements is included in Section 3.)**

Tracking Progress

It is important to devise a system for tracking performance. There are several options depending on the size of your district and other factors. These range from forms filled in by hand, to spreadsheets and proprietary software. **(See a list of resources in Section 3, Appendix B.)**

Consider the following when choosing your tracking system:

- **Ease of Use:** It should be easy to use, update, and maintain. It should be easy for a new staff member to be trained on how to use the system.
- **Cost:** When assessing your needs, take into consideration the cost of the more complex applications available. They are powerful and the capabilities may be important to you, but in many situations, a simpler, less-costly solution may suffice.
- **Communication:** One of the primary purposes for your efforts is to inform decision makers and the district community. Your system should be set up such that informative reports can be easily generated. Reports that are generated should be designed to clearly communicate to all members of the school community including students and parents.

Tracking Suggestions:

(List adapted from ENERGY STAR®.)

- At a minimum, collect data by fuel type at an individual building or facility level.
- Collect data from submeters, if possible.
- Use actual, not estimated, use data, if possible.
- Use data that is current and timely.
- Use a tracking system to develop quarterly and annual reports that profile energy performance. The tracking system will be utilized during Step 5.
- Use a tracking system to allow facilities to compare their performance to their peers.
- Use an existing tracking system, such as ENERGY STAR®'s **Portfolio Manager** or **Energy Performance Indicators (EPIs)** to organize data and benchmark against the industry.
- Use utility management software. There are several packages available that are specifically designed to manage utility costs. These may offer some advantages over spreadsheets and databases created internally. *(See Section 3, Appendix B for a list.)*

STEP 4: IMPLEMENTING YOUR ENERGY MANAGEMENT ACTION PLAN

Now that the team has developed a school-wide action plan, each stakeholder should implement the action steps that are specific to his/her position. Facilities, administration, teachers, and students each play different roles in the energy management program. **(Section 3 provides detailed information and resources for all departments.)**

Putting the action plan into practice requires the support and commitment of all building users. To gain that support, the group must communicate the action plan and raise awareness of energy use. The more informed building users are about the energy management plan, the more likely they are to become involved and apply energy-conscious behaviors. Providing incentives and training are additional ways to motivate people to embrace the energy management plan.

Develop a Communications Strategy

Developing a clearly defined strategy will make your communications efforts more effective. Use the expertise of the EMT to determine key audiences, key messages, and specific strategies. Combine these ideas into a document that makes clear how the team will go about publicizing the program. Answering the questions below will help the team develop a plan that results in clear, coordinated communications tailored to target audiences.

- **What are your goals?** This is an important step that is often overlooked. Spend some time with your team determining what you want to accomplish with your communications plan. One way is to write objectives describing what your audience will know about your program and energy-related activities. Create a battery of test questions that you'd like your staff and students to be able to answer. From there, define these areas of knowledge as your goals.
- **Who is your audience?** You should consider all members of the district community to be your audience, ultimately. However, they all need to be reached in different ways. Determine who the sub-audiences are and what messages they will respond to. It's also important to assess the audience's present level of knowledge. Appeal to the audience's self-interest wherever possible. Work with EMT members to determine what the motivators are in their sector of the community.
- **What are the most important messages?** Try to narrow this down to just a few and let the goals you set guide the creation of messages. When communicating about the plan to your district continually refer to these main messages. Developing a slogan or tagline that ties your main messages together is a particularly powerful way to keep the program on the mind of community members.
- **How will you reach your audiences?** Find ways to tie in the main messages of your program to all communications. Be specific about the strategies you will use, the timing of the communications, and the vehicles. Be sure to task particular staff with delivering the communications that are slated. Some communications strategies are listed below:
 - ◆ Regular articles/features in district newsletter and individual school newspapers
 - ◆ References to the program on school calendar
 - ◆ Training for staff
 - ◆ Reporting to the community regularly at school assemblies
 - ◆ Email blasts to particular sectors of the community
 - ◆ Use of bulletin boards and other areas of the district website

Promote the Program

Promotion will build enthusiastic support for your program. The entire school needs to know what the program is and why it is important to participate. Here are a few promotional ideas:

- Hold a kick-off event and/or assemblies.
- Design posters about energy efficiency.
- Post a giant graph of the school's energy usage and update monthly.
- Have a door decorating contest with an energy efficiency theme.
- Create switch plate covers that promote energy efficiency.
- Have students write a newsletter article, brochure, or letter to the editor about energy efficiency.
- Design T-shirts or vests for the monitors.
- Give energy-saving tips during morning announcements.
- Give presentations to the School Board and PTA.
- Dedicate a bulletin board in a main area to the program, highlighting activities, progress, outstanding people, and important dates.

Make Training A Priority

Any successful energy management plan requires building users to make wise energy decisions. For some, this means simply continuing actions that are routine at home. For many, however, there is much learning that needs to take place for energy conservation to become a habit.

All building users should be made aware of any energy management plan a school undertakes. Support from and training for the custodial and maintenance staff will greatly improve the success of a plan. Educating the building users about conservation practices being implemented promotes a sense of pride in the school. Additionally, knowledgeable students and teachers will educate the community about using energy resources wisely.

Some steps in the Action Plan may require staff training. If actions required under the plan are unfamiliar to those taking those actions, or the actions require new procedures and protocols then training will be necessary. At a minimum, basic training on the program should be delivered to the entire school community. Training sessions are also an excellent opportunity to solicit feedback from community members. Training topics could include:

- **The Mission and Goals of the Program**
- **Summary of Analysis Findings**
- **Information on Building Systems that Consume Energy**
- **Key Components of Action Plan**
- **Key Milestones**
- **Energy Saving Actions and Behaviors**

More specialized training may be necessary for specific aspects of the community. O&M staff and facility managers may need training on their specific duties under the action plan. This training would focus on new operating methods and procedures to reduce energy use. Administrative training would focus on reporting, monitoring, data collection, and other administrative efforts that support energy management. Some specialized training may also be necessary for staff on the operation and maintenance of new equipment or tools associated with the Action Plan. If major equipment replacement is part of the plan then operations staff will need training on the operation and maintenance of equipment such as HVAC equipment and controls.

In addition to taking the behavioral actions required of all employees under the plan, teachers have a special role. They are responsible for training their students on their role in the Action Plan. Additionally, they will be weaving energy education into the curriculum. NEED provides training for teachers integrated with curriculum focused on the Science of Energy, the Sources of Energy, Electricity, Transportation, and Energy Efficiency/Conservation. NEED materials have been designed to meet the needs of teachers and students, and are correlated to the National Science Education Content Standards and many state standards. Activities are available at all grade levels—from kindergarten to 12th grade—and incorporate NEED's *Kids Teaching Kids* approach to education by encouraging students to teach others. The NEED Project has a Teacher Advisory Board to ensure that all curriculum materials are objective, up-to-date, scientifically accurate, and meet the requirements of national and state standards.

Student Education: NEED offers a series of classroom kits and programs for students to use to monitor energy use in their buildings. Each of the kits are designed to work with a specific grade level range and can be used by students to record energy measurements.

- The **Saving Energy at Home and School** and **Building Buddies** curricula introduces primary students to basic concepts of energy use and conservation, beginning with activities focused on home energy use and extending to school energy use and conservation measures. Students monitor outdoor weather conditions, record indoor and outdoor temperatures, and evaluate their energy use and energy conservation behaviors daily. Individual students and classrooms are recognized for energy-saving habits and being good Building Buddies.
- The **Monitoring and Mentoring** curriculum introduces students in grades 4-6 to methods of measuring energy usage, determining costs and quantifying environmental effects through a series of activities that include reading electric and natural gas meters, EnergyGuide Labels, and electric nameplates. Students conduct surveys of the school building and school energy consumption—gathering, recording, and analyzing data, and monitoring energy usage. Students are encouraged to buddy with primary level students to learn about teaching others.
- The **Learning and Conserving** curriculum teaches middle and secondary school students about energy consumption and conservation by reading utility meters and utility bills, comparing EnergyGuide labels, and exploring electric nameplates. Students conduct comprehensive surveys of the school building and school energy consumption—gathering, recording, and analyzing data, and monitoring energy usage.

Training for New Employees: The EMT should ensure that new employees joining the district are aware of the district's commitment to energy management. In addition to providing new employees with the energy policy, training on the program and on ways to use energy efficiently in the workplace should be provided.

Frequency of Training: Whatever training options are implemented, there are several reasons why training needs to be delivered on an ongoing basis. With new staff and new technologies and best practices emerging, periodic training sessions ensure that the staff's energy knowledge base is strong and up-to-date. Repeated training also reinforces the importance of behavioral and O&M actions. New behaviors require repeated intervention in order to succeed; an ongoing training program ensures sustained energy savings. Ongoing programs should consider twice-yearly trainings, which allow for a focus on seasonal actions related to energy savings.

Motivating Stakeholders

What will motivate district staff to take action and change behaviors? This is an essential question to answer as you put together your action plan. A key concept to understand is ownership. When community members establish, individually, a sense of owning the outcome of the program, you will have a highly motivated community. A sense of ownership can be developed in many ways. Individual members of the community will respond differently to the various motivational strategies that can be applied to develop ownership. Listed below are some of the most common strategies:

- **Identification with Self-Interest:** Most of us will respond to a call to action when we see that taking action directly benefits us in some way. Identify the benefits that will come to community members if the program meets its goals. In some cases, increased comfort for more building occupants may be the result of taking actions. There may be other outcomes that are not directly connected to the goals of the action plan that should be identified, because they may motivate some aspect of the district community.
- **Appreciation:** Step 6, below details strategies for recognizing community contributions to the program. When done with sensitivity, this can be a great way to motivate. Publicly appreciating staff and students builds good will and a sense of program ownership.
- **Stewardship:** Many people respond to the message of *doing the right thing*. It feels good to take care of your community and it's important to harness this powerful motivator when designing your program. Below are a few ways that stewardship can be applied:
 - ◆ **Financial Stewardship:** Let everyone know that their efforts are saving taxpayer dollars. Detail the financial savings and wherever possible earmark savings for redirection to broader school goals. Involve community members in determining how savings will be reallocated.
 - ◆ **Environmental Stewardship:** Let everyone know that their efforts are improving the environment. If their efforts are improving the indoor environment, make sure that is part of your message as well. Quantify environmental impacts in terms of pounds of CO₂, or compare the environmental impacts with a number of trees planted or cars taken off the road. This quantification lets community members know how much their efforts are paying off.
 - ◆ **Image Stewardship:** Is your school community proud of being a leader? Let everyone know that your school is showing leadership by taking action to manage energy use. Many of your community members take pride in the appearance of their school, and the image it portrays. The energy management plan can boost community spirit and motivate members achieve a high level of savings.
- **Financial Rewards:** If your pay structures allow, you can tie energy performance goals to bonuses. As each department is given specific performance goals, a yardstick is created by which their effectiveness is measured. By offering a financial incentive for meeting the goal, many employees will increase their efforts.
- **Employee Performance Requirements:** Energy-related behaviors can be written in to employee performance standards. Once coded into the standards, they can be incorporated into employee reviews.
- **Personal Commitment:** When individuals make a formalized commitment to take action, they are more likely to follow through. There are several ways this can be approached. In all cases, there should be a document to be signed. The signee should keep a copy and a copy should be kept by the EMT. Here are some ways that commitment can be applied as a motivational strategy:
 - ◆ **Choice of Action:** After determining what the most effective actions are that building occupants can take, offer a menu of these actions. From the list, any or all of the actions can be chosen, and the community member signs a form signifying their intention to take the actions they chose.

- ◆ **Pledge:** A slate of actions is presented to all community members, who are asked to sign on. This pledge is a commitment by the individual to take actions for the benefit of the community. The pledge can also include less-defined attitudinal intentions such as “using energy efficiently whenever possible”, as well as specific actions such, “turning off all lights when leaving a room.”
- ◆ **Public or Personal Commitment:** If pledges or agreements are signed, they can be made public in several ways, such as adding names to a banner, listing names in a newsletter, or announcing the names over the school PA system. Taking this step can build momentum for your program, if done with care. Seeing names on a list can motivate others to make commitments, as well.

Choice is an essential part of this approach. A commitment is only meaningful if the one making the commitment is doing so in earnest. Compiling a long list of names is meaningless if no one on the list is serious about taking action. It is difficult to make a real commitment to something if you feel there is no other choice. Pressuring individuals to make commitments (even subtly) undermines the integrity of the commitment. Make sure that those being asked to make commitments have real opportunities to say “no thanks” without any kind of penalty.

STEP 5: MONITOR AND EVALUATE ENERGY MANAGEMENT PROGRESS

On-going evaluation is an integral part of a successful energy management plan. Therefore, the entire energy management team should meet periodically to evaluate the progress of the program. This evaluation provides the opportunity to measure improvements in energy use and determine the level of energy performance and awareness in relation to the goals. Evaluation determines the effectiveness of an action plan and allows for modification to enhance improvement. Finally, evaluation of progress provides an opportunity to recognize and communicate accomplishments.

There are two components to this step:

- 1. Monitoring: Ongoing activities where data is collected and activities are observed and recorded.**
- 2. Evaluation: A review of the data collected through monitoring activities to determine the effectiveness of the program and future actions.**

Monitoring

On-going monitoring is an integral part of successful energy management plans. It provides the opportunity to see improvements in energy use. It gives the chance to distinguish where energy performance and awareness stand in comparison to the goals. The evaluation process utilizes monitoring data to determine the effectiveness of an action plan and allows for modification to continue energy performance improvement.

As a result of the analysis in Step 2, the metrics to be gathered were determined. These metrics need to be gathered regularly in order to monitor performance and evaluate the program's effectiveness at meeting the goals. As part of developing the Action Plan in Step 3, a tracking system was developed that effectively tracks the metrics. The tracking system is the means by which an energy program's activities are monitored. The system will pull in data from all monitoring activities in categories such as:

- Energy and Water Consumption
- Behaviors and Conditions Observed
- Other Factors Affecting Building Consumption
- Student Performance
- Health, Safety, and Comfort
- Environmental Improvement

The EMT should compile all of this data into a form that can be accessed by everyone in the school community. The Team should have a way to organize this information in a way(s) that is (are) understandable by all facets, including students. Step 6 provides several ideas on ways to communicate the progress of the plan to the school community. To ensure that the tracking system is effective, it is important that the information contained is up-to-date and comprehensive. Be sure to determine intervals for data collection up front. Many organizations update their tracking systems on a weekly and/or monthly basis.

Community Member Monitoring Activities

There are monitoring opportunities for all building occupants—teachers, students, O&M staff, other school staff and other users. These are simple and practical ways to remind everyone to be energy efficient and also provide tools to reward those who are doing a good job. One member of the EMT should be responsible for coordinating the data to be gathered.

Administrative Staff Monitoring Opportunities

Provide the utility data required for the program. The data should be compiled from the bills into a spreadsheet, database, or other format that can present the data cohesively. Preferably, data should also be presented as graphs. Utility management software, described in Step 3, can be helpful in organizing and clearly presenting data. Keep the Energy Management Team posted as to district policies and plans that may affect the Action Plan.

Operations and Maintenance Monitoring Opportunities

- Monitor compliance to energy policy requirements by outside groups using facilities.
- Monitor O&M activities that affect energy consumption.
- Monitor HVAC equipment repair and maintenance logs.
- Conduct periodic reviews of the building's energy management system settings (schedules may be changed to meet a special need and never get changed back to their original setting).
- Periodically perform after-hours or weekend walk-throughs to see if any equipment is on when it doesn't need to be.

Teacher and Student Monitoring Opportunities

Teachers can facilitate the formation of student monitoring teams. Teams would be responsible for gathering data on energy use in the building and monitoring compliance to energy policy guidelines. When forming teams consider the following:

- Form teams of six or less.
- Appoint a captain for each team.
- Provide a monitoring form. *(See Section 3, Appendix D for samples.)*
- Assign specific monitoring zones.
- Set up a monitoring schedule.
- Establish where forms will be kept.
- Encourage teachers to appoint room energy monitors.
- Have patrol teams wear ID such as badges, T-shirts or vests.
- Create student monitoring teams using entire grades, student clubs or other subsets of students. The NEED energy efficiency curricula provide details on how to form an ongoing student monitoring program. Students can monitor many different aspects of energy use in a building. For example, students can keep records as to whether:

Lights are off in unoccupied rooms.

Computers and other equipment are off at the end of the day.

Exterior windows and doors are closed when heating or cooling systems are operating.

- The student teams patrol assigned zones, using recording forms to document energy efficient behaviors in their zones, as well as opportunities for improvement. There are several options for forms such as:

NEED Recording Forms

NEED Building Buddies Calendar

Creating your own forms

Asking the maintenance staff for input

When organizing your monitoring activities consider the following:

- **When will you patrol?** Choose times when classrooms are usually empty such as before and after school, during lunch, and recess.
- **Where will you patrol?** Decide if any areas will be off limits. Think about closets, bathrooms, workrooms, etc. Decide where you will store your patrol supplies. Will keys be needed to access rooms?
- **How often will you patrol?** Schedule patrols often enough so that people will be reminded that you are always watching. A minimum of one during school and one after school patrol per month is required.

