Acknowledgements

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Thanks to the Alliance to Save Energy for sharing information from their publication, *Green Schools*. Thanks to the Interstate Renewable Energy Council for sharing information from their publication, *Solar Schools*. Thanks to both organizations for their expert review of this primer.

Thanks to the Wyoming Business Council, specifically the patience and leadership of both John Nunley and Dale Hoffman. We are indebted to our Wyoming energy efficiency and renewable energy professionals and advocates who reviewed this document and provided valuable feedback, including Dennis Davis, Viron Energy; Dalton Jones, Laramie County School District Number One; and Duane Keown, University of Wyoming. Thanks also to Jerry Maurer, Executive Director of the Wyoming School Boards Association who helped us identify helpful school board officials and energy professionals currently working with Wyoming schools.

IT'S TIME TO REENERGIZE OUR SCHOOLS

A K-12 Wyoming Energy Efficiency and Renewable Energy Primer

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EXECUTIVE SUMMARY

As energy prices begin to rise again, school districts are finding it worthwhile to analyze their energy consumption. The purpose of this "primer" is to steer Wyoming school districts toward simple, proven, cost-effective energy efficient and renewable energy technologies for schools. Why? Because the less money Wyoming spends on energy, the more it has for educating our children.

Specifically, this primer was written as a supplemental tool for use by an energy efficiency and renewable energy circuit rider team in 2000. It is intended to be a quick, easy-to-read orientation to renewable energy and energy efficiency school applications. While providing useful suggestions about how to mobilize the community to advance renewable and energy efficient technologies, this primer will also help school district officials identify expert resources to assist them with building better schools. It is, more or less, a smart first step on the road to improving the quality of Wyoming schools and our children's education.

Energy efficient and renewable energy school applications are important building blocks for sustainable design. Building with these technologies not only makes economic sense over the long term, but also environmental sense. These applications require fewer natural resources, contribute less to air emissions, improve indoor air quality, and thus our health.

America's schools spend more than $6 billion each year on energy. Most building experts believe that 25 percent of that cost—or $1.5 billion annually—can be saved through better building design, widely available energy-efficient and renewable energy technologies, and improvements to operations and maintenance. Unfortunately, many Wyoming schools postpone important maintenance projects due to higher-than-expected energy costs. Nationally, it is estimated that 40 percent of school districts routinely use maintenance budgets to cover unexpected energy bills. A 1991 national estimate of deferred maintenance for public schools was more than $100 billion!

Old Schools, New Technologies...

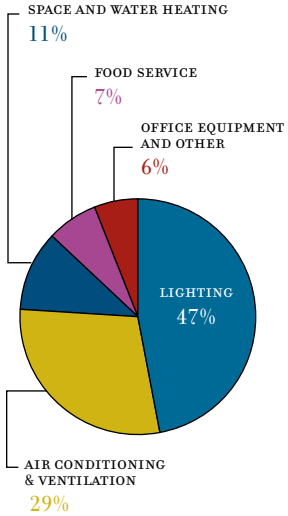
Most existing Wyoming (K-12) school buildings are at a distinct disadvantage—Wyoming children are attending school in buildings constructed in the 1950s. Thirty-one percent of U.S. schools were built before World War II, and 43 percent were built between 1950 and 1969—long before energy costs were a concern. Therefore, 74 percent of Wyoming schools probably have exceeded their 30-year life expectancy and consume more energy than is necessary. The scope of this primer is from small primary school buildings to large high school facilities.

The productivity gains attributable to better lighting and ventilation are becoming clearer thanks to recent research. For example, student test scores improved as much as 20 percent in math and 26 percent in reading as a result of maximum exposure to daylight in their classrooms, according to the Interstate Renewable Energy Council.

Rich in natural resources, Wyoming is a net exporter of all energy forms it produces (natural gas, coal, liquid fuels and electricity.) Wyoming school district administrators are generally well aware of the economic upside and downside of volatile energy prices. Administrators understand that energy efficiency and energy independence make economic sense. Cost-effective energy efficiency technologies exist now to upgrade old school facilities at minimal cost. Small investments in school energy efficiency improvements can generate huge benefits.