Evaluation

The tracking system should allow for a compilation of data that can be easily reviewed by the team to paint a picture of the program's effectiveness at meeting the goals. As mentioned above, the Team needs to meet periodically to review this information to evaluate progress. The review can include the following:

- **Energy and Water Consumption:**
 - Review data and compare to baselines.
 - Benchmark the building using Portfolio Manager and see how the score compares to initial score.
- **Behaviors and Conditions Observed:**
 - Review student monitoring forms to determine level of occupant compliance with behavior guidelines.
 - Review O&M staff comments on compliance of outside groups with behavior guidelines.
 - Review other O&M data gathered on equipment.
- **Other Factors Affecting Building Consumption:**
 - Review temperature data during monitoring period.
- **Student Performance:**
 - Review results of student assessments.
- **Environmental Improvement:**
 - Translate energy consumption into emissions data or other data pertinent to environmental goals and review results compared to goals.

It can be helpful to have a form created where data related to each goal can be filled in for periodic review. **(See example in Section 3, Appendix A.)** If building activities and conditions have been monitored, this information should be included on the form. If the monitoring plan is thorough, the picture provided should give clear direction on next steps. If the program is missing targets, the reasons should be evident. Use the evaluation process as an opportunity to determine what steps need to be taken to get back on course. The evaluation process will lead you back to Step 2 and it may be necessary to repeat some of the actions detailed there.

On at least an annual basis, the Team should benchmark the building. By using **Portfolio Manager**, the Team can quickly compare the current performance with past performance.

Year-End Evaluation

Each of the key groups in the building should have data substantiating their contribution to the program. The EMT will use this information to prepare an end-of-the-year report.

Students: Throughout the year, students need to keep monitoring records and document all actions done to save energy at school. The goal is for students to locate where energy may be better conserved and to recognize where energy is being used efficiently. These records should be reviewed annually.

Teachers: An Energy Poll is available at www.need.org. The teacher may administer this assessment prior to the energy efficiency unit and at its conclusion as a measurement of the student's understanding of the subject. Other student assessments should be submitted as well along with any rubrics or other assessment tools used.

Facilities Director and Custodians: At the end of the school year, the Energy Coordinator should meet with the facilities director to examine the utility data. Compare the baseline utility usage to the data over the past year. Maintenance records and logs should be reviewed, as well.

End-of-Year Review

The EMT should convene before the end of the year to evaluate how closely the school came to meeting or exceeding the energy goals, in order to report back to the student body and teachers before the school year ends. Teachers and staff may be polled for feedback on the program and offer recommendations for the following year.

The EMT will use these findings to do the following:

1. Prepare a summary report for the School Board,
2. Inform the school stakeholders of their performance, and
3. Make suggestions for next year's goals.

STEP 6: RECOGNIZE ENERGY MANAGEMENT ACHIEVEMENTS

For long-term success, recognition must be given to those who are implementing the energy management plan—not just the energy team, but all building users and participants. Recognition sustains the people who are putting the action plan into practice every day, provides an opportunity to positively expose the community to the energy management plan, and offers additional motivation for continuing energy-conscious practices.

Reporting Results

As the Team monitors the building's energy consumption over time, it is important to share this information with the school community. Community members who have been asked to make additional efforts will want to see the results of those efforts. This is a basic form of recognition that affirms their participation in a building-wide endeavor and lets them share in the data produced by these efforts. This can be handled in several ways:

Wall Charts are a great way to communicate progress. Large charts posted in high-visibility locations serve two purposes. First, they are a constant reminder of the program and its goals. It can serve to inspire community members and remind them of the actions they have decided to take in an effort to save energy. Energy saving tips can be incorporated into the design and periodically changed to reflect the seasons. Secondly, they report the results of the program in the most accessible way possible. Updating the chart regularly (monthly is suggested) is important. Posters or charts in hallways will tend to fade into the background eventually for passersby, but by updating the chart monthly, passers-by will be more likely to pay attention to it. Bar charts are effective at communicating progress. Setting up the bars such that most recent consumption is compared with the same month a year ago, gives the best comparison of current vs. past performance.

A periodic **Team Newsletter** produced by the team could provide energy-saving tips, as well as reporting on energy consumption. Graphs and charts are effective at communicating this information. Providing the newsletter digitally saves energy and resources which sends a message that the Team is serious about sustainability.

A regular **Section of an Existing Newsletter** could be arranged with your newsletter editor. The information would be similar to that above and have the advantage of a built-in audience. The information may be more likely to be read when delivered as part of a larger piece rather than as another piece of paper that may get overlooked when put in a full inbox.

Email Messages can be sent periodically to staff and students that contain the information mentioned above. However, with the spread of spam and the general increase in email communication, you risk the deletion of your message by those who are feeling overwhelmed by the quantity of email in their inbox.

PA Announcements can be made periodically that report on savings progress. While this demonstrates the importance of energy savings on the school agenda, it is recommended that this strategy be employed in combination with others. It is often difficult to hear morning announcements and it is sometimes a busy part of the day when listeners are engaged in other activities. The message is more powerful if it can also be referred to in hard copy or on a screen.

Recognition

If the Team is going to ask community members to take make energy saving behavioral changes, it will be important to let the community know how effective their actions are. If their actions are making a positive impact, it is important to recognize their contributions. Regardless of the results, it is necessary to recognize the efforts made by individual classrooms or offices within the building. If the community is asked to take an action such as shutting down computers at the end of the day, it is important to monitor whether or not this is happening and then recognize the community members who are adopting the behavior. It is up to the Team to design methods that work for their school. In designing an approach to recognition, be sure to emphasize the positive. Pointing up a group's non-participation can create an antagonistic situation that deflates morale and can undermine your program. Here are a few suggestions for recognizing participants:

Handwritten Notes: Personal communications are often the most meaningful recognition. In a very personal way, the Team can recognize staff and student efforts.

Door-hanger Signs for Classes that Turned Out their Lights: This strategy can give specific feedback to a classroom or office while providing data for the team. Check off boxes on the hanger allow the team's monitors to indicate whether or not the class made the requested efforts. With a little creativity, the door-hanger can become a meaningful way to give a pat on the back to the group for their efforts.

Certificates and Ribbons: These recognize long-term efforts. It shows the community that the Team is watching and notices when positive actions are taken. When those actions are taken consistently over a period of time (i.e. a month or a semester) it's important to recognize that contribution. These are the contributions that make a difference. If Classrooms know that their efforts can lead to the awarding of a certificate it may motivate behaviors. A certificate can become a source of pride for a classroom or office. This award validates their efforts and recognizes their citizenship. Ribbons are meaningful in a similar way. Although not as personal, since the group's name is not mentioned, it still conveys an appreciation and recognition.

Stars on a Chart: This is a very public way to recognize the contributions of a classroom or office. However, unlike those strategies mentioned above, this approach is comparative. Some classrooms/offices will have stars and others will not. While the public acknowledgement can be motivating, using this method should be considered carefully. Those who are not recognized may find this to be de-motivating, and if not done with sensitivity this tactic can undermine a program. Be sure to emphasize the positive in whatever course is chosen.

Announcements over the PA System: This public recognition is a great way to boost morale and again, let classrooms know that their efforts are noticed. However, this should be used with care so as to not alienate some classrooms. If a classroom has been following the recommended procedures and is not announced, they may wonder why they have not been recognized. Those who have not yet been following the recommendations may respond negatively because their absence from the announcements may be noticeable. That can decrease their motivation to come on board later.

End-of-the-year Recognition Ceremonies: It is important to recognize community members for their participation and accomplishments. One way to do this is with a year-end celebration. This event could be a school wide assembly or a community wide event funded through energy savings or by a local sponsor. A year-end celebration is a great motivator and will energize efforts for the following year. It's a good time to give special, public recognition to those who demonstrated outstanding contributions to the program.

Shared Savings: Perhaps the most meaningful way to recognize achievement is to share the accrued energy savings with the school community. However, it can be a complex arrangement and should be constructed carefully. Such an arrangement needs to be negotiated with the central administration of your district. The plan should be based on a pre-determined baseline of energy use, calculated during Step 2. Once the baseline is established, it becomes the benchmark against which future performance is measured. Usage below that baseline is counted as savings. A reasonable division would give the school 5 percent of the savings to utilize for school-based initiatives, however, this figure is up for negotiation. The use of these funds should be made public and the decision making process on how the funds will be used should be as inclusive as possible to build motivation among community members.

State and National Recognition: Students also have the opportunity to submit their participation in the program to the state and national NEED Youth Awards. This competition requires documentation of the efforts students made to educate the school and community about energy management. The students and teachers set goals and objectives and keep a record of their activities. In April, the students combine their materials into scrapbooks and send them to their state coordinators. All contest rules and forms are included in NEED's *Projects and Activities* which is available for download at www.need.org.

CONCLUSION — GETTING STARTED!

Applying the six steps outlined above will allow your district or school to meet energy management goals. While the steps are a proven method, everyone's approach to them will be different. Successful programs tap the creativity and unique qualities of their participants to craft solutions that will work in a specific context.

The diagram on the next page organizes the steps to implementing your energy management program. These are the steps that all school energy plans need to be successful. Simple goals are terrific! Just be sure to write them down. You want to have a way to evaluate your success at the end of the year.

Section 3 provides more detail on the roles that can be played by each department in the district, as well as the resources and tracking tools to help get you started.

STEPS FOR IMPLEMENTING A SUCCESSFUL ENERGY MANAGEMENT PLAN

STEPS	TASKS	LEADER	DOCUMENTS
1 Get School District Approval	Meet with principal or superintendent to explain the need for an energy management plan.	Any key partner - principal, teacher, or student group.	Step 1
2 Form An Energy Team	Recruit members from all aspects of the school community.	Administration or Energy Manager.	Step 1
3 Set Goals	Set goals for how much energy to save and/or the energy-saving practices to establish.	Usually the EMT to oversee department goal-setting.	Utility records - 12 mo. Forms - Section 3 Appendices A, B, C
4 Develop An Action Plan	Develop the objectives to achieve the goals in Step 3. Education and training should be included.	EMT and partners in charge of their departments.	Sample Action Plan Section 3 Appendix A
5 Monitor School Energy Usage	Monitoring responsibilities vary according to the participants in the plan.	EMT and all participating departments.	Monitoring Forms Section 3 Appendices B, C, D
6 Promote The Program	Provide regular reports to the school board, faculty, and students.	EMT and students.	Step 4
7 Recruit Sponsors	Optional	EMT and students.	
8 Document Activities	Create a notebook with records and photographs of all energy-saving activities.	EMT and students.	Youth Awards Guide Section 3 - Appendix B Utility Reports
9 Recognize Successes	Attend state and national NEED Recognition Ceremonies in May & June.	Students, teachers, and sponsors.	Youth Awards Guide Section 3 Appendix B

Section 3: Implementing the Action Plan

INTRODUCTION

The School Building is a System

Everyone has a role to play in implementing the program. This section provides specific tasks, resources and strategies that will assist all members of the school community with contributing to the program. It is important that all staff and students keep in mind the systemic nature of their buildings when taking actions related to the plan. The Energy Management Team has an important role to play in coordinating efforts of the various departments and ensuring that efforts in one area are not leading to unintended negative effects somewhere else related to energy use or health and safety.

When managing the systems of a school to minimize energy consumption, it's important to maintain the health and comfort of the occupants. After all, the reason energy is being used in the first place is to provide a good learning environment. Human beings have specific requirements for temperature, relative humidity, and general air quality. They also have requirements for the quality and quantity of lighting. If light levels are too low, or of poor quality, they can cause eyestrain, headaches, and safety issues. Energy can be saved by turning off lights and lowering the heat in winter, but doing so thoughtlessly can cause unsafe or unhealthy conditions in the building. When the building is treated as a system, energy is saved while maintaining or improving the indoor environment.

School Energy Use

According to the U.S. Department of Energy, taxpayers spend \$6 billion annually on school energy costs, which is 25 percent higher than necessary to keep occupants comfortable and healthy. By managing energy wisely and installing energy-efficient equipment, that \$1.5 billion in excess utility costs could be used to hire 30,000 new teachers or purchase 40 million new textbooks, annually.

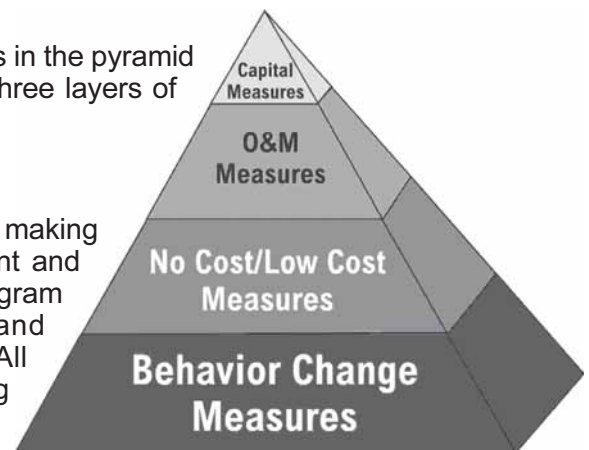
How schools utilize energy varies depending on region. The map and chart on the next page demonstrate these differences. Where your school is located will determine not only how it utilizes energy, but also what you will do to save energy. The tasks listed in this guide are generic. Some may not be as effective or make as much of an impact in your school as they might make in schools located in other regions. The data on the chart can serve as a guide to where your efforts will make the most impact. However, your buildings may differ from the norms of your region. It is always best to be guided by your school's historic data, and your walk-through surveys to determine the areas of focus that will make the most impact on district consumption.

ENERGY MANAGEMENT TASKS BY DEPARTMENT

For each department, the tasks are broken down into the categories in the pyramid diagram. The tasks outlined in this section pertain to the bottom three layers of the pyramid.

ADMINISTRATION

The administration plays a key role in implementing the program by making a commitment to the program's success. With strong commitment and leadership from administrators, there is a high probability of program success. The administrators demonstrate this commitment and enthusiasm by keeping energy management on the agenda. All departments should have tasks assigned and goals to meet regarding energy use, and it's the job of the administration to ensure that goals are met. Areas of direct responsibility include space utilization, community relations, and finance.

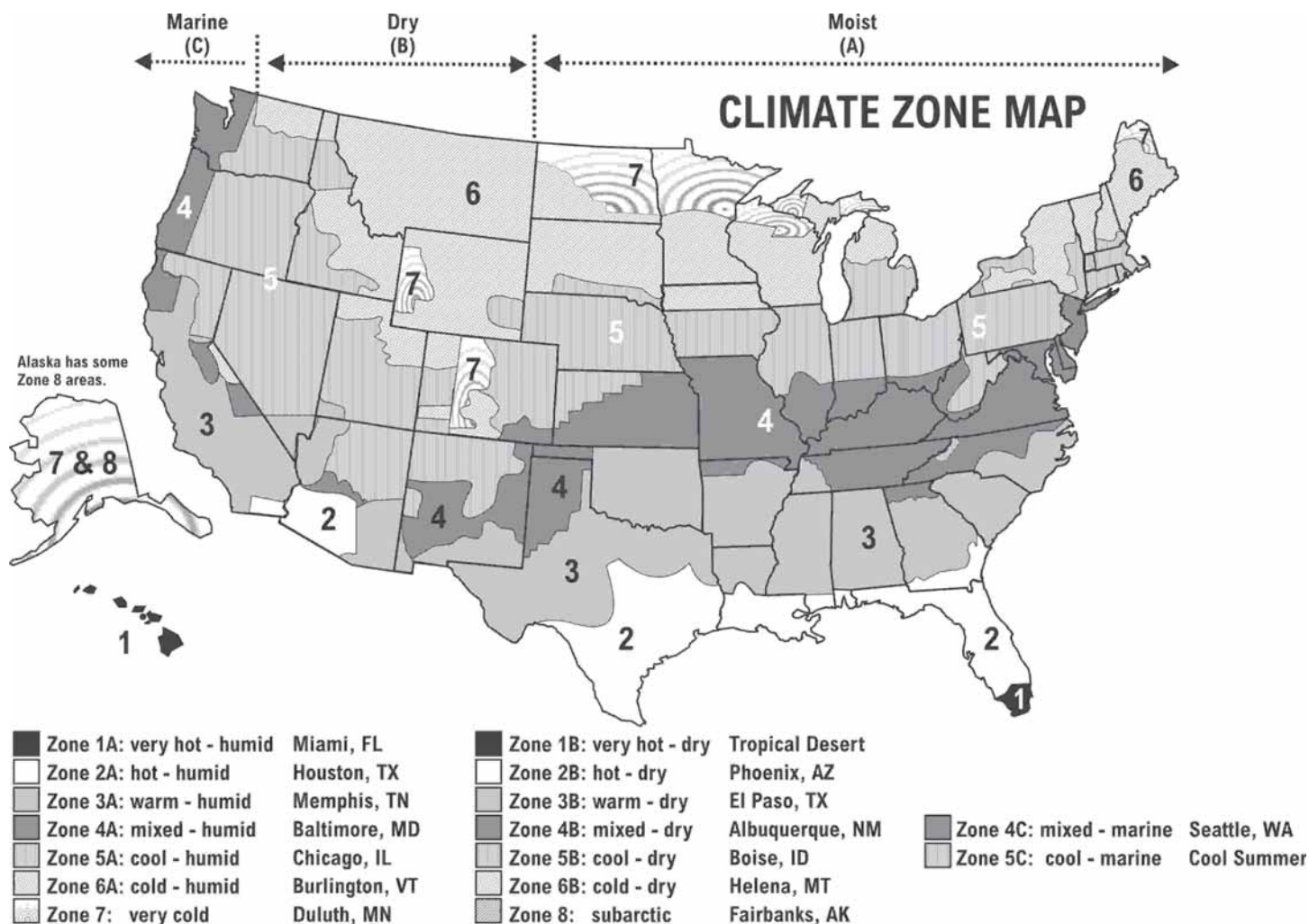


The responsibilities of the administration in the plan include:

1. Ensuring that all departments have and are meeting energy management goals.
2. Ensuring that information related to energy management and the program is relayed to all district staff and students on a regular basis.
3. Informing the broader community about energy management program activities and successes.
4. Monitoring district energy use and costs.
5. Utilizing space in an energy-efficient manner.

ENERGY CONSUMPTION BY CLIMATE ZONE

CLIMATE ZONE	HEATING	COOLING	LIGHTING	WATER SYSTEMS	ELECTRICAL DEVICES	FANS
1A	0.5%	27.6%	27.4%	1.0%	19.7%	23.8%
2A	4.6%	19.8%	28.9%	1.4%	20.8%	24.4%
2B	2.0%	22.5%	28.1%	1.2%	20.2%	26.1%
3A	7.2%	14.3%	30.9%	1.7%	22.2%	23.7%
3B	2.9%	15.0%	32.6%	1.7%	23.5%	24.3%
3C	3.7%	6.1%	34.4%	2.2%	24.7%	28.9%
4A	15.1%	9.1%	29.2%	2.0%	21.0%	23.7%
4B	7.1%	10.3%	31.7%	2.0%	22.8%	26.1%
4C	10.6%	3.3%	34.2%	2.4%	24.5%	25.1%
5A	23.8%	6.5%	26.1%	1.9%	18.8%	23.0%
5B	15.6%	6.3%	29.3%	2.1%	21.0%	25.7%
6A	32.8%	3.9%	23.8%	1.9%	17.1%	20.5%
6B	26.5%	3.7%	26.1%	2.1%	18.7%	23.0%
7A	39.6%	2.0%	21.1%	1.9%	15.2%	20.2%
8A	58.7%	0.6%	15.4%	1.5%	11.1%	12.7%



Specific administrative tasks related to the program include:

- Ensuring that every department in the district is aware of its role in the energy plan.
- Hiring an Energy Manager—the money the district saves often more than pays for the salary and benefits of this position.
- Establishing an internal communications plan that informs district staff and students about the program and their role.

Scheduling and Space Utilization:

- Schedule after-school events with energy usage in mind. Off-hour activities extend operating hours for energy using systems. Schedule events within designated HVAC zones as a way of avoiding heating or cooling unoccupied areas of the school during off hours.
- Schedule meetings and events in “correct-sized” spaces. Consider regrouping activities into smaller areas that can be conditioned separately—such as modular classrooms, or areas of the building that may be separately controlled.
- Look for opportunities to design the school calendar to help save on energy usage. For example, one district extended its school day by five minutes, allowing it to go to a four-day week during some periods of the year.

Community Relations:

- Have you investigated the Energy Star School Label? The top 25 percent of energy efficient schools in the country are eligible for Energy Star labels and the associated publicity and recognition. (***See Benchmarking in Section 2, Step 2, or go to www.energystar.gov/index.cfm?c=leaders.bus_leaders for details.***)
- Inform the broader community about your energy-saving efforts and the money the district is saving for other budgetary needs.
- Include specific information about program activities and achievements in every issue of the school newsletter.
- Ensure that signage is placed throughout the buildings indicating dollars saved by program activities.
- Develop a marketing plan for your energy conservation plan. Some schools have created cartoon characters for their programs; others have come up with names such as *Energy Defenders* or *Energy Savers*.

Finance and Accounting:

- Review bills to ensure that there are no billing errors.
- Generate and review building energy usage reports.
- Does maintenance review your district utility bills? The maintenance staff may spot irregularities the finance department would not have the information to identify. Take advantage of their knowledge so bills don’t get blindly paid.
- Check to see if there are alternative rate structures available for any of the district’s meters that could lower rates.
- Some meters might be combined in order to save money in customer and usage charges.
- Ensure that all meters are still serving functioning areas. Some schools have discovered they are being billed for meters that have nothing connected to them, or are in a space no longer used by the school. Have the maintenance team investigate each metered account.
- When is your billing peak demand? This is a 15-minute period when a school uses its peak amount of energy (known as “demand charge” on the bill). It could cost a school as much as half its bill, depending on its utility’s rate structure. Work with maintenance to see if scheduling can be adapted to reduce workload during this time.
- Make sure that your procurement policy requires the purchase of Energy Star equipment. These products use 25–50 percent less energy. Be sure to calculate life-cycle costs before making purchases.
- Monitor building energy usage to keep track of performance.

VendingMisers: Ask your vendor to install VendingMisers (www.usatech.com/energy_management/energy_vm.php) on the vending machines as part of their contract. By monitoring occupancy levels around vending machines and ambient temperature changes, the VendingMiser allows only enough power to keep the cooled product inside at the right temperature and have it ready to dispense when someone is in the vicinity. The average vending machine uses \$280 in energy, yet vendors rarely pay for this expense.

Water Meters: Do you have a separate meter for water used for irrigation and cooling? Sewer companies set the quantity of sewage as equal to water, because water is metered while sewage is not.

INSTRUCTIONAL STAFF

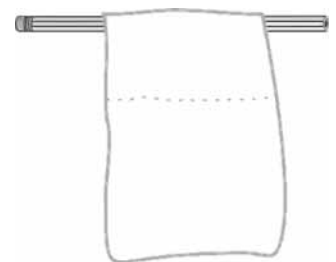
The instructional staff, and the students they work with comprise the largest percentage of the school community. Their actions, and more importantly attitudes, will have a major impact on energy use. Teachers have a role to play first, by becoming educated about the school's energy systems and how they affect energy use in the buildings. When teachers educate their students about energy and incorporate a study of the building energy usage into their program, students become powerful advocates for energy management. Students can play a major role in monitoring energy use and educating others in the school community. NEED has developed materials that actively engage students in the study of energy management and energy conservation. **(A description of resources available is included in Appendix D.)**

The responsibilities of the instructional staff in the plan include:

1. Understanding how their buildings use energy,
2. Taking steps to use energy efficiently in their daily activities, and
3. Educating students about the science of energy, sources of energy, and efficiency and conservation.

Below are specific instructional staff and student tasks related to the program:

- Participate in training on how to use energy efficiently in your building.
- Participate in training on NEED's energy management curriculum for students.
- Facilitate student energy audits of your building.
- Have students deliver presentations on their findings from the energy audit to school board or PTA.
- Monitor energy usage in your classroom and around your building.
- Have students track energy consumption in their building by acquiring billing data from the central office.
- Have students determine areas of energy loss by using "draftmeters" made from plastic wrap (or lightweight paper) and pencils to study where drafts are coming in. Tape a strip of material to the pencil and hold it near a window or door. The toilet paper will move if there is a draft.
- Design posters about energy efficiency.
- Post a giant graph of the school's energy usage and update monthly.
- Have a door decorating contest with an energy efficiency theme.
- Create switch plate covers that promote energy efficiency.
- Have students write a newsletter article, brochure, or letter to the editor about energy efficiency.
- Design T-shirts or vests for the monitors.
- Give energy-saving tips during morning announcements.
- Dedicate a bulletin board in a main area to the program, highlighting activities, progress, outstanding people, and important dates.



OPERATIONS AND MAINTENANCE

Staff members in this department have the greatest direct impact over energy use in the district. How the buildings are operated and maintained will determine the extent to which energy can be saved in the district. Maintaining heating and cooling appliances, upgrading equipment, and making timely repairs all factor into building energy use significantly. Their task in the School Energy Plan is to take advantage of all “low cost, no cost” opportunities to reduce energy usage in the operation and maintenance of the building.

The responsibilities of the operations and maintenance staff in the plan include:

1. Operating buildings in the most efficient way possible,
2. Maintaining equipment and building systems that impact energy use,
3. Monitoring energy use,
4. Upgrading equipment to increase energy efficiency, and
5. Maintaining and improving indoor air quality.

Below are specific O&M tasks related to the program in categories related to general activities, HVAC, Building Shell, Lighting and Electrical Appliances:

General Tasks:

- Establish a Preventative Maintenance Plan if one does not already exist. Existing plans should be reviewed to ensure that energy management has been considered. Schedule off-hour activities to accommodate partial shutdown of building systems.
- Schedule custodial and cleaning activities during working hours whenever possible.
- Determine ways to reduce after-hours lighting use by cleaning staff. If security is a concern, encourage custodians to work in teams after school hours.
- Schedule after-school meetings in portable classrooms or in one area of the building and lower HVAC in the rest of building.
- Plant low-growing grass to reduce frequency of mowing (native species, drought resistant, etc.). An excellent resource is www.american-lawns.com/index.html.
- Review utility bills in order to monitor building energy consumption. Review monthly utility bills and check meter readings for irregularities
- Know when the peak demand period is for your building(s). Use this information to guide decisions about when to use high-consumption appliances. Educate staff about peak demand periods and how they can help reduce peaks. **(See Appendix C for information on The Energy Detective – a device that monitors your school’s energy use in real time and sends data wirelessly to a remote receiver. It can be helpful in determining when peak demand is reached.)**
- Report facilities problems right away, including identified air leaks and temperature problems. Create reporting forms for all staff to use.
- Conduct a building walk-through locating opportunities for energy savings. **(See Appendix C for forms and other resources.)**
- Use student teams to conduct energy audits and help monitor energy use. **(See Appendix D for forms and other resources.)**
- Post reminder signs in key areas to encourage building occupants to conserve energy. This is one of many opportunities to team with a classroom teacher or student organization to create signs. Here are sample sign ideas:

Please turn lights off when you leave the room.

Our school’s peak billing period is X:00 x.m. – X:00 x.m. Use only necessary equipment during this time.

The temperatures in our school are set at the most energy efficient level to provide an atmosphere conducive to learning. With your help, this will save our school money and protect our environment.

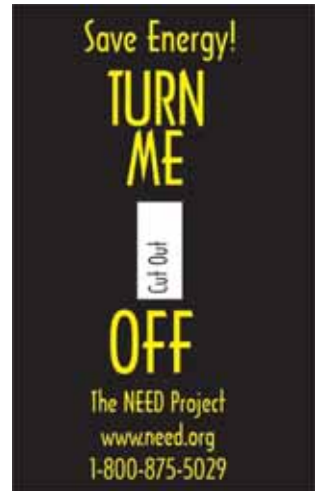
Please report cracked windows or exterior doors that do not close properly to the maintenance team. Prompt repair will conserve energy usage in our school.

Did you adjust the thermostat today? Please return it to the proper setting before you leave.

Every hour our school uses XXX in energy. Do your share to conserve!

The VendingMiser attached to this machine is saving ____ \$\$\$s.

By removing the lamps in this vending machine, we are saving ____ \$\$\$s.



HVAC Systems:

- Stagger major equipment (HVAC units, etc.) start times. This helps offset peak billing demand.
- Implement control strategies through automated systems to control equipment operating time. This includes strategies such as outdoor temperature lock out of pumps, AC lockout during winter, and boiler lookout during summer.
- Ensure that building operators are trained to use the building's Energy Management System (EMS) if there is one.
- Review EMS set points periodically to see that any overrides have been returned to original settings.
- Implement and monitor temperature set point policy. Create a form to request overrides. (**See recommended set points in Appendix A.)**
- Check thermostats for accuracy. Calibrate thermostats periodically.
- Ensure that HVAC systems are set back during unoccupied hours.
- Ensure that all new staff members are trained on how the EMS works, if there is one.
- Make sure vents and registers are not blocked. Make sure that the tops of unit ventilators are kept clear of books and other items. Educate staff on the need to allow a free flow of air through unit ventilators.
- Keep bookcases and other bulky items away from the heating and cooling units so they don't block the air that should be coming into the room.
- Where classrooms or other areas are uncomfortably cold or drafty, find the source of the problem and take steps to correct, if possible. Custodians, teachers, students and maintenance should work together to increase building comfort.
- Keep areas around room thermostats/sensors clear. They are dependent on airflow and obstructions will impair the "sensed" temperature. Computers, TV's and other electric appliances give off a lot of heat and may cause "false" readings, and will have a negative impact on the controls.
- Keep flags, banners, and signs away from air supply diffusers and return registers. These can interfere with their design airflow and impact comfort.
- Keep exterior doors and windows closed. In addition to safety requirements, this will help improve HVAC system performance.
- Encourage staff and students to dress appropriately. Wearing clothes appropriate for the weather will help everyone be more comfortable and minimize the need for extreme heating or cooling operations.
- Minimize (or eliminate) use of electric space heaters. If there are areas of the building that are colder, investigate ways that the building shell and/or HVAC system can be improved to provide adequate heat.
- Repair hot water leaks.
- Lower hot water to the legal limit.
- Install and repair pipe insulation.

Building Shell:

- Look for areas of air infiltration around doors, windows, and other penetrations to the outside. Caulk or foam these areas to minimize air movement.
- Keep interior and exterior doors closed when heat or air conditioning is operating.
- Inform staff on how to use blinds to control heat.
- Open blinds in cold weather allowing direct sun to warm the space.
- Close blinds in warm weather to block solar gain.
- Plant trees to provide shading and windbreaks for buildings—plant coniferous or other evergreen trees on the north side of buildings to block north winds, year-round; pPlant deciduous trees on south sides of buildings. They will shade the building in the summer, reducing cooling loads, and allow sun into the building during winter, reducing heating loads.

Lighting:

- Optimize the use of natural lighting to the extent your buildings allow. Using natural daylight reduces lighting costs and has been shown to increase student performance. (**Research on this topic is listed in Appendix G.**)
- Ensure that lights are turned off in unoccupied areas.
- Direct building occupants to turn off lights when leaving rooms.
- Turn lights off in unoccupied rooms and areas, especially at night, and in closets and storage areas at all times.
- Turn off lights in hallways and restrooms during class periods if daylight is sufficient.
- Measure light levels and compare to industry standards. (**See Appendix C for information.**) If spaces are over the standard, consider removing lamps from fixtures.
- Identify locations where incandescent lighting is being used and investigate options for replacing with compact fluorescent or High Intensity Discharge (HID) lighting.
- Monitor exterior and parking lot lighting to ensure that light sensors are working properly. If exterior lighting is manually controlled or controlled by time clock, consider installing light sensors.
- Establish a group relamping schedule at about 70 percent of the lamp calendar life. According to the ENERGY STAR® Building Manual, this dramatically reduces the time spent replacing each lamp (not to mention the time spent responding to service calls and complaints), which can reduce your overall lighting maintenance budget by more than 25 percent.
- Clean lamps regularly. Accumulated dust can reduce light levels by 10 percent or more.
- Encourage use of CFLs in task lamps.

Electrical Devices and Appliances:

- Investigate possibilities for scheduling the use of major electrical equipment to reduce demand.
- Install Vending Misers on vending machines. By monitoring occupancy levels in the area around the vending machine and ambient temperature changes, these devices allow only enough power to keep the cooled products at the right temperature and have it ready to dispense when someone is in the vicinity.
- Minimize (or eliminate) the use of mini-refrigerators and microwave ovens in classrooms.
- Turn off computers and peripherals at night, if IT policies allow.
- Use the “sleep” option for computers during the day.
- Turn computer monitors off when not in use.
- Ask staff to turn off personal appliances (coffeepots, space heaters) before leaving for the day.
- When purchasing new equipment, specify that equipment be ENERGY STAR® rated.

There are many more low cost, no cost steps that the facilities team can take, from changing filters, to establishing a group relamping plan. One of the best resources is **School Operations and Maintenance: Best Practices for Controlling Energy Costs**. (**See Appendix G for more information.**)

INFORMATION TECHNOLOGY (IT)

Over the past two decades, schools have been rapidly adding information technology equipment. While this movement has revolutionized education, it has also added a large new source of energy consumption. While the primary function of IT staff is to maintain and upgrade the systems they are responsible for, the impact of their activities on the district's energy use makes them necessary players on the district energy team.

The responsibilities of the IT staff in the plan include:

1. Establishing maintenance and upgrade schedules with energy use in mind,
2. Optimizing computers and peripherals for energy savings,
3. Procuring new equipment that is at a minimum, ENERGY STAR® rated, and
4. Educating staff on how use equipment efficiently and safely.

Below are specific IT tasks related to the program:

- Set up all computers to minimize power consumption by enabling standby modes and disabling screensavers. (**See www.energystar.gov/index.cfm?c=power_mgt.pr_power_management.**)
- Ensure that all peripherals are set up to go into standby or sleep mode when idle.
- Investigate power management software options. (**More information is available at www.energystar.gov/index.cfm?c=power_mgt.pr_pm_step1.**)
- Many IT departments ask users to leave computers on after hours in order to install updates overnight. Consider scheduling updates to occur less frequently and notify users to leave machines powered up on specific nights. This way, machines can be shut down most nights.
- Consider energy efficiency before making purchases. ENERGY STAR® equipment should be required.
- The energy consumption of various IT strategies should be considered before implementation. For example, wireless technology is a major consumer of power, a factor to be considered prior to installation.
- Computer monitors, district-wide, should be programmed to go into low-power sleep mode when inactive. Screen savers should be disabled, since they consume as much power as when the computer is in use.