A well-planned energy renovation program can reduce energy use by 30 to 50 percent. Targeting lighting retrofits or new school lighting applications makes economic sense because the leading electric energy end-uses in elementary and secondary schools are lighting and HVAC (Heating, Ventilation And Cooling). *See Figure 1.* Heating energy consumption in Wyoming classrooms is generally much lower than would be expected because classrooms contain large sources of internal heat, namely people and lighting. Efficiency gains can also be realized by upgrading lighting systems, mechanical systems, controls and the building envelope (exterior of your building).

Figure 1



Annual End-Use Electricity Consumption for Educational Buildings

Climate Does Make a Difference…

Most of Wyoming enjoys low humidity, abundant sunshine and relatively inexpensive electricity. However, winter temperatures often fall below zero, and when combined with winds, can prove challenging to school administrators interested in keeping their children warm and comfortable in a fifty-year-old school building. The high average altitude of Wyoming, about 6,700 feet, ensures that temperatures remain cool for much of the school year. Mountain areas are not the only cold spots during the winter—Wyoming's valleys and basins collect the dense, cold air coming down from the mountains, making energy efficiency and comfort important goals for most school administrators.

Photo provided by the National Renewable Energy Laboratory.

School administrators in Jackson Hole, where the temperature reaches below zero on average 42 times each year, have different school design needs than school administrators in Cheyenne, where the temperature dips down that low on average only 12 times each year.

Often, school districts do not need major investments or major changes to reduce energy use. Schools can dramatically reduce energy consumption with minor changes. As the Alliance to Save Energy points out in *Green Schools: An Investment in Our Children's Future*, simple changes in energy use behavior and building operations—such as taking advantage of daylight where available, adjusting thermostats and minimizing equipment run times—can result in energy savings of up to 25 percent.

For example, the Laramie County School District Number One, the largest school district in Wyoming, simply made changes to existing processes without retrofitting any schools and has saved $1.3 million over the last three years. Says, Dalton Jones, Energy Manager for Laramie County Schools District Number One, "We achieved these savings simply by 'controlling things' better and by making sure our equipment is running efficiently. It isn't rocket science, and most school districts can find similar savings with a little work."

Wyoming is Solar Country…

While most documents address either one or the other, this is unique because we address both renewable energy and energy efficiency school applications. The value of renewable energy technologies, specifically solar energy, is significantly enhanced when used to complement energy-efficient designs and strategies. To ignore one or the other is like disregarding half of the ingredients needed for your favorite recipe. There are hundreds of schools currently using the sun for lighting, heating, and cooling.

*Advice From the Experts…*We spoke with several dozen national experts on school energy use, and they offered the following simple strategies to school administrators:

STRATEGY 1: *Artificial lighting systems are the largest consumers of energy, followed by heating, cooling, and ventilation systems, so make sure you incorporate the newest lighting technologies available—natural lighting strategies combined with well-designed artificial lighting systems can reduce lighting requirements by as much as 90 percent and total classroom energy consumption by more than 40 percent.*

STRATEGY 2: *Smaller heating, ventilation and air conditioning systems are generally better. It is better to have an appropriately-sized small motor running efficiently, than to have a large, oversized motor running inefficiently.*

STRATEGY 3: *Simple, inexpensive control systems to operate lights and heating/cooling systems are usually more cost-effective than sophisticated systems.*

STRATEGY 4: *Involve the entire school in the project. The more students and parents get involved, the better your chances of success.*

STRATEGY 5: *Once you have invested in new energy efficient and/or renewable energy equipment, scheduled maintenance is crucial to ensure that energy savings accrue and equipment life is extended.*

STRATEGY 6: *Regardless of the size of the project, always include an energy specialist on your design team. Over time it can save your school district hundreds of thousands of dollars.*

STRATEGY 7: *Formally link school administrators' pay to energy use. By requiring school administrators to follow energy use guidelines as part of their formal evaluations, energy savings are more likely to materialize. (This is already done in Laramie County School District Number One.)*

STRATEGY 8: *Invest in an inexpensive software program to help you analyze your numbers. There are numerous inexpensive software programs on the market that can help you assemble energy statistics and analyze where you can save money in the future. You do not have to spend a bunch of money to do it right.*

Trends in School Energy Use

More and more schools are expanding their hours, reducing class size, and adopting other measures to improve student performance. Some of these changes increase a school's energy consumption and costs, leaving fewer funds for books and other resources that directly affect education. Therefore, smart energy management is even more important as schools adopt new practices that can effect energy needs. The EnergySmart Schools program highlights the following trends:

THE "HOUSE" OR "CLUSTER" CONCEPT

To provide a smaller school atmosphere, many large schools are grouping subsets of students into specific areas of buildings. These clusters often have their own facilities such as laboratories for science, computers, or foreign language instruction. Cluster-based schools often have more specialty classrooms, requiring larger schools to accommodate the same number of students.

SHARED RESOURCES

Some new schools are designed so that gymnasiums, cafeterias, libraries and other areas are shared among grades or even schools. This allows for more efficient use of space, lower energy bills and lower construction costs.

YEAR-ROUND CLASSES

Schools that adopt year-round schedules are in use 15 to 30 percent more than schools with full summer breaks. In addition to expanding the time that energy systems are in use, year-round schools operate during hot summer months when cooling bills can skyrocket.

MORE INDIVIDUAL INSTRUCTION

One-on-one instruction requires private areas where the teacher and student can interact undisturbed, often in private rooms. Schools must therefore have more space to accommodate the same number of students. Larger schools require larger equipment and have more windows, doors, and walls where air and noise can leak.

COMPUTER-BASED EDUCATION

Each computer station in a classroom reduces its capacity by one to one-and-a-half students. This means that schools must be larger to serve the same number of students. Also, computer-based classrooms require extensive electrical systems, which increases the cost of construction. In addition, printers, scanners and other computer devices add to electricity consumption and increase utility bills.

SMALLER CLASS SIZE

As schools strive to reduce student-teacher ratios, they typically add classrooms rather than moving walls within existing buildings. Such expanded schools can place more demands on energy systems. If the added classrooms are modular, energy consumption may increase even more, since the average modular classroom is far less efficient than a comparable permanent classroom.

It's easy to get energy efficiency and renewable energy technologies into your school. First, consider the following steps:

What Information You Need to Get Started...

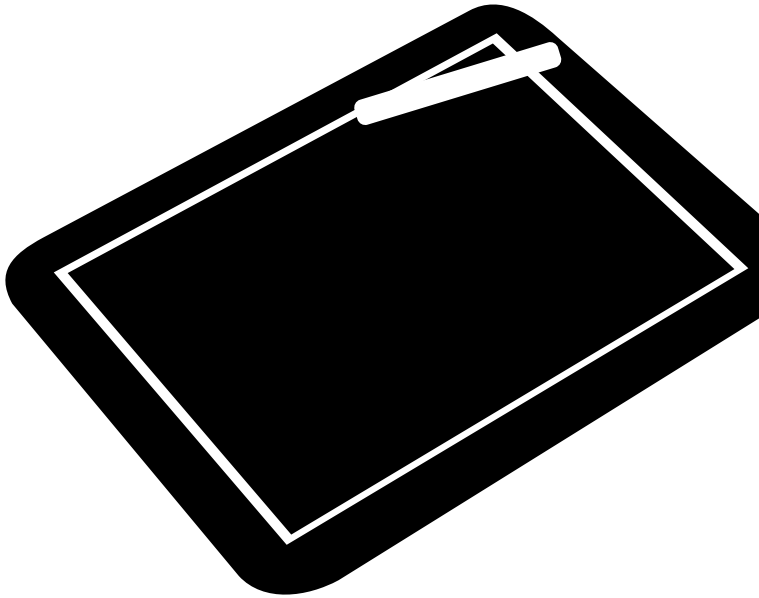
Step 1. Identify your energy efficiency and/or renewable energy "champion(s)" and set-up a "Kitchen Cabinet." Identify people who know your school system well and can provide the vision and primary drive to get your initiative started. Put together a list of five to ten people who can provide you with valuable guidance. This "Kitchen Cabinet" may be composed of technical experts, elected and appointed officials, students, teachers, principals, parents, your local utility and just about anyone else you think can help you. For example, custodians and school board officials can be especially valuable allies. The custodians know your building inside and out—and school board officials can provide important political support when you need it!