FOOD SERVICES

Refrigeration, cooking, and dishwashing equipment are major users of energy. Because of this, every day, food services staff has opportunities to make a meaningful impact on the district's energy consumption.

The responsibilities of Food Services staff in the plan include:

1. Using appliances efficiently,
2. Investigating options for increasing equipment efficiency,
3. Scheduling activities to minimize energy use and lower peak demand, and
4. Ensuring that food safety is maintained while reducing energy consumption.

Below are specific Food Services tasks related to the program:

- Investigate the use of enzymatic detergents for dishwashers. These provide clean dishes with lower-temperature water.
- Investigate the use of booster heaters for dishwashers. Small, gas-fired water heaters installed near dishwashers allow the building's general water temperature to be set lower.
- Maintain temperatures in walk-in coolers and other refrigeration equipment at the highest possible temperatures that ensure food safety to minimize energy use.
- Make sure that ovens, stoves, steam tables, and other cooking and holding equipment are shut down immediately after use.
- Ovens should not be turned on prematurely. Ovens should take about 15 minutes to reach temperature.
- Clean refrigerator coils regularly.
- Only operate hood fans when stoves or ovens are in use.

TRANSPORTATION

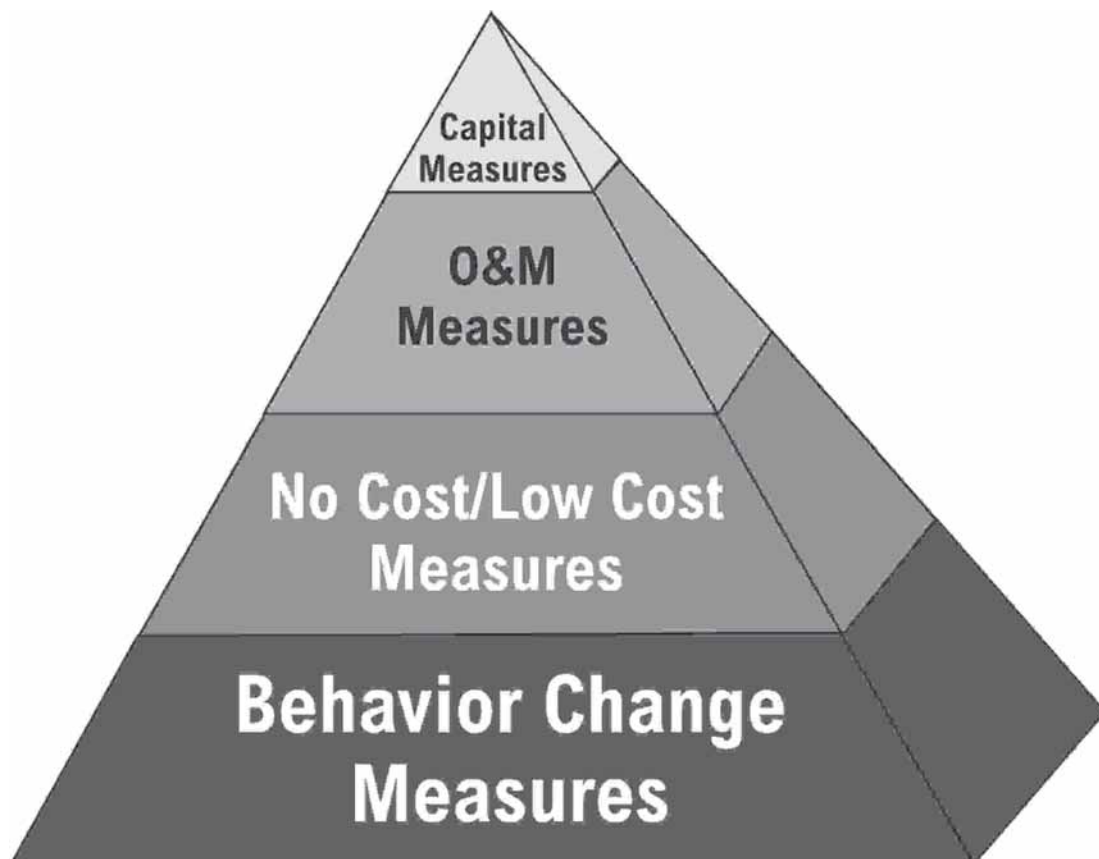
Nationwide, approximately 440,000 school buses provide transportation to 24 million students every school day. The enormous amount of fuel that is used to accomplish this makes it necessary for our schools to explore ways to increase the efficiency of their fleets. Because of this impact, there are opportunities for transportation staff to make a meaningful impact on district energy use. Their activities related to maintenance of equipment, bus route design, and the use of their facilities contribute to the success of the program.

The responsibilities of Transportation Department staff in the plan include:

1. Maintaining vehicles to optimize fuel efficiency,
2. Scheduling student pick-up and designing bus routes to maximize fuel efficiency,
3. Investigating options for the use of alternative fuels, and
4. Ensuring that garages and other facilities are utilizing energy efficiently.

Below are specific Transportation Department tasks related to the program:

- Use software applications to optimize bus routes. Reducing the number of routes reduces the amount of fuel used by fleet. One such product is available through **Trapeze Software** at www.trapezegroup.com/solutions/school.php.
- Implement an anti-idling program. Buses that are left idling add unnecessary pollutants to the air and waste fuel.
- Ensure that vehicles are tuned up regularly and tires are kept at recommended pressure.
- Investigate alternative fuel options. A good place to start is the **School Bus Toolkit** at the U.S. Department of Energy's Alternative Fuels Data Center at www.eere.energy.gov/afdc/apps/toolkit/school_bus_toolkit.html.
- Apply for tax rebates on alternative fuel purchases.



CAPITAL MEASURES: BUILDING UPGRADES AND NEW CONSTRUCTION

Upgrades: As schools save money using the low cost measures, they may consider redirecting the savings into building upgrades that can yield even greater savings. This section focuses on capital measures on the top of the pyramid. Below are listed some of the most common upgrades:

COMPONENT	IMPROVEMENT	RESULTS & COMMENTS
BUILDING SHELL	Install double-paned, low-e windows Apply cool roof strategies	Reduces heating & cooling loads. High cost leads to a long payback period. Reduces cooling loads. A cool roof is defined differently by different codes or programs, but it is basically a roof that reflects the sun's energy rather than transferring it to the building below. "Coolness" is measured by two properties - solar reflectance and thermal emittance. Both properties are measured from 0 to 1 with the higher the value, the cooler the roof. (www.coolroofs.org/index.html)
HVAC	Install or upgrade energy management system Upgrade boiler systems Upgrade cooling systems Convert from electric to natural gas heat Install high-efficiency motors and variable drives Convert to variable air volume ventilation system	Saves on heating, cooling, and lighting costs. Improves control of building temperature, ventilation and lighting systems. Saves on heating costs. Replacing or refurbishing boilers to higher efficiency units and/or switching from a central to a modular system. Saves on cooling costs. New chillers and towers should be considered. Lowers heating costs. Reduces electricity load. Improves efficiency of HVAC systems. Reduces electricity load. Improves efficiency of HVAC systems.
LIGHTING	Upgrade to T-8s with electronic ballasts. Consider T-5s where light intensity and heat are not issues Install specular reflectors in light fixtures Install motion sensors Install LED exit signs	Reduces electricity and cooling loads. Improves light quality. Reduces electricity and cooling loads by reducing the number of fixtures and/or lamps per fixture needed. Focuses light where it is needed. Reduces electricity and cooling loads, and maintenance costs. Reduces electricity load. LED exit signs consume only 2 watts with useful lifespans of 10-25 years.
ELECTRICAL DEVICES & APPLIANCES	Purchase only ENERGY STAR® rated devices Install power management software on computers Install Vending Misers on vending machines	Reduces electricity load and cooling load. Reduces electricity load and cooling load. Reduces electricity load and cooling load.
OTHER	Install energy efficient transformers	Reduces electricity load. Transformers lower and raise voltage for building needs. Energy efficient transformers increase reliability and reduce noise. They have the lowest life cycle cost.

Some districts possess the in-house knowledge to undertake these projects. Others utilize engineering firms or general contractors to accomplish the work. Energy Performance Contracting (EPC) is one vehicle available for school districts to implement energy efficiency upgrades in their buildings. Districts that enter into EPC agreements contract with energy service companies (ESCOs) that perform analyses and serve as general contractors for the work. With an EPC, the work can be financed through loans secured by guaranteed energy savings.

While doing the work through an EPC will add cost to the job, many districts have used this vehicle for the security of the savings guarantee and the flexibility it provides for financing. Since the financing is secured by the ESCO, approval by voters is not required. Flat fee financing is arranged that provides for a net positive cash flow for the district. The analysis will reveal if there are opportunities for major equipment upgrades and, if so, this course should be considered as part of the action plan. EPCs will stipulate how baselines are developed and how future utility rate increases will be accounted for. Other contingencies such as changes in occupancy, equipment, or building structure will be stipulated, as well. Many districts hire engineering firms or performance contracting specialists to assist with the RFP development and applicant selection.

New Construction: High Performance Schools: When new construction is planned, consider following high-performance design guidelines. High performance schools achieve a higher level of energy, environmental, and economic performance than schools built with standard practices. While saving money and improving the environment, these buildings provide a healthy indoor environment for occupants. A process called whole-building design is utilized to achieve these results.

In whole-building design, the building's structure and systems, as well as the occupants, are all considered as an integrated whole. Because of this integration, members of the design team, such as architects, engineers, building owners and occupants, need to work together from the beginning of the design process. The systems are designed interactively to ensure all work together in the best possible way to save energy and reduce environmental impact. For example, a building that uses extensive daylighting techniques will reduce the amount of heat given off by lighting fixtures, thus allowing for a smaller air conditioning system. Listed below and on the next page are several high performance elements that should be considered when designing for new construction.

COMPONENT	IMPROVEMENT	RESULTS & COMMENTS
SITE PLANNING	Orient buildings to take advantage of passive solar heating, natural breezes, and existing landforms	Reduces heating, cooling and lighting loads.
	Plant trees for shade and windbreaks	Reduces heating and cooling loads. Plant coniferous trees on north side of building to block winds, plant deciduous trees on south side to provide shade in summer and allow sun in winter.
	Landscape with indigenous plants	Reduces water use, erosion, and storm water run-off; provides learning opportunities.
BUILDING SHELL	Use light-colored materials for roofs and walls	Reduces cooling load.
	Choose products made from recycled materials, are recyclable, or are made with sustainable-yield processes	Reduces the need to send construction materials to landfills. Maintains natural resources. Reduces costs associated with transporting materials.
	Utilize local manufacturers for building materials and equipment	Stimulates local economy.
	Use non-toxic materials	Improves indoor air quality.
	Choose energy-efficient windows designed to reduce solar heat gain and increase daylighting options	Reduces lighting and cooling loads.
	Utilize materials that provide the best insulating value	Reduces heating and cooling loads.

COMPONENT	IMPROVEMENT	RESULTS & COMMENTS
HVAC	Choose ENERGY STAR® equipment that is sized for the space Install operable windows Install separate HVAC controls for each room or area Maintain indoor relative humidity levels at 40-60% Provide adequate filtered outside air with intake vents located in cool locations away from building exhaust and heat sources Install intelligent controls	Reduces heating and cooling loads. Increases equipment efficiency. Reduces cooling load. Increases occupant comfort. Increases occupant comfort. Reduces heating and cooling loads. Increases occupant comfort. Reduces cooling load. Improves indoor air quality. Reduces heating and cooling loads.
LIGHTING	Use daylighting elements such as clerestory windows and light shelves Install high-efficiency, long-life lights Provide light levels suited to room tasks Use occupancy sensors in all rooms	Reduces lighting and cooling loads. Reduces glare and provides natural lighting to improve student performance. Reduces lighting and cooling loads. Reduces maintenance costs. Reduces lighting load. Increases occupant comfort and improves performance. Reduces lighting load.
WATER USE	Install on-site water retention systems Install low-flow fixtures and waterless urinals	Reduces water use for landscaped areas and flushing of toilets and urinals. Reduces water use.

Appendices

Appendix A: Energy Management Plan Resources and Forms

The forms and resources provided in this section assist with the administration of the energy plan.

Sample Setpoints for Controls. The setpoints provided are meant as guidelines only. They can serve as a starting point as your district develops an energy policy.

Energy Management Plan Tracking Form

Building Profile Form

Sample Energy Policies

Sample Energy Management Plan

Energy Director Job Description

Appendix B: Performance Tracking Resources and Forms

Appendix C: School Energy Survey Resources and Forms

Appendix D: NEED Materials and Resources for Students and Teachers

Appendix E: Operations and Maintenance Resources

Appendix F: Transportation Resources

Appendix G: Resources for High Performance Schools

Appendix H: Sustainability Resources

Energy Management Plan Tracking Form

Task	Frequency
1. Benchmark Building Energy Usage Electricity Natural Gas	Annually
2. Conduct Building Awareness Audit Custodial staff Student monitoring team	Annually
3. Appoint Building Energy Monitor	Annually
4. Form Student Monitoring Teams	Optional
5. Return overrides to regular settings	Monthly
6. Adjust time clocks	Monthly
7. Issue Energy Reports (including copies of energy audits) Detailed copy to building staff Summary to Board	Quarterly Dates issued _____ Dates issued _____
8. Conduct night and weekend audits: Dates conducted night audit: Dates conducted weekend audit:	Semi-annually _____ _____
9. Verify all staff have annual certificate of EMS and/or datalogger training Name _____ Name _____ Name _____ Name _____	Annually Date of training _____ Date of training _____ Date of training _____ Date of training _____
10. Verify facilities are using EMS, where possible, to do the following: Optimal start/stop Air and water economizing Chilled and heating water resets Night setback and setup Night purge Morning warm-up Hot and cold deck optimization Lighting sweeps	Annually yes no yes no yes no yes no yes no yes no yes no yes no
11. Ensure unused spaces have HVAC equipment and lights turned off.	Annually

Building Profile: Energy Benchmarking Data

Please submit one form for each building, and attach copies of most recent 12 months of utility bills.

General Info

Name of Building _____

Address _____

City _____ Zip Code _____

Point of contact: Name/Title _____

Address _____

Phone _____ E-mail _____

Fax _____ Mobile _____

Building Info

Year Built _____ No. of students _____

Size of building (sq. ft.) _____ No. of floors _____
(Do not include unheated attics or basements)

Type of school ____ High School ____ Middle/Junior High ____ Elementary ____ Other

Electric Utility _____ Electric Utility Account # _____

Gas Utility _____ Gas Utility Account # _____

How is building heated? _____

No. of personal computers _____

How is building cooled? _____

Percent of building cooled _____

Does the building have cooking facilities? Yes No

No. hours of occupancy per week _____ No. months operated per year _____
(Times when the majority of the building is being used)

OTHER:

Sample Set Points for Controls

SET POINTS FOR HVAC/EMS CONTROLS SHALL BE AS FOLLOWS:

Temperature set point (cooling season, occupied)

Classrooms, offices	= 74 deg F (dry bulb)
Corridors	= 78 deg F (dry bulb)
Cafeterias	= 74 deg F (dry bulb)
Mechanical Rooms	= Uncontrolled or off
Auditoriums	= 76 deg F (dry bulb)
Computer rooms	= 74 deg F (dry bulb)
Lobbies	= 78 deg F (dry bulb)
Restrooms	= 78 deg F (dry bulb)

Temperature set point (heating season)

Classrooms, offices	= 70 deg F (dry bulb)
Corridors	= 65 deg F (dry bulb)
Cafeterias	= 68 deg F (dry bulb)
Mechanical Rooms	= 55 deg F (dry bulb)
Auditoriums	= 70 deg F (dry bulb)
Computer rooms	= 65 deg F (dry bulb)
Lobbies	= 70 deg F (dry bulb)
Restrooms	= 68 deg F (dry bulb)

Maximum thermostat adjustment = + 1 deg F

Summer setback	= 78 deg F
Off after midnight	
Winter setback	= 55 deg F

Ventilation Requirement = 15 CFM/Person

HVAC “normal” hours

Elementary school day	= 7:30 am—2:50 pm
Elementary start-up/stop time	= 6:30 am / 4:00 pm
Middle school day	= 8:30 am—3:50 pm
Middle school start-up/stop time	= 6:45 am / 5:00 pm
High school day	= 7:30 am—3:20 pm
High school start-up/stop time	= 6:45 am / 5:00 pm

Automatic over-rides shall be limited to one time for one hour. HVAC needs beyond that shall be considered events and require submittal of an over-ride request sent to Maintenance.

Fresh air exchange operations shall start and stop with normal schedules and event schedules.

Weather permitting, heating season dates are considered October 15 through April 15. Cooling season dates are April 15 through October 15.