Step 2. Cultivate and build partnerships within your school and with local organizations and businesses. These partnerships can provide you with needed technical, educational, and financial resources. Building a strong partnership with your local utility makes sense, since chances are that the school district is one of their largest commercial sector customers. Enlist the support of public- and private-sector partners interested in your schools—no partner is too small or too large! (Section IV has more details on this important item)

Step 3. Match the project to your school's priorities and curriculum. You want the program to become an integral part of your school's culture, so tying it in with science, math, social studies, and economics curricula is good business. The more teachers you have involved in your program, the better. Promoting energy efficiency and renewable energy helps establish a strong link between energy and the environment. Everyone wants to protect Wyoming's environment, so make sure your curriculum shows that pollution results from the production, consumption, and disposal of energy.

Step 4. Establish your energy-use baseline, and find out what kind of energy consuming equipment you are using now. This makes it possible to measure the project's success and to identify problem areas. If you don't measure where you are now, you won't know how well you are doing later.

Step 5. Promote your program at every opportunity and encourage broad-based participation. Use your Kitchen Cabinet to help get the word out to the public. Write press releases and feature stories and get them placed in your local press. If you don't tell anyone about it, it's almost as if it didn't happen. The program is most successful when the whole school and others in the district are involved.



Cultivating and Building Your Partnerships

The Alliance to Save Energy points to the following people who can help you get started:

Local utilities and state energy offices

They are often eager to help with the technical aspects of the program. Look to them for help with cost estimates, establishing your baseline and ongoing energy consumption levels and environmental impacts. They may also be able to provide you with financial assistance for building retrofits and educational materials about energy efficiency. The Wyoming Business Council's Energy/Minerals Division (phone: 307-777-2804) has access to energy efficiency and renewable energy experts. Call them for advice.

School district facilities or buildings and grounds division

Your school district can provide energy consumption data and may also be willing to conduct a building walk-through to familiarize students and teachers with energy-use practices and features.

Building engineers and custodians

These people know the school buildings the best and can suggest and make changes in operations and maintenance routines. These changes have the greatest potential impact on energy use and cost savings.

Curriculum developers

Your school district may be willing to guide you in determining how energy efficiency and renewable energy concepts could be incorporated into existing or future educational standards.

School administrators

Administrators can help to attract attention and resources to the project. Their support is often critical in encouraging cooperation between the facilities and instructional departments.

Nearby school districts

Other districts may have similar programs in place and could serve as great resources for ideas, model programs or even joint projects.

The community, local businesses, and organizations

Help defray implementation costs and/or extend the program's educational impact through equipment donations, low-cost loans and presentations on new energy-efficient technologies.

Action Plan for Implementing Energy Conservation in Your School

Step 1. Assign Someone in Charge of Energy Efficiency.

One of the first things you can do is assign someone in charge of energy efficiency. This person should be willing to research your existing energy consuming equipment, trends and habits and be able to identify general areas for improvement. Consider paying them for their extra time spent on this task and allowing them to take time off from their existing job for this important work.

Step 2. Identify Energy-saving Measures.

This job requires identifying existing cost-effective technologies potentially applicable to your school. Call some of the organizations listed in the *Where to Get More Help* section of this primer for help with this task. Usually, your local utility will be willing to brief you on these measures free-of-charge. Since you learn about new technologies, this can be a fun job!

Step 3. Measure Actual Energy Use (Gas and Electric).

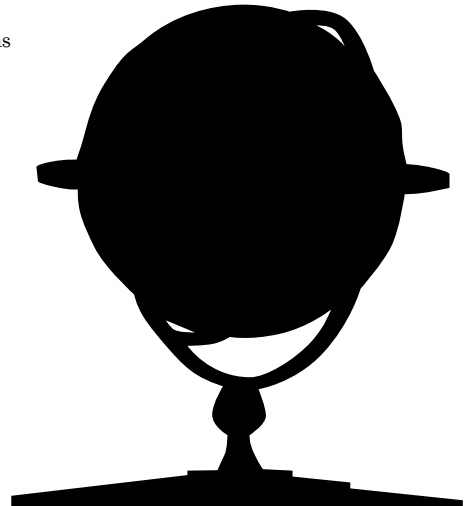
Review recent and past utility bills to see if you can identify any trends. It is far better to use the actual energy bills versus the average bills, since you can break the information down between times of the year, which is more valuable.

Step 4. Determine Required Energy Use.

Look carefully at your future energy requirements for each individual area across the school (cafeteria, gymnasium, classrooms, etc.), and determine what it will take to effectively meet them. This requires careful planning and considering the likely future uses of your school.

Step 5. Establish Quantitative Goals.

Most older schools can achieve 25 percent gains in energy efficiency with little trouble. Fifty percent gains are possible, but usually require more time, effort and front-end expense. Decide what goals are appropriate for your school, considering local politics, your climate, local building practices, indigenous resources, financial needs and other factors.



The Myths About Energy Efficiency and Schools

MYTH 1: *Energy isn't a major budget item for schools*

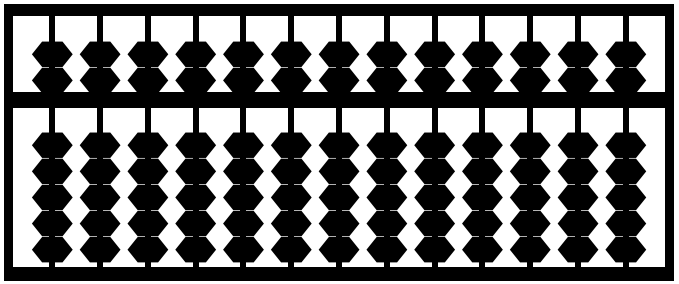
FACT: In many school districts, energy costs are second only to salaries, exceeding the cost of supplies and books.

MYTH 2: *Schools can't save much by being energy smart.*

FACT: Not so. Changes in behavior alone—such as turning off lights in unoccupied rooms and turning off computers at night and on weekends—can save an individual school thousands of dollars every year. Even vending machine lights can make a difference. The Seattle School District saved $20,000 a year by turning off the lights in its 250 vending machines.

MYTH 3: *Energy efficiency is not related to student performance.*

FACT: Evidence is growing that energy-efficient schools can provide learning environments that lead to improved student performance. If lighting quality is poor, students can't read the black board; they can't hear teachers over noise coming in through leaky walls and windows; and they can't concentrate if they're roasting or freezing in classrooms with poor temperature control. Studies have shown that daylighting—an integral part of most new energy-efficient schools—may have a positive effect on student attitudes and performance.



MYTH 4: *Energy improvements in existing buildings require major upfront investments.*

FACT: Fortunately, financing options such as energy saving performance contracts and lease-purchase programs allow schools to make improvements with little or no investment. With lease-purchase programs, schools make payments each month and own the equipment at the end of the contract period. With performance contracts, an energy services company (ESCO) pays for the energy improvements and is paid back over time through the utility bill savings the project creates. The ESCO will guarantee that savings meet or exceed annual payments to cover all project costs, usually over a seven to ten year period. If savings don't materialize, the ESCO pays the difference, not the school. To ensure that an ESCO provides the best mix of energy measures, we recommend you get an outside expert to review their proposals. Some companies provide this service for free or at a low cost for schools.

MYTH 5: *It takes more energy to turn things back on, or "warm things up," then to keep them on in the first place.*

FACT: It almost always cuts energy use, and virtually never hurts the equipment (computer, light bulb, copier, etc) to turn it off when not in use. Computer monitors use about 60 percent of the total energy use of the computer, and screen savers can use quite a bit of energy also. So remember, it generally prolongs the life of the computer to turn it off at night, not shortens it.

Photo provided by the EnergySmart Schools Initiative.

A shining example of an energy-efficient design that resulted in reduced construction costs is the Durant Middle School in Raleigh, North Carolina. Not only does this school save $165,000 a year in energy costs, but it was constructed $700,000 under budget. Decreasing the size of the cooling and electrical systems saved $115,000 in construction costs. Daylighting combined with a radiant barrier on the roof that reflects the sun's heat lessens the cooling load about 30 percent below that of a conventional school.

Market-Ready Cutting Edge Energy Efficiency and Renewable Energy School Technologies

There are hundreds of examples of energy efficiency and renewable energy technologies already applied in a school setting. Here a few proven examples that may be useful to you:

ENERGY EFFICIENCY TECHNOLOGIES

New Lighting Products

Electric lighting accounts for as much as 50 percent of school building energy costs. You can improve lighting efficiency with daylighting, controls, reflectance, ceiling design and by setting formal illumination goals. Lighting design strategies include using daylighting, individualized control for occupants, occupancy sensor switches to areas sporadically used, and time clocks to turn off lights after hours.