Indoor Air Quality Operational Standards

Operational standards for fresh air systems (pending HVAC capabilities) are as follows:

Relative humidity	= 40 – 60%
Carbon Dioxide (CO ₂) levels	
Indoor	= 1,000 ppm
Outdoor	= 700 ppm

SAMPLE Energy Policy: Roanoke County Schools, VA

9.9 AR ENERGY CONSERVATION GUIDELINES

Purpose:

To establish short and long range guidelines for all staff members of Roanoke County Public Schools regarding facilities management, energy awareness, and energy conservation.

Procedures:

1. The teacher will be responsible for implementing the guidelines during the time he/she is present in the classroom.
2. The principal will be held responsible for the total energy usage of his/her building. The principal will be provided information reflecting the energy consumption for his/her building on a monthly basis.
3. All savings are calculated using August 1997-July 1998 as the base year. All calculations are based on weather adjustments, changes in square footage, additions or deletions in HVAC equipment and computer additions.
4. Specific areas of emphasis include lighting, heating, and cooling and water consumption.

Lighting

1. The custodians will be responsible for turning hall lights on and off daily. Hall lights should be turned on 30 minutes before students are to arrive for classes. Hall lights should be turned off immediately after students are dismissed for the day.
2. Teachers and coaches shall turn off lights unless the classroom is in use. If there is ample ambient light from windows turn the classroom lights off. All lights are to be turned off when the room is to be unoccupied.
3. Outside lights should be off during the daylight hours and weekends. Outside lights will be routinely lit from dusk until custodians leave for the evening. Outside lights will be turned on when the cafeteria and custodial staffs arrive for work and will be turned off at dawn. Security lights will remain on nightly.
4. When in the building during non-school hours, custodians should turn lights on only in the specific area in which they are working.
5. All personnel restroom lights should be turned off when unoccupied.
6. Support staff shall turn off lights in all areas that are unoccupied. They are also responsible for turning on lights at the beginning of the day and off when they leave for the end of the day.

Heating Equipment

1. The heating temperature range is from 68 to 71 degrees throughout the school system.
2. Individual classroom and office doors will be closed when the heating equipment is in operation.
3. In those buildings with central controls, the start time for the heating equipment will be set to start as late as possible while still allowing time to heat the building to the guideline temperatures. Elementary schools will be set to shut off at 3:00 p.m. Secondary schools will be scheduled to shut off at 3:30 p.m. In those buildings with classroom controls the heat will be turned on by the custodian daily and set back to 60 degrees by the teacher when he/she leaves at the end of each day.
4. The principal will be responsible to insure that the custodial staff performs an end of the day shutdown checklist. (These checklists are given out at the beginning of each school year by the energy manager)
5. The principal and energy manager will work together to maintain a comfortable temperature in each school.
6. Electric space heaters may be used providing the following:
 - Heaters must be located a minimum of three feet away from any combustible materials which include books and/or furniture.
 - Heaters are equipped with a circuit breaker that prevents electrical overloads.
 - Heaters are equipped with tip-over protection to prevent possible injury and/or fire.
 - Heaters are turned off when rooms are not occupied.
7. Mobile units are to be turned on by the custodian each morning. The teacher will set the thermostat back to 60 degrees nightly.

Air Conditioning

1. During the summer break, air conditioning will be used only in schools having summer school and in office areas. The principal, head custodian and energy manager will maintain a building temperature in occupied areas to range from 74 to 78 degrees.
2. The cooling temperature is from 74 to 78 degrees throughout the school system.
3. All classroom and office doors will be closed when air conditioning systems are in operation.
4. In those buildings with central controls, the start time for air conditioning will be set 30 minutes before students are to start class. Elementary schools will be set to shut off at 3:00 p.m. Secondary schools will be set to shut off at 3:30 p.m. In buildings with classroom controls the air conditioning will be turned on by the custodian daily and turned off by the teacher when he/she leaves at the end of each day.
5. The principal will be responsible to insure that the custodial staff performs an end of the day checklist.
6. Mobile units are to be turned on by the custodian each morning. The teacher will turn off the air conditioning unit nightly.

Miscellaneous

1. All employees are to turn off printers, monitors, speakers, computers, laminating equipment, copy machines and other office machines at the end of each day. Only network servers should be left on.
2. Custodians should turn off all exhaust fans in restrooms nightly.
3. The Head Custodian at each school will be responsible for a complete and total shutdown of the school when closed each evening. He/she will be responsible for reporting water leaks to maintenance.

Accountability:

1. The school principal will be held accountable for building conformity to energy policy guidelines.
2. The Energy Manager will submit a monthly report to the school principal or building supervisor. A report will be submitted to the superintendent if a school or building receives a failing report for 2 consecutive months.
3. If a building is found to be using excessive energy, the principal will be notified in writing of the specific problem. If the specific problem has not been corrected during the subsequent inspection, the building will be assessed the cost of the increased energy consumed.

Adopted: November 9, 2005

SAMPLE Energy Regulation

Purpose

The purpose of this regulation is to provide _____ School employees, students and volunteers the necessary short and long-range administrative guidelines to implement energy awareness and conservation in order to better utilize available funds for improving student achievement.

General

The conservation measures outlined herein shall be emphasized throughout the school year with emphasis during the heating and cooling seasons. The principal through his/her administrative and instructional staffs shall be accountable for energy management at his/her school. Judicious use of the various energy systems will be the joint responsibility of the principal and the custodians to ensure that an efficient energy posture is maintained on a daily basis.

Every student will participate in the energy management program in the school division as an "energy saver". This concept will be emphasized in the curriculum.

Specific areas of emphasis include:

1. Effective immediately, all unnecessary lighting in unoccupied areas will be turned off. All lights will be turned off when students and teachers leave school. Custodians will turn on lights only in the areas in which they are working.
2. The school division energy manager will chart each school's progress on conserving energy and will communicate with the school principal on their progress as well as areas of concern.
3. Energy management in the school will be part of the principal's annual evaluation.
4. The head custodian at each school will be responsible for a complete and total shutdown of the facility when closed each evening.
5. Administrative procedures (below) are hereby made a part of these regulations and will be the "rules of the game" in implementing our energy program.

Procedures

Occupied Mode and Unoccupied Mode:

Occupied mode begins 60 minutes before the official start of school and Unoccupied Mode begins 60 minutes after the official end of the school day for teachers. Below is a chart for the elementary, middle and high schools.

	Official Start	Official End	Start Occupied	Start Unoccupied
Elementary	8:30	3:30	7:30	4:30
Middle	8:00	3:00	7:00	4:00
High	7:30	2:30	6:30	3:30

Sections of the building used for after-school activities will be considered occupied. It should be note that an entire school is not occupied when an activity is occurring in the school. The space that is being occupied will be heated or cooled.

Any malfunctioning devices, windows or vents should be immediately reported by school administration or head custodian to the maintenance department through the I-Series work order system.

Heating Season

1. Thermostats shall be lowered to obtain a building temperature of 68-70 Fahrenheit during the day.
2. Heating setback switches shall be adjusted to obtain nighttime building temperatures at 55. Setback switches shall be activated for nighttime temperature according to Section III – Procedures for start of Unoccupied Mode.
3. Door and window closures shall be carefully monitored to reduce heat loss.
4. The Maintenance Department shall coordinate with the school principal on efficient boiler use to ensure minimum boiler operations.
5. The Maintenance Department shall assess outside air intake systems and adjust where needed to reduce heat loss.
6. Heating problems should be reported to the maintenance department through the I-Series work order system.

Cooling Season

1. Cooling levels for air-conditioned areas shall be held at not lower than 74-76 during working hours. Setback switches shall be activated for nighttime temperature according to Section III – Procedures for start of Unoccupied Mode unless the physical plant is specifically exempt to provide comfortable temperatures for special programs in a school.
2. The Maintenance Department shall adjust cooling system controls to ensure that the temperature of air-conditioned areas will be maintained between 74-76 degrees.
3. Cooling and air circulation problems should be reported to the maintenance department through the I-Series work order system.

Other

1. Interior hall lights shall be reduced by 50 percent at all times where practical. Classroom lights shall be turned off when not in use. Night custodial staffs shall use minimum lighting necessary to accomplish tasks.
2. All areas without staff or students shall have lights off completely.
3. When a room is only occupied by a teacher, lights should be at half-power.
4. Half lighting will be used in the hallways at night, and only classrooms that are being worked in will be lit. One custodian in a hall way should mean only one classroom light on.
5. All outside lights should be off during daylight hours. The Maintenance Department will coordinate the use of photocells to control the operation of outside lights.
6. Once school activities have ended, all outdoor lights should be at a pre-set minimum. The Maintenance Department will verify the necessary candlepower to ensure the safety of the parking lot lighting.
7. All copiers and laminators should be turned off when teaching and administrative staff members have left the building.
8. All computers and computer accessories should have sleep timers reset to go to “sleep” after three minutes of inactivity or be disconnected.
9. No outside microwaves, refrigerators, toaster ovens or appliances should be used outside of teacher workrooms.
10. No space heaters will be permitted in classrooms or offices.
11. Modular classrooms not in use for classroom purposes will be disconnected.

Hot water heaters

1. Hot water temperature in the elementary classrooms shall not be above 100 degrees.
2. All other heaters will be set at 125 degrees. Booster heaters will be utilized to increase the water temperature in the dishwasher room to 140 degrees.

Role of Energy Manager

The Energy Manager will make periodic visits during school hours, nights and unoccupied hours to ensure energy saving methods are being followed. A checklist will be filled out and the information will be shared with the building administrator in a timely fashion.

SAMPLE Energy Management Plan

ENERGY MANAGEMENT PLAN OUTLINE AND DRAFT _____ PUBLIC SCHOOLS

SUBJECT: Energy Management Plan

Purpose

The purpose of this plan is to implement the _____ Schools board energy policy to reduce energy consumption in the district school and improve the learning and teaching environment for our students and teachers. This implementation will guide the operations of the school district to achieve the highest standards in energy/water use, environmental and economic performance.

Goals of the plan

1. To reduce energy consumption in each school facility by at least (____)% at the end of the 2011-2012 school year and maintain the achieved level of consumption for five years after obtained. Baseline to be established at the 2004-2005 school year.
2. Establish an energy awareness training program and maintain it for all _____ School employees through periodic training
3. Obtain and make available energy education materials for all teachers for _____ incorporation into their subject matter
4. Objectives to achieve energy reduction Goal:
5. Achieve at least a (____)% reduction in energy consumption from the established baseline in at least (____)% of the schools by the end of the 2006-2007 school year
6. Achieve at least a (____)% reduction in energy consumption from the established baseline in at least (____)% of the schools by the end of the 2007-2008 school year
7. Achieve at least a (____)% reduction in energy consumption from the established baseline in at least (____)% of the schools by the end of the 2008-2009 school year
8. Achieve at least a (____)% reduction in energy consumption from the established baseline in at least 100% of the schools by the end of the 2009-2010 school year
9. Achieve at least a (____)% reduction in energy consumption from the established baseline in at least 25% of the districts schools by the end of the 2008-2009 school year
10. Achieve at least a (____)% reduction in energy consumption from the established baseline in at least 50% of the districts schools by the end of the 2009-2010 school year
11. Achieve at least a (____)% reduction in energy consumption from the established baseline in at least 75% of the districts schools by the end of the 2010-2011 school year
12. Achieve at least a (____)% reduction in energy consumption from the established baseline in at least 100% of the districts schools by the end of the 2011-2012 school year

Objectives to achieve an energy awareness training program for personnel

1. Develop, test, and evaluate an energy awareness training program during 2005-2006 school year
2. Implement to all _____PS employees during the 2006-2007 School Year

Objectives to achieve the classroom energy education element:

1. Identify and evaluation existing energy education materials using instructional personnel for the selection during the 2005-2006 School Year
2. Request volunteers with at least three teachers at each grade level and each subject to use and evaluate the materials during the 2006-2007 School Year
3. Achieve 50% usage in classrooms by the 2011-2012 School year

Implementation

- Establish and fund an energy manager position and area energy coordinators
- Establish and Energy Management Team of all segments of the school community
- Gather 2004-2005 energy and water utility data for each school and input into the ENERGY STAR® Program and establishment of an energy baseline
- Determine building occupancy profiles for each school
- Determine building and system characteristics for each school
- Energy Audit at least 10% of the buildings in 2005-2006 SY; at least 50% by 2006-2007; at least 100% by 2007-2008
- Adopt a set of High Performance/Green Design guidelines for use in the design and construction of new and renovation of existing school facilities

Checklists

Develop checklists for all segments of the school community for use on daily energy conservation actions

1. Classroom
2. Outside Activities

Develop checklists for special circumstances to control energy usage

1. Holidays
2. Summer
3. Weather closings
4. Athletic Activities

Energy Awareness Training and Education

Develop Energy Awareness training programs to support stated objectives for:

1. Administrators
2. Instructional
3. Support Personnel
4. Community

Obtain energy education materials to achieve stated objectives

Energy Conservation Measures

As the results of energy audits and facility/systems inspections, develop an energy conservation measures project list in conjunction with the capital projects. Use energy conservation measures list provided from existing resources

Evaluation/Re-evaluation of Plan and Measurement of Success

Develop a program to evaluate the success of the overall program and to measure the success of the EMP

Recognition

Develop a program for recognition of success in the program both internally and externally.

The community should be informed on a continuing basis of the energy management program that exists, what has been accomplished, by who and how they could take advantage of the action taken to reduce their own energy bills

SAMPLE Energy Manager Job Description

Adapted from the Texas State Energy Conservation Office

Job Description : Energy Manager

PRIMARY PURPOSE:

Be responsible for analyzing current energy usage and developing the district's energy management plan in order to provide proper environmental conditions with cost effective energy utilization. The Energy Manager will be responsible for the district's HVAC control and energy tracking computer system in order to achieve this purpose.

QUALIFICATIONS:

Minimum Education/Certification:

Bachelor's degree in mechanical engineering, engineering technology, business or related field with emphasis on facilities management. Professional designation of Certified Energy Manager (CEM), preferred.

Special Knowledge/Skills:

Knowledge of energy management program development. Knowledge of HVAC and lighting systems. Ability to manage budget and personnel. Strong organizational, communication, and interpersonal skills.

Minimum Experience:

Two years of experience in energy management, mechanical systems design, construction, and/or maintenance, or closely related field

MAJOR RESPONSIBILITIES AND DUTIES:

1. Ensure that energy management operations are supportive of the instructional goals of the district.
2. Promote a comfortable indoor climate for learning.
3. Maintain liaison with the Maintenance/Operations department and Principals and their staffs in order to provide optimum facility comfort while reducing energy consumption levels.
4. Employ effective interpersonal skills.
5. Recommend sound policies directed toward energy conservation.
6. Develop long-range plans for implementing innovations.
7. Establish and coordinate site-based energy management teams
8. Support district programs for recruitment, selection, orientation, and assignment of district maintenance employees.
9. Assist maintenance managers in evaluating HVAC and energy equipment maintenance staff to ensure effectiveness.
10. Develop training options and/or improvement plans to ensure the best operation in the area of HVAC and energy equipment maintenance.
11. Pursue an aggressive program to reduce district costs for energy.
12. Assume responsibility for compiling, maintaining, and filing all energy reports, billings, and other documents required.
13. Maintain a continuous activity schedule for all buildings in order to coordinate efficient usage.
14. Utilize consultants when necessary to identify energy conservation measures.
15. Compile utility budgets and energy conservation measure cost estimates based upon documented program needs.
16. Pursue outside funding sources for equipment retrofits.
17. Maintain liaison with equipment suppliers in order to conduct bidding process for equipment upgrades and retrofits.
18. Monitor all facilities design and construction activities as relates to energy management.
19. Review and recommend maintenance supply and equipment purchases to ensure energy efficient replacements are being specified.
20. Review and negotiate energy purchase agreements and make recommendations regarding energy fuel selection.
21. Implement the policies established by federal and state law, State Board of Education rule, and local board policy in the area of energy conservation.

22. Provide regular reports as to the overall effectiveness of the energy management program.
23. Demonstrate support for the district's student management policies and expected student behavior related to energy management and safety programs.
24. Take the initiative to develop needed professional skills appropriate to job assignments.
25. Demonstrate behavior that is professional, ethical, and responsible and serve as a role model for all district staff.
26. Articulate the district's mission and goals in the area of energy management to the community and solicit its support in realizing the mission.
27. Demonstrate awareness of district-community needs and initiate activities to meet those identified needs.
28. Demonstrate the use of appropriate and effective techniques for community and staff involvement.

SUPERVISORY RESPONSIBILITIES:

Supervise and evaluate the performance of support staff assigned to the area of energy management.

WORKING CONDITIONS:

Extensive in-district travel.

Periodic exposure to conditions in mechanical/boiler rooms, ceilings, roofs, and underfloor areas.

Occasional irregular hours.

Appendix B: Performance Tracking Resources & Forms

To determine how successful your program is, you will need to track performance over time. This can be done by hand, with spreadsheets, or with software that is commercially available. Spreadsheets for this purpose are available for download at www.need.org/EnergyManagement. They allow you to enter data from your utility bills and monitor usage over time.

Commercial software is available that provides additional information to help you manage your utilities. Some of these products capture data directly from submeters that are installed as part of the services provided by the suppliers. Often, these applications are web-based. Typically, the software can identify unusual consumption patterns, enable forecasting and budgeting, and produce a range of reports from the data. Another way of tracking performance is by periodically utilizing ENERGY STAR®'s **Portfolio Manager**. Portfolio Manager is described at www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager and in Section 2, Step 2 of this guide.

Below are descriptions of several utility management software packages:

Energy Watchdog: Energy Watchdog is an on-line interactive utility bill auditing, tracking, analysis and reporting service. The program allows users to enter their monthly utility bill information into the system. Available features include reports and advice generated by the software that will help find opportunities to reduce utility use and cost.

Utilivision, Inc, 877-564-7554, www.energywatchdog.com/index.php

School Dude: School Dude provides web-native operations management solutions designed for educational professionals. In addition to utility tracking, their software products cover a wide range of district management needs including inventory, work order management, and facility use scheduling. Their UtilityDirect service is an online utility management and reporting tool that audits, tracks and analyzes utility consumption and costs to identify savings opportunities. It tracks and monitors bills, allows cost comparisons between buildings and generates reports.

School Dude, 877-868-DUDE (3833), www.schooldude.com/

Utility Manager: This is an integrated Software Solution that provides a comprehensive set of applications. It is a comprehensive package that combines bill management, interval data, utility accounting, and contract management in order to identify unique savings opportunities and verify the success of cost reduction programs. They can also manage procurement of utilities and install submeters that feed data directly into their software. Several versions of the software and levels of service are available.

Save More Resources, 1-866-854-7283, www.savemorerresources.com/

Some energy service companies (ESCOs) also provide proprietary utility management applications, which are mainly web-based. These will be provided as an option when an ESCO performs work under a performance contract (EPC) and may be available outside of an EPC agreement.

Utility Tracking Forms and Spreadsheets

On the pages that follow are examples of spreadsheets that can be downloaded from the NEED website at www.need.org/EnergyManagement to track natural gas and electricity consumption and to record historical data in order to set baselines. Enter the information from utility bills into these spreadsheets.

ELECTRICITY USAGE TRACKING FORMS

FOR EACH ACCOUNT OR METER:

	ACCOUNT INFORMATION			
	ACCOUNT#	LOCATION:		
	Usage - kWh	Cost	Demand - kW	Cost
January				
February				
March				
April				
May				
June				
July				
August				
September				
October				
November				
December				
TOTALS				

ANNUAL TOTALS FOR ALL ACCOUNTS OR METERS:

ACCOUNT #	USAGE - kWh	COST	DEMAND - kW	COST
GRAND TOTALS				

NATURAL GAS USAGE TRACKING FORMS

FOR EACH ACCOUNT OR METER:

ACCOUNT INFORMATION		
ACCOUNT#		
LOCATION:		
	Usage - therm	Cost
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		
TOTALS		

ANNUAL TOTALS FOR ALL ACCOUNTS OR METERS:

ACCOUNT #	USAGE - therm	COST
GRAND TOTALS		

Appendix C. School Energy Survey Resources & Forms

Walkthrough surveys are necessary to get the full picture of energy consumption in your facilities. The walkthrough can be accomplished by O&M staff, other trained staff, and even students. The walkthrough survey should be seen as a periodic task rather than a one-time event. As buildings, equipment and cultures change, it will be necessary to re-visit the buildings to see how energy use patterns have changed. Be sure to survey your buildings during off hours. That way you will know how energy is being used and wasted at night, after school, and on weekends.

The forms provided on the following pages allow for data collection on all building systems and are designed for data that is easily collected through observation or simple measurements using basic equipment. Forms designed for student use are provided in NEED's **Monitoring and Mentoring** and **Learning and Conserving** materials.

The forms are:

Energy-Related Behaviors Observation Form: Used by staff or students to record actions or conditions they see that impact energy consumption. Noted conditions can be either negative or positive and should include recommendations for action.

Lighting Survey: Used to record lighting conditions. A light meter is required in order to complete the form. Using this form along with the included Recommended Light Levels sheet will let you know if spaces are over lit or under lit. The Recommended Light Levels are only a guide and recommendations are from the American Society of Illumination Engineers. Many states and districts have adapted these guidelines as policy. Your district or state education department may have different requirements for light levels. If so, those levels should be used when making decisions about adjusting light levels.

Electric Appliance Survey: The best way to determine wattage is to meter the appliance (watt meters are described later in this section). For equipment that cycles on and off such as refrigeration equipment, air conditioners, and computers, it is best to meter over time. Meter the appliance for at least one hour (There is no need to fill in the data for watts, hrs/week, or hrs/year in this case). Use the following formula to determine kWh/year:

$$\text{kWh/Time (in hours decimal)} \times \text{Hours/Year Operated} = \text{kWh/Year}$$

Multiply by your electricity rate to determine the annual operating cost

Building Shell Survey: Can be used to record information about the condition of doors, windows, and other building shell components

Room Survey: This form takes a different approach. Instead of focusing on a specific energy use, building-wide, this form can be used to gather information about all energy use in a particular space. While the form does not provide as much detail, this approach may be more effective for your situation.

Recommended Light Levels: These recommendations are from the American Society of Illumination Engineers and serve as a guideline. Many states and districts have adapted these guidelines as policy. IMPORTANT: As mentioned above, the Recommended Light Levels sheet is a guide only. Your district or state education department may have different requirements for light levels. If so, those levels should be used when making decisions about adjusting light levels.

BEHAVIOR OBSERVATION FORM

MONITOR: _____

DATE	TIME	LOCATION	BEHAVIOR OBSERVED	RECOMMENDED ACTION

LIGHTING SURVEY

DATE: _____ AUDITOR: _____

TIME	LOCATION	OCCUPIED Y/N	LIGHTS ON? ALL/SOME/NONE	FIXTURE DESCRIPTION	CONTROLS DESCRIPTION	DAYLIGHTING OPPORTUNITIES	LIGHT METER READING	COMMENTS

ELECTRICAL DEVICE & APPLIANCE SURVEY

DATE: _____ AUDITOR: _____

LOCATION	DEVICE OR APPLIANCE	IN USE Y/N	WATTAGE	HOURS ON PER WEEK	WEEKS USED PER YEAR	kWh PER YEAR	COST YEAR	COMMENTS

BUILDING SHELL SURVEY

DATE: _____

AUDITOR: _____

LOCATION	EXTERIOR DOORS & WINDOWS	OTHER SHELL COMPONENTS	RELATIVE HUMIDITY	TEMPERATURE	RECOMMENDED ACTION

ROOM SURVEY

DATE: _____

AUDITOR: _____

ROOM: _____

GENERAL INFORMATION:

Indoor Temp: _____ Outdoor Temp: _____

Indoor RH: _____ Outdoor RH: _____

Room Currently Occupied? _____

HVAC:

Thermostat Setting (if applicable): _____

Hot Water Temperature: _____

Observations on Heating/Cooling Distribution:

BUILDING SHELL:

Drafts or Cold Spots?

Condition of Exterior Doors & Windows:

Observations on Ventilation:

Observations on Other Building Shell Components:

LIGHTING:

Lights On? _____ Light Meter Reading: _____

Fixture Descriptions:

Observations on Daylighting:

Controls Descriptions:

DEVICES & APPLIANCES:

Computers: _____ # Computers On: _____ # Computers In Use: _____

Screensavers Enabled? # yes _____ # no _____

Stand-by Mode Enabled? # yes _____ # no _____

Name of Device - Check If On ✓

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

OVERALL RECOMMENDATIONS (continue on back if necessary):

Recommended Light Levels

Below is a list of recommended illumination levels for school locations in footcandles.

AREA	FOOTCANDLES
Classrooms-general	50-75
Classrooms-art	50-75
Classrooms-computer	50-75
Classrooms-drafting	75-100
Classrooms-sewing	75-100
Labs-general	50-75
Labs-demonstrations	100-150
Auditorium seating areas	10-15
Auditorium concerts on stage	50-75
Kitchens	50-75
Cashiers	20-30
Dishwashing areas	20-30
Dining areas	10-20
Corridors & stairwells-elementary	10-15
Corridors & stairwells-middle	20-30
Corridors & stairwells-high	20-30
Gymnasiums	20-30
Media centers	50-75
Offices	75-100
Teacher workrooms	30-50
Conference rooms	30-50
Washrooms	20-30
Building exteriors & parking lots	1-2

Basic Energy Auditing Equipment

When conducting walkthrough audits, some simple equipment can be used to gather data about your buildings that is not available through direct observation. Below is a list of recommended equipment.

DEVICE	MEASUREMENTS	COMMENTS
Digital Immersion Thermometer	water temperature	Included in NEED Energy Management Kits. Inexpensive and readily available. Call NEED for supplier.
Digital Hygrometer/ Thermometer	indoor/outdoor temperature and relative humidity	Included in NEED Energy Management Kits. Inexpensive and readily available. Call NEED for supplier.
Light Meter	light levels in footcandles	Included in NEED Energy Management Kits. Expensive but readily available. Call NEED for supplier.
Plug-In Watt Meter	consumption of devices in kW, kWh, V, A, power factor	Included in NEED Energy Management Kits. Moderately expensive but readily available. Call NEED for supplier.
Smoke Pencil	reveals areas of air leakage	Device that emits a chemical smoke when squeezed. Available through Energy Federation: www.efi.org
Digital Camera	graphic record of observations	Useful for recording building observations and making presentations of findings.
OPTIONAL EQUIPMENT		
Infrared Thermometer	temperature of surfaces	Uses laser technology to record temperature of a surface from a distance. Can detect hidden air paths and help determine thermal properties of buildings.
The Energy Detective	energy consumption (kW), kWh, energy cost, voltage, peak demand	Connects to electrical panel and sends data wirelessly to a receiving display unit. Can measure consumption of a single circuit or an entire building.
Dataloggers	all energy-related consumption data and indoor air quality data	These devices gather data over time that can be uploaded to personal computers. Helpful for documenting trends in buildings related to temperature, humidity, light levels, etc. Datalogger Store: www.microdaq.com

Appendix D: NEED Resources for Students & Teachers

NEED Energy Curriculum

The NEED Program includes innovative K–12 educational materials, teacher and student training programs, evaluation, and recognition. NEED materials and training conferences are designed to provide comprehensive, objective information about energy production and consumption and the major energy sources—how they are used and their impact on the environment, economy, and society. The program emphasizes the development of critical thinking and problem solving skills using hands-on activities that encourage students to consider the trade-offs inherent in energy use. NEED materials have been designed to meet the needs of teachers and students, and are correlated to the National Science Education Content Standards and many state standards. Activities are available at all grade levels—from kindergarten to 12th grade—and incorporate NEED's *Kids Teaching Kids* approach to education by encouraging students to teach others. The NEED Project has a Teacher Advisory Board to ensure that all curriculum materials are objective, up-to-date, scientifically accurate, and meet the requirements of national and state standards.

NEED also publishes two newsletters. Energy Exchange is published four times a year to keep teachers and sponsors informed about new curriculum materials, current energy issues and opportunities available for teachers and students. Career Currents is published four times a year to provide students with information about a variety of careers in the energy industry. The newsletters are distributed to all NEED members, partners and sponsors, and are available in PDF format on the NEED website, www.NEED.org.

NEED works with school districts and teachers across the country to design and implement individualized energy programs to meet their education goals and objectives. In many areas, NEED materials are incorporated into the formal curriculum at many grade levels. NEED has the flexibility to tailor programs to meet the specific requirements of individual states, schools districts, and teachers.

The diagram below gives an overview of the energy curriculum available through The NEED Project. A description of each unit may be found in the on-line catalog at www.need.org/needpdf/Catalog.pdf

(BS = Blueprint for Success, GI = Games and Icebreakers, PA = Projects and Activities)

BASIC NEED UNITS	BASIC PRIMARY UNIT (K-4)	BASIC ELEMENTARY UNIT (4-6)	BASIC INTERMEDIATE UNIT (6-8)	BASIC SECONDARY UNIT (8-12)
PRE-EVALUATION	Energy Pre-Polls (BS)			
STEP ONE SCIENCE OF ENERGY	Primary Science of Energy Exploring Magnets	EnergyWorks and/or Elementary Science of Energy	EnergyWorks and/or Elementary/Secondary Science of Energy	Secondary Science of Energy
STEP TWO SOURCES OF ENERGY	Primary Chants (GI)	Energy Round-up (GI) Energy in the Balance	Transparent Energy Debate Game	Transparent Energy Mission Possible
STEP THREE ELECTRICITY ELECTRIC POWER	Energy Infobooks & Activities			
		ElectroWorks	ElectroWorks Current Energy Affair	Mission Possible Current Energy Affair
STEP FOUR TRANSPORTATION	Primary Stories	Transportation Fuels Curriculum		
STEP FIVE CONSERVATION EFFICIENCY	Saving Energy FlipBook Building Buddies Today in Energy	Monitoring/Mentoring Energy Wasters (GI)	Learning/Conserving Energy Wasters (GI)	Learning/Conserving
	Energy Conservation Contract or Saving Energy Expo			
STEP SIX SYNTHESIS REINFORCEMENT	Primary Stories and More	Energy Flows Rock Performances	Energy Flows Rock Performances	Energy Flows Debate Game
	Energy Jeopardy			
STEP SEVEN EVALUATION	Energy Post-Polls (BS) Online Question Bank			
STEP EIGHT RECOGNITION	Youth Awards Program (PA)			

NEED Energy Management Curriculum

NEED provides a series of age-appropriate curricula designed to promote energy conservation and efficiency in schools. All activities are correlated to the National Science Education Standards.

Saving Energy at Home & School, Time varies, Grade Level: K-2

Introduces students to concepts of energy use and saving energy with a flipbook, worksheets, and activities.

Building Buddies, Time: 5 class periods & ongoing, Grade Level: 2-4

Introduces students to the concepts of energy use and conservation, beginning with activities focused on home energy use and extending to school energy use and conservation. Companion kit included.

Monitoring and Mentoring, Time: 5 class periods & ongoing, Grade Level 4-6

Introduces students to methods of measuring energy usage, determining costs, and quantifying environmental effects through a series of hands-on activities. Companion kit included.

Learning and Conserving, Time: 5 class periods & ongoing, Grade Level: 7-12

Secondary students learn about energy consumption and conservation, conduct surveys of school energy usage and develop a school energy management plan. Companion kit included.

School Energy Survey

Students conduct a school energy audit and develop a comprehensive energy management plan.

CURRICULUM	TOPICS COVERED	SAMPLE ACTIVITIES	SKILLS DEVELOPED
Saving Energy at Home & School (K-2)	sources of energy uses of energy saving energy trash and energy	flipbook for teachers to read, student worksheets, simple monitoring of weather and energy consumption	language arts, science, math, listening, critical thinking, observation
Building Buddies (2-4)	sources of energy energy consumption at home & school energy conservation and efficiency	monitor weather conditions, patrol school for energy conservation behaviors, record & evaluate behaviors	language arts, science, math, critical thinking, observation, comparison & contrast, recording data, cooperative learning
Monitoring & Mentoring (4-6)	energy consumption, economic and environmental effects of using energy, conservation and efficiency	explore insulation & conduction, explore lighting, learn to read utility meters, EnergyGuide labels, and nameplates, survey and monitor school energy consumption, teach others	language arts, science, math, critical thinking, cooperative learning, forming hypotheses, observation, recording & interpreting data, comparison & contrast, public speaking, using tools to gather data, data analysis
Learning & Conserving (7-12)	energy consumption, environmental & economic impacts, efficiency and conservation	explore lighting, learn to read utility meters, EnergyGuide labels, and nameplates, calculate payback periods, survey school energy consumption, develop basic school energy management plan	language arts, science, math, cooperative learning, critical thinking, public speaking, technology, using tools to gather data, data analysis
School Energy Survey (7-12)	energy consumption, conservation, and efficiency	survey school energy consumption and develop comprehensive school energy management plan	science, math, cooperative learning, critical thinking, technology, using tools to gather data, data analysis

Additional Educational Resources

National Energy Education Development Project

Comprehensive, hands-on K-12 energy curriculum.

www.need.org

Energy Information Administration Kid's Page

Provides games, activities, and informational pages on all areas of energy.

<http://www.eia.doe.gov/kids/>

Energy Information Administration (US DOE)

www.eia.doe.gov

US Environmental Protection Agency

www.epa.gov/epahome/educational.htm

Howstuffworks.com:

Provides pages related to explaining how devices and processes work. Includes extensive resources related to energy technologies.

www.howstuffworks.com

Kentucky NEED Project

Has developed several guides for student-led energy campaigns, including the Energy WISE Program.

Contact: Karen Reagor, Executive Director

PO Box 176055

Covington, KY 41017

Tel: (859) 578-0312

Fax: (859) 578-0316

Email: kreagor@need.org

Web: www.need.org/states/kentucky

Student Forms

On the following pages are two forms that students can use when monitoring energy use in their school.

Energy Monitoring Form: Allows students to gather data on building energy use over time. Designed in a monthly format, the form utilizes a lettered key system to identify energy-wasting conditions found in a given space.

Energy Smart Classroom Calendar: This form is designed in a weekly format and serves as a daily checklist for a student who is monitoring energy in their classroom.

The following forms provided by Kenton County School District (KY) Energy WISE Program

Secret Audit Form: The Secret Audit patrol should be done in before a student-led awareness campaign begins. Use this form when patrolling the school. This approach will allow you to see what the energy habits are in your school and create an energy habit baseline.

Patrol Record: Another format for gathering data about building energy use. The same format as the secret audit. For use after the awareness campaign has begun.

Shut Down Checklists: Can be used by students to monitor whether equipment is being shut down for breaks. Several forms provided for various types of school breaks.

Patrol Record Summary Report: Can be used to summarize a year's worth of patrol findings.

Classroom Checklist: Can be provided to classrooms in your building to let them know what will be monitored by the patrols.

Door Hangars: These can be used to provide feedback to rooms that are visited by the student patrols.

For the month of

BS - Before School
MM - Mid Morning
LT - Lunch Time
AS - After School

C- = Computers On, Room Unoccupied
C+ = Computers Off When Not In Use
D- = Door Open
D+ = Door Closed
L- = Light On, Room Unoccupied
L+ = Lights Off

[illegible]

ENERGYSMART CLASSROOM CALENDAR

WEEK OF: _____

ENERGY MONITOR: _____

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
WEATHER: Outside Temperature: AM: ____F ____C PM: ____F ____C Inside Temperature: AM: ____F ____C PM: ____F ____C	WEATHER: Outside Temperature: AM: ____F ____C PM: ____F ____C Inside Temperature: AM: ____F ____C PM: ____F ____C	WEATHER: Outside Temperature: AM: ____F ____C PM: ____F ____C Inside Temperature: AM: ____F ____C PM: ____F ____C	WEATHER: Outside Temperature: AM: ____F ____C PM: ____F ____C Inside Temperature: AM: ____F ____C PM: ____F ____C	WEATHER: Outside Temperature: AM: ____F ____C PM: ____F ____C Inside Temperature: AM: ____F ____C PM: ____F ____C
LIGHTS OUT: ____ Before School ____ After School ____ AM Recess ____ PM Recess ____ Lunch ____ Door Closed ____ Computers OFF if not in use	LIGHTS OUT: ____ Before School ____ After School ____ AM Recess ____ PM Recess ____ Lunch ____ Door Closed ____ Computers OFF if not in use	LIGHTS OUT: ____ Before School ____ After School ____ AM Recess ____ PM Recess ____ Lunch ____ Door Closed ____ Computers OFF if not in use	LIGHTS OUT: ____ Before School ____ After School ____ AM Recess ____ PM Recess ____ Lunch ____ Door Closed ____ Computers OFF if not in use	LIGHTS OUT: ____ Before School ____ After School ____ AM Recess ____ PM Recess ____ Lunch ____ Door Closed ____ Computers OFF if not in use
END OF DAY: ____ Lights Out ____ Chairs Up ____ Trash Picked Up ____ Door Locked ____ Equipment OFF	END OF DAY: ____ Lights Out ____ Chairs Up ____ Trash Picked Up ____ Door Locked ____ Equipment OFF	END OF DAY: ____ Lights Out ____ Chairs Up ____ Trash Picked Up ____ Door Locked ____ Equipment OFF	END OF DAY: ____ Lights Out ____ Chairs Up ____ Trash Picked Up ____ Door Locked ____ Equipment OFF	END OF DAY: ____ Lights Out ____ Chairs Up ____ Trash Picked Up ____ Door Locked ____ Equipment OFF
BONUS: ____ Lights were off when sun could provide adequate light. ____ Blinds were closed to reduce heat from the sun on warmer days ____ Blinds were open to admit heat from the sun on cooler days ____ Vents were unobstructed ____ Room was arranged for best energy usage ____ Other:	BONUS: ____ Lights were off when sun could provide adequate light. ____ Blinds were closed to reduce heat from the sun on warmer days ____ Blinds were open to admit heat from the sun on cooler days ____ Vents were unobstructed ____ Room was arranged for best energy usage ____ Other:	BONUS: ____ Lights were off when sun could provide adequate light. ____ Blinds were closed to reduce heat from the sun on warmer days ____ Blinds were open to admit heat from the sun on cooler days ____ Vents were unobstructed ____ Room was arranged for best energy usage ____ Other:	BONUS: ____ Lights were off when sun could provide adequate light. ____ Blinds were closed to reduce heat from the sun on warmer days ____ Blinds were open to admit heat from the sun on cooler days ____ Vents were unobstructed ____ Room was arranged for best energy usage ____ Other:	BONUS: ____ Lights were off when sun could provide adequate light. ____ Blinds were closed to reduce heat from the sun on warmer days ____ Blinds were open to admit heat from the sun on cooler days ____ Vents were unobstructed ____ Room was arranged for best energy usage ____ Other:

BS = Before School
LR = Lunch/Recess
AS = After School

✓ = on/in use
0 = no energy in use
X = energy in use/no occupants

[illegible]

BS = Before School
LR = Lunch/Recess
AS = After School

✓ = on/in use
0 = no energy in use
X = energy in use/no occupants

[illegible]

PATROL RECORD SUMMARY REPORT

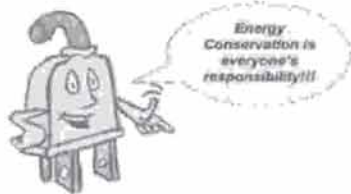
BS = Before School
LR = Lunch/Recess
AS = After School

√ = on/in use
0 = no energy in use
X = energy in use/no occupants

MONTHLY TOTALS	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY
Record Key	√ 0 X	√ 0 X	√ 0 X	√ 0 X	√ 0 X	√ 0 X	√ 0 X	√ 0 X	√ 0 X
CLASSROOM									
BS									
LR									
AS									
NON-CLASS ROOM									
BS									
LR									
AS									

How to complete this form:

- Gather all of your monthly Energy Wise Patrol Logs.
- Beginning with your September Patrol Logs,
 - Count how many classrooms patrolled during BS, LR, and AS have √. Write those numbers on this Summary Report in the √ column for September.
 - Count how many classrooms patrolled during BS, LR, and AS have 0. Write those numbers on this Summary Report in the 0 column for September.
 - Count how many classrooms patrolled during BS, LR, and AS have X. Write those numbers on this Summary Report in the X column for September.
 - Do the same for non-class rooms patrolled.
- Repeat the steps in #2 for each month.



SCHOOL ENERGY SHUT DOWN CHECKLIST

(Long Weekends)

SCHOOL: _____

DATE: _____ TIME: _____

CHECKER: _____

	DONE
Blinds closed.	
Office & classroom computer monitors, printers, scanners, VCRs, TVs, etc. SHUT DOWN (no green lights). (Does not apply to LAN servers & cafeteria computers.)	
All interior lights TURNED OFF in unoccupied areas.	
All kitchen exhaust & ceiling fans OFF except where needed.	
All home economics appliances OFF except refrigerators.	
All exterior lights timed to turn off during daylight hours.	
Check & report any water fixtures that leak or run water constantly.	
COMMENTS:	

Place completed form in your Energy Wise notebook!

Kenton County School District, Kentucky

2007-2008



SCHOOL ENERGY SHUT DOWN CHECKLIST

(Winter Break)

SCHOOL: _____

DATE: _____ TIME: _____

CHECKER: _____

STATUS	DONE
All refrigerators, personal and shared staff, should be cleaned out, unplugged and door propped open. Exception: Food Service Refrigerators.	
Carefully verify the accuracy of the School and Community Use Schedule over the break. Some groups may not meet over the scheduled break. If there will be no actual activities over break, please notify Energy Management to schedule the building as UNOCCUPIED during this time.	
All kitchen exhaust & ceiling fans OFF except when needed.	
Check thermostat set point: Maximum heating level - 68 degrees.	
All interior lights OFF in unoccupied areas.	
Blinds closed.	
Office & classroom computer monitors, printers, scanners, VCRs, TVs, etc. SHUT DOWN (no green lights). (Does not apply to LAN servers & cafeteria computers.)	
Check & report any water fixtures that leak or run water constantly.	
All water fountains unplugged except one.	
All other unnecessary equipment TURNED OFF.	
All home economics appliances TURNED OFF including refrigerators (clean and empty before leaving to avoid safety/health hazard from possible spoiled food.)	

Notes/Observations:

Place completed form in your Energy Wise notebook!



SCHOOL ENERGY SHUT DOWN CHECKLIST

(Spring Break)

SCHOOL: _____

DATE: _____ TIME: _____

CHECKER: _____

STATUS	DONE
All refrigerators, personal and shared staff, should be cleaned out, unplugged and door propped open. Exception: Food Service Refrigerators.	
Carefully verify the accuracy of the School and Community Use Schedule over the break. Some groups may not meet over the scheduled break. If there will be no actual activities over break, please notify Energy Management to schedule the building as UNOCCUPIED during this time.	
All kitchen exhaust & ceiling fans OFF except when needed.	
Check thermostat set point: Minimum cooling level - 74 degrees.	
All interior lights OFF in unoccupied areas.	
Blinds closed.	
Office & classroom computer monitors, printers, scanners, VCRs, TVs, etc. SHUT DOWN (no green lights). (Does not apply to LAN servers & cafeteria computers.)	
Check & report any water fixtures that leak or run water constantly.	
All water fountains unplugged except one.	
All other unnecessary equipment TURNED OFF.	
All home economics appliances TURNED OFF including refrigerators (clean and empty before leaving to avoid safety/health hazard from possible spoiled food.)	

Notes/Observations:

Place completed form in your Energy Wise notebook!



SCHOOL ENERGY SHUT DOWN CHECKLIST

(Summer Break)

SCHOOL: _____

DATE: _____ TIME: _____

CHECKER: _____

STATUS	DONE
All refrigerators, personal and shared staff, should be cleaned out, unplugged and door propped open. Exception: Food Service Refrigerators.	
Carefully verify the accuracy of the School and Community Use Schedule over the break. Some groups may not meet over the scheduled break. If there will be no actual activities over break, please notify Energy Management to schedule the building as UNOCCUPIED during this time.	
All kitchen exhaust & ceiling fans OFF except when needed.	
Check thermostat set point: Minimum cooling level - 74 degrees.	
All interior lights OFF in unoccupied areas.	
Blinds closed.	
Office & classroom computer monitors, printers, scanners, VCRs, TVs, etc. SHUT DOWN (no green lights). (Does not apply to LAN servers & cafeteria computers.)	
Check & report any water fixtures that leak or run water constantly.	
All water fountains unplugged except one.	
All other unnecessary equipment TURNED OFF.	
All home economics appliances TURNED OFF including refrigerators (clean and empty before leaving to avoid safety/health hazard from possible spoiled food.)	
Check and reset all time clocks for security and parking lot lighting.	
All animals & plants removed from classrooms including aquariums.	
Notes/Observations:	

Place completed form in your Energy Wise notebook!

Kenton County School District, Kentucky

2007-2008

Classroom Checklist



Lights Out

Before school
After school
Recess
Lunch



Computer monitors & printers off

When not in use



Personal appliances off

When not in use



Doors closed

During class
When room is unoccupied



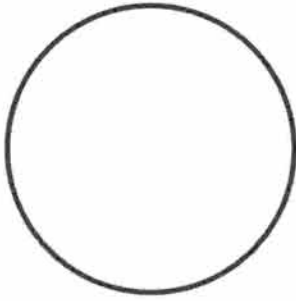
Windows closed

When heating or cooling on



WISE GUY says . . .

Lights off when sun provides enough light
Blinds closed to reduce heat from sun on warmer days
Blinds open to admit heat from sun on cooler days
Vents unobstructed so heating and cooling can freely enter room
Room arranged for best energy usage
Thermostat - no electronic equipment within five feet



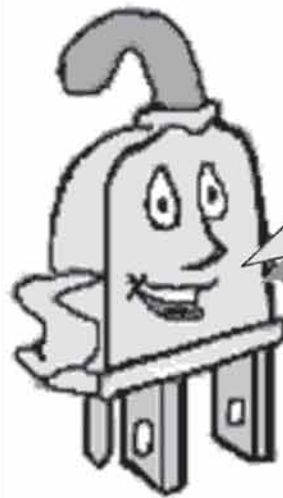
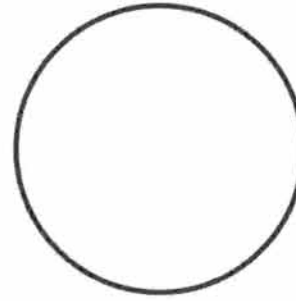
Thank you
for saving
energy!

Congratulations!

The Energy Team stopped by.
Here's what they found.

YES NO

- | | | |
|--------------------------|--------------------------|-------------------------------------|
| ☐ | ☐ | Classroom lights off. |
| ☐ | ☐ | Closet lights off. |
| ☐ | ☐ | Computer monitors off. |
| ☐ | ☐ | Printers off. |
| ☐ | ☐ | Ventilation units obstruction-free. |
| ☐ | ☐ | Personal appliances off. |
| ☐ | ☐ | Doors closed. |
| ☐ | ☐ | Windows closed. |



Thank you
for saving
energy!

You're Getting There!

The Energy Team stopped by.
Here's what they found.

YES NO

- | | | |
|--------------------------|--------------------------|-------------------------------------|
| ☐ | ☐ | Classroom lights off. |
| ☐ | ☐ | Closet lights off. |
| ☐ | ☐ | Computer monitors off. |
| ☐ | ☐ | Printers off. |
| ☐ | ☐ | Ventilation units obstruction-free. |
| ☐ | ☐ | Personal appliances off. |
| ☐ | ☐ | Doors closed. |
| ☐ | ☐ | Windows closed. |

Appendix E: Operations & Maintenance Resources

ORGANIZATIONS AND PROGRAMS:

The Council of Educational Facility Planners

www.cefpi.org

Energy Efficiency and Renewable Energy (US DOE)

<http://www.eere.energy.gov/buildings/>

ENERGY STAR for Schools (US EPA)

www.energystar.gov

Sustainable Buildings Industry Council

www.SBICouncil.org

US Green Building Council

www.usgbc.org

Portland Energy Conservation, Inc.

www.peci.org/library.htm

Building Commissioning Association

www.bcxa.org

This site contains a searchable directory of BCA members. BCA members include firms and individuals that provide commissioning services for new construction and existing buildings and who ascribe to the BCA's *Building Commissioning Attributes*, which defines BCA's criteria for quality services and conduct.

Council for Educational Facility Planners

www.cefpi.org

CEFPI is an advocate for excellence in student learning environments. It is a professional association whose sole mission is improving the places where children learn. CEFPI members are individuals, institutions and corporations who are actively involved in planning, designing, building, equipping and maintaining schools.

Energy Services Coalition

www.escperform.org

The Energy Services Coalition (ESC) is a non-profit organization for utilizing performance contracting to achieve greater energy efficiency. Performance contracting allows schools to enter into a partnership with a private energy service company (ESCO) where the school pays for energy improvements through their actual savings in energy costs. The ESC website contains information on performance contracting, case studies, and sample contracts and requests for proposals.

National Clearinghouse for Educational Facilities

www.edfacilities.org

This comprehensive website provides over 140 information-packed resource lists on planning, finance, design, construction, and maintenance issues that are updated frequently. The site also contains a news section, a calendar of events, a gallery of award-winning school designs, and monthly construction data from F.W. Dodge.

The Alliance to Save Energy's Green Schools

www.ase.org/greenschools

The ASE Green Schools program encourages schools to save energy through facility retrofits, maintenance and operations procedures, and improved user behavior patterns. The Green School website features an abundance of energy resources for school facility planners, educators and administrators.

ONLINE TOOLS AND RESOURCES:

Energy Star Buildings

www.energystar.gov/index.cfm?c=business.bus_index.

This site offers extensive resources for energy efficiency in new construction or existing facilities. Here are a few examples:

- Target Finder: This tool helps you monitor your design's energy performance and evaluate the cost effectiveness of energy efficiency measures associated with the building design.
- Portfolio Manager: An on-line tool that helps you benchmark and track energy consumption and performance in your buildings
- Designed to Earn the ENERGY STAR: Architects use Target Finder to verify that their design is intended to provide clients with a building that will earn the ENERGY STAR.
- Energy Star 10% Challenge: Provides steps to greater energy efficiency and cost savings, with the goal of improving efficiency of buildings by 10% or more.

Montgomery County Public Schools

www.mcps.k12.md.us/departments/facilities/greenschoolsfocus/index.shtm

This district has a progressive energy management program that includes an incentive program for students and teachers (SERT) that is expected to return more than twice its annual cost in new savings, according to their 2007 Resource Conservation Plan.

PUBLICATIONS:

School District Energy Manual

Published by the Association of School Business Officials Published 1998, 140 pages, ISBN #0-9101-7074-6 * \$43.00 paperback * \$34.40 for ASBO Members.

This is one of the most practical guides available on the subject. It includes all of the procedures, checklists and forms school officials need to save their school district thousands of dollars in energy costs. Topics include the business administrator's role in energy management, operations and maintenance audits for energy conservation, as well as detailed analyses of HVAC systems and maintenance schedules, building life cycle costs, and more. The guidebook contains simple, straightforward worksheets any school district could implement immediately.

<http://asbointl.org>

School Operations and Maintenance: Best Practices for Controlling Energy Costs

Prepared by Princeton Energy Resources International for the US Department of Energy Published 2004, 132 pages. Available on line in PDF format.

Subtitled A Guidebook for K-12 School System Business Officers and Facilities Managers, it offers strategies for maintaining facilities, as well as opportunities for reducing energy costs and increasing energy efficiency at existing schools. Detailed and practical guidance is given on how K-12 school districts can plan and implement enhancements to their current O&M programs while reducing energy costs up to 20 percent. The manual was co-sponsored by the Association of School Business Officials International, the Higher Education Facilities Managers and the National School Plant Administrators Association.

www.energysmartschools.gov/attachments/SolutionCenter/SchoolEnergyGuidebookv2.pdf

Washington State University Energy Program Energy Audit Workbook

Pages 29-52 of this manual contain a building audit checklist ideal for a basic energy building walk-through. The chart lists 102 potential problems, divided into categories such as building envelope, HVAC heating or HVAC cooling. Each line item also contains simple recommendations for repairing the problem. An operations and maintenance solution is offered along with energy conservation opportunities.

www.energy.wsu.edu/ftp-ep/pubs/rem/energyaudit/audit2.pdf

O&M Best Practices Series

The EPA and Department of Energy provided funding for the Portland Energy Conservation, Inc. to write an excellent series of Operation & Maintenance manuals on energy efficiency. They are FREE and can be viewed or downloaded at www.peci.org.

Fifteen O&M Best Practices for Energy-Efficient Buildings (PDF 1.1Mb)

An overview of 15 O&M best practices that building owners and managers can employ to make their buildings more energy-efficient. These best practices are divided into four major categories: management, teamwork, resources, and energy-efficient.

Tuned Up for Success (PDF 1.6Mb)

A brochure that summarizes the processes and results of the five commercial and retail facilities that participated in the Building Tune-Up Demonstration Project conducted by U.S. EPA and U.S. DOE.

Operation and Maintenance Service Contracts: Guidelines for Obtaining Best-Practice Contracts for Commercial Buildings (PDF 2.4Mb)

Frequently, building owners and managers outsource most if not all of the O&M services for their building systems. This publication provides an overview of current outsourcing trends and options.

Portable Dataloggers-Diagnostic Monitoring Tools for Energy-Efficient Building Operation (PDF 1Mb)

A review of the benefits of using portable dataloggers and criteria for selecting dataloggers.

Enhancing Energy-Efficient Operation (PDF 1.7Mb)

Significant low-cost savings in energy and staff time as well as other non-energy benefits can be realized through operation assessments and building tune-ups. The guide provides information on how to plan and orchestrate the process.

Energy Management Systems: A Practical Guide (PDF 4.4Mb)

A guidebook covering the following topics: evaluating an existing EMS; specifying and selecting a new EMS; commissioning new EMS; service contracts for EMS; strategies for optimizations; using EMS for operational diagnostics; non-energy control applications; sample control specification language; and using spreadsheets for graphing and analyzing trend data.

Putting the “O” Back in O&M Best Practices in Preventive Operations, Tracking, and Scheduling (PDF 644Kb)

This document addresses continual schedule optimization and provides staff with methods to assess day-to-day operation of major plant equipment. The document also emphasizes enhancing O&M plans to give equal weight to operational issues.

Daylighting in Schools: An Investigation into the Relationship Between Daylighting and Human Performance.

Heschong Mahone Group. 1999. Pacific Gas and Electric Company Report, on Behalf of the California Board for Energy Efficiency Third Party Program. (August 20), pp. 24-29.

An analysis by the Heschong Mahone Group studied elementary school students in districts from three different states: California, Washington, and Colorado. Although each district had different curriculums, building designs, and climates, students were found to perform significantly better on standardized tests in classrooms where windows and skylights let more daylight in the classroom.

www.pge.com/pec/daylight/valid.html

American School and University Magazine

An excellent information source for education facilities and business professionals—serving the nation's K-12 and higher-education administrators responsible for the planning, design, construction, retrofit, operations, maintenance and management of education facilities. Each issue contains a mix of features, how-to-articles, industry reports, exclusive surveys, new sections, new product introductions and case histories. Subscription is free.

<http://asumag.com/>

Appendix F: Transportation Resources

An often overlooked, but important, aspect to a school energy management plan is transportation. Since nationally buses carry 24 million students to and from school every weekday, making school transportation part of a comprehensive energy management plan is environmentally and fiscally prudent.

School Bus Toolkit

Contains materials to help introduce alternative fuel vehicles to the school bus niche market. It contains customizable presentations, contact and product lists, market and air quality reports, and case studies that can be reproduced to meet specific needs.

www.eere.energy.gov/afdc/apps/toolkit/school_bus_toolkit.html

Clean Cities Program (US DOE)

www.eere.energy.gov/cleancities/index.html

FreedomCAR and Vehicle Technologies Program (US DOE)

www.eere.energy.gov/vehiclesandfuels

Nation Renewable Energy Laboratory's Alternative Fuels Website

www.nrel.gov/vehiclesandfuels

Appendix G: Resources for High Performance Schools

Energy Design Guidelines for High Performance Schools

Developed by the National Renewable Energy Laboratory. Available for download.

www.eere.energy.gov/buildings/pdfs/29105.pdf

High Performance School Buildings Resource and Strategy Guide

Published by the Sustainable Buildings Industry Council.

www.sbicouncil.org/store/index.php

High Performance School Design Online

www.hpschooldesigntraining.com/nyserda/home.jsp

ENERGY STAR® Tools and Resources for Energy Management

www.energystar.gov/index.cfm?c=tools_resources.bus_energy_management_tools_resources

AIA Sustainable Design Policy Resource Center

This site lists tools to help define and design “green” buildings. It states “typically, buildings are designed to meet building code requirements, whereas green building design challenges designers to go beyond the codes to improve overall building performance and minimize life-cycle environmental impact and cost.” A list of tools is provided that can assist in analyzing energy use and savings in a building.

www.aia.org/static/state_local_resources/adv_sustainability/

Collaborative for High Performance Schools

This program of the California public school system features extensive information for schools interested in becoming High Performance in status. Staff training on-line courses, design guidelines, publications on design, commissioning, operations and maintenance are all available at this site.

www.chps.net

EPA Healthy School Environments

EPA Healthy School Environments web pages are intended to serve as a gateway to on-line resources to help facility managers, school administrators, architects, design engineers, school nurses, parents, teachers and staff address environmental health issues in schools.

www.epa.gov/schools

EPA Indoor Air Quality Tools for Schools

This site shows schools how to carry out a practical plan of action to improve indoor air problems at little or no cost using straightforward activities and in-house staff.

www.epa.gov/iaq/schools/toolkit.html

Greening America’s Schools: Costs and Benefits

This report is intended to answer this fundamental question: how much more do green schools cost, and is greening schools cost effective? It was conducted by Greg Kats, Managing Principal of Capital E, a national clean energy technology and green building firm.

www.cap-e.com/publications/default.cfm

High Performance Design

A free self-paced on-line training for architects and engineers specializing in sustainable design for K-12 schools. The site offers twenty-five Internet based courses in high performance school design. Each course has been approved for one (1) Learning Unit in the area of Health, Safety, and Welfare under the American Institute of Architects Continuing Education System (AIA/CES).

www.nyserda.org/hps/default.asp

Poudre School District Sustainable Design Guidelines

These guidelines present the desired performance outcomes from employing sustainable design, and suggested approaches for attaining them.

www.psdschools.org/services/operations/planningdesign/

Sustainable Building Industry Council

SBIC is a non-profit organization organized to “advance the design, affordability, energy performance, and environmental soundness of residential, institutional, and commercial buildings nationwide.” Their website contains important information for architects and builders on designing high-performance facilities.

www.sbicouncil.org

SBIC On-line High Performance Classroom

Downloadable tools that will prepare you to deliver a persuasive, consistent, authoritative presentation to any audience about high performance schools.

www.buildingmedia.com/sbic/

Whole Building Design Guide

The WBDG is a web-based portal providing government and industry practitioners with one-stop access to up-to-date information on a wide range of building-related guidance, criteria and technology from a ‘whole buildings’ perspective. Currently organized into three major categories—Design Guidance, Project Management and Operations & Maintenance—at the heart of the WBDG are Resource Pages, reductive summaries on particular topics.

www.wbdg.org/index.php

Appendix H: Sustainability Resources

EPA Sustainability Page

Provides links to resources related to water, ecosystems, and environment, the built environment, energy & the environment, and materials & toxics.

www.epa.gov/sustainability/

U.S. Department of Energy

Comprehensive sustainable building site of the U.S. Department of Energy's website.

www.sustainable.doe.gov/

State of California Division of the State Architect – Sustainable Schools

The Division of the State Architect (DSA) is committed to helping schools create high performance educational facilities that will ensure the optimal health and productivity of students and faculty. Their website provides a diverse collection of sustainable building resources including the numerous benefits, guidelines, programs, case studies, relevant publications, funding options/incentives, and plenty more.

www.sustainableschools.dgs.ca.gov/sustainableschools/

The Sustainable Schools Project

The program is designed to help schools use sustainability as an integrating context for curriculum, community partnerships, and campus practices.

www.sustainableschoolsproject.org/

Center for Ecoliteracy, Re-thinking School Lunch Program

Rethinking School Lunch builds on the premise that hands-on experience growing and preparing food is a powerful way for children to discover that healthy food tastes good, and to learn about the cycles, seasons, other processes of nature, and the relationship between the health of natural and social systems. Program includes a guide, an ongoing online essay series and downloadable model wellness policy.

www.ecoliteracy.org/programs/index.html

Healthy School Environments

The Healthy School Environments Web pages are intended to serve as a gateway to on-line resources to help facility managers, school administrators, architects, design engineers, school nurses, parents, teachers and staff address environmental health issues in schools.

<http://cfpub.epa.gov/schools/index.cfm>

Leadership in Energy and Environmental Design (LEED)

LEED is a green building rating system developed by the U.S. Green Building Council (U.S.GBC). The intent was to develop a rating system that provided a framework for measuring "how green a building is".

www.leedbuilding.org

National Clearinghouse for Educational Facilities (NCEF) - Impact of Facilities on Learning

NCEF's resource list of links, books, and journal articles examining the association between student achievement and the physical environment of school buildings and grounds.

www.edfacilities.org/rl/impact_learning.cfm

New Schools, Better Neighborhoods (NSBN)

This organization promotes the community joint use of schools by way of designing smaller school facilities that can build upon and accommodate existing community land and facilities to save on the time, money, land, and other resources used to duplicate functions elsewhere.

www.nsbns.org/

Oikos

Site includes a searchable database, called REDI, of more than 1,700 companies that offer green building products. You'll also find information on books, videos, and software related to green building and design, a product gallery of new and interesting products, useful information on sustainable design and construction, and a newsletter filled with ideas for making your building project more energy- and resource-efficient.

www.oikos.com

Rocky Mountain Institute

Rocky Mountain Institute is a nonprofit research and educational foundation with a vision across boundaries. Its mission is to foster the efficient and sustainable use of resources as a path to global security. The Institute creates, and helps individuals and the private sector to practice, new solutions to old problems-mainly by harnessing the problem-solving power of market economics and of advanced techniques for resource efficiency.

www.usgbc.org/

Savings by Design

A program that offers services and incentives to help architects and building owners raise energy performance to a top priority when planning new facilities. The program is funded by California utility customers and administered by PG&E, San Diego Gas & Electric, Southern California Edison, and Southern California Gas.

www.savingsbydesign.com/

United States Green Building Council

The Council's mission is to "accelerate the adoption of green building practices, technologies, policies, and standards." On this site, you can download the Council's Leadership in Energy and Environmental Design. (LEED) building rating system to benchmark the design, construction, and operation of high performance green buildings. Contact for the Kentucky USGBC chapter is Jeff Moneypenny, JMoneypenny@luekett-farley.com.

www.usgbc.org

OTHERS:

Center for the New American Dream

Dedicated to helping individuals and institutions reduce and shift consumption to enhance quality of life and protect the environment. More Fun, Less Stuff!!

Institute for Sustainable Communities

Works with communities in existing and emerging democracies, providing training, advice, and grants for sustainable development.

International Sustainability Indicators Network (ISIN)

A member-driven organization that provides people working on sustainability indicators with a method of communicating with and learning from each other.

NEED National Sponsors and Partners

American Association of Blacks in Energy
 American Electric Power
 American Electric Power Foundation
 American Petroleum Institute
 American Public Power Association
 American Solar Energy Society
 American Wind Energy Association
 Aramco Services Company
 Armstrong Energy Corporation
 Association of Desk & Derrick Clubs
 AWAKE
 BJ Services Company
 BP Foundation
 BP
 BP Alaska
 BP Solar
 Bureau of Land Management–
 U.S. Department of the Interior
 C&E Operators
 Cape and Islands Self Reliance
 Cape Cod Cooperative Extension
 Cape Light Compact–Massachusetts
 Center for the Advancement of Process
 Technology–College of the Mainland–TX
 Chesapeake Public Schools–VA
 Chevron
 Chevron Energy Solutions
 Citizens Gas
 ComEd
 ConEd Solutions
 Council of Great Lakes Governors–
 Regional Biomass Partnership
 Cypress-Fairbanks Independent School
 District–TX
 D&R International
 Dart Foundation
 David Sorenson
 Desk and Derrick of Roswell, NM
 Devon Energy
 Dominion
 Duke Energy Kentucky
 Duke Energy Indiana
 Duke Energy North Carolina
 Duke Energy South Carolina
 East Kentucky Power
 Energy Information Administration–
 U.S. Department of Energy
 Energy Training Solutions
 Energy and Mineral Law Foundation
 Equitable Resources
 Escambia County School District–FL
 FPL Energy Encounter–FL
 First Roswell Company
 Florida Department of Environmental
 Protection
 FMC Technologies
 Foundation for Environmental Education
 Fuel Cell Store
 Gerald Harrington, Geologist
 GlobalSantaFe
 Governors' Ethanol Coalition

Guam Energy Office
 Halliburton Foundation
 Hydril
 Hydropower Research Foundation
 Illinois Clean Energy Community Foundation
 Illinois Department of Commerce and
 Economic Opportunity
 Independent Petroleum Association of
 America
 Independent Petroleum Association of NM
 Indiana Community Action Association
 Indiana Office of Energy and Defense
 Development
 Indianapolis Power and Light
 Interstate Renewable Energy Council
 Iowa Energy Center
 Kentucky Clean Fuels Coalition
 Kentucky Office of Energy Policy
 Kentucky Oil and Gas Association
 Kentucky Propane Education & Research
 Council
 Kentucky River Properties LLC
 Kentucky Soybean Board
 Kentucky State Fair
 Keyspan
 KidWind
 Llano Land and Exploration
 Long Island Power Authority–NY
 Maine Energy Education Project
 Maine Public Service Company
 Marathon Oil Company
 Marianas Islands Energy Office
 Massachusetts Division of Energy Resources
 Michigan Energy Office
 Michigan Oil and Gas Producers Education
 Foundation
 Minerals Management Service–
 U.S. Department of the Interior
 Mississippi Development Authority–
 Energy Division
 Nabors Alaska
 Narragansett Electric–
 A National Grid Company
 New Jersey Department of Environmental
 Protection
 NASA Educator Resource Center–WV
 National Alternative Fuels Training Center–
 West Virginia University
 National Association of State Energy Officials
 National Association of State Universities and
 Land Grant Colleges
 National Biodiesel Board
 National Fuel
 National Hydrogen Association
 National Hydropower Association
 National Ocean Industries Association
 New Jersey Department of Environmental
 Protection
 New York Power Authority
 North Carolina Department of Administration–
 State Energy Office
 Northern Indiana Public Service Company–
 NIPSCO

Nebraska Public Power District
 New Mexico Oil Corporation
 New Mexico Landman's Association
 New York State Energy Research and
 Development Authority
 Noble Energy
 Nuclear Energy Institute
 Offshore Energy Center/Ocean Star/OEC
 Society
 Offshore Technology Conference
 Ohio Energy Project
 Oil & Gas Rental Services
 Pacific Gas and Electric Company
 Petroleum Equipment Suppliers Association
 Poudre School District–CO
 Puerto Rico Energy Affairs Administration
 RSA Engineering
 Renewable Fuels Association
 Roanoke Gas
 Robert Gorham
 Roswell Desk and Derrick Club
 Roswell Geological Society
 Rhode Island State Energy Office
 Saudi Aramco
 Schlumberger
 SchoolDude.com
 Sentech, Inc.
 Shell Exploration and Production
 Snohomish County Public Utility District–WA
 Society of Petroleum Engineers
 Southwest Gas
 Spring Branch Independent School District–TX
 Tennessee Department of Economic and
 Community Development
 Texas Education Service Center–Region III
 Toyota
 TransOptions, Inc.
 University of Nevada–Las Vegas
 United Illuminating Company
 Urban Options–MI
 U.S. Environmental Protection Agency
 U.S. Department of Agriculture–
 Biodiesel Education Program
 U.S. Department of Energy
 U.S. Department of Energy–
 Hydrogen, Fuel Cells and Infrastructure
 Technologies
 U.S. Fuel Cell Council
 Vectren Energy Delivery
 Virgin Islands Energy Office
 Virginia Department of Mines, Minerals and
 Energy
 Virginia Department of Education
 Virginia General Assembly
 Wake County Public Schools–NC
 Western Kentucky Science Alliance
 W. Plack Carr Company
 Xcel Energy
 Yates Petroleum