Changing from standard incandescent lamps to compact fluorescent lamps (CFLs) offers energy saving potential on the order of 70 percent. CFLs have a much higher initial cost, but their much longer life and higher efficiency result in a lower life-cycle cost, especially when the maintenance costs of lamp replacements are considered. See *Figure 2* for impressive payback periods for lighting upgrades.

Figure 2

AVERAGE PAYBACK PERIODS FOR LIGHTING UPGRADES

Lighting Upgrade	*Simple Payback (Years)*
Compact fluorescent replacing incandescent	1.1–2.3
High-efficiency fluorescent lamp replacing standard 40 watt	0.5–1.2
High-efficiency magnetic ballast replacing standard magnetic	1.4–2.8
Electronic ballast replacing standard magnetic	3.9–8.0
Daylighting Controls	1.6–9.6
Occupancy Sensors	1.3–5.4

Source: 1998 ACEEE Commercial Building Equipment Efficiency: A State-of-the-Art Review. Based on 3,500 hours/year operation, electricity at $0.07/kWh.

Smart Windows

Clear glass is basically a thing of the past. There is a new generation of glazings and layered glass that reduce heat transfer through your windows. To make your school more comfortable and efficient, you can now control the amount of heat loss and heat gain through your windows. Double- and triple-pane windows with new "low-e" coatings, spectrally selective glass, heat-absorbing (tinted) glass, reflective glass, gas-filled windows, and windows that use a combination of some of these options are all available now. For example, spectrally selective glass filters out as much as 70 percent of the heat normally transmitted through clear glass, while allowing the full amount of light through the window. This glass also possesses remarkable properties that protect your school carpet, furniture and walls from the fading that occurs with average single pane glass.

Computer Related Equipment

While usually less than 10 percent of energy costs (See *Figure 1*), energy use by computers and office equipment is one of the fastest-growing sources of electricity consumption in schools. This category includes computers, monitors, printers, facsimile machines and copiers. Energy use is expected to grow by as much as 500 percent in this area over the next decade.

The U.S. Department of Energy and the U.S. Environmental Protection Agency launched the *Energy Star* Office Equipment Program to help schools identify products that save energy and money. For more information about energy efficient computer-related equipment, call 1-888-STAR-YES, or e-mail them at info@energystar.gov.

Heating, Ventilation and Air Conditioning (HVAC) Equipment

Today's best air conditioners use 30 to 50 percent less energy to produce the same amount of cooling as air conditioners made in the mid-1970s. Even if your air conditioner is only 10 years old, you can save 20 to 40 percent of your cooling costs by replacing it with a newer, more efficient unit. For information about energy efficient heating, ventilation and air conditioning equipment, call the Air Conditioning Contractors of America (ACCA) at 202-483-9370 (www.acca.org), or the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) at 404-636-8400 (www.ashrae.org).

Market-Ready Cutting Edge Energy Efficiency and Renewable Energy School Technologies

RENEWABLE ENERGY TECHNOLOGIES

Photovoltaics ("PV")

Photo provided by the National Renewable Energy Laboratory.

Renewable technologies are popular in Wyoming. For example, the University of Wyoming has two 5-kilowatt photovoltaic arrays and one 35-kilowatt array system on campus, and Casper's Centennial Junior High School was a national trendsetter with its passive solar design that greatly reduces heating and air conditioning energy bills.

Photovoltaic cells convert sunlight directly into electricity; they have no moving parts. When sunlight strikes a PV cell, an electron is dislodged. These loose electrons are gathered by wires attached to the cell, forming an electrical current. The more cells, the greater the current and voltage. A number of PV cells laid side-by-side form a rectangular "module," and several modules together form an "array."

PV systems are already part of our lives. NASA uses PV for U.S. space missions, including the much-publicized trip to Mars. The smallest systems power calculators and wrist watches. Larger systems provide electricity for water pumps, highway signs, communications equipment, satellites, mobile homes, medical purposes (to power medical equipment, water purifiers, and refrigerators holding vaccines), navigation buoys, streetlights, and even for lighting homes and running appliances. In a surprising number of cases, PV power is the cheapest form of electricity for performing these tasks, and it is far cheaper than running electric lines to remote areas.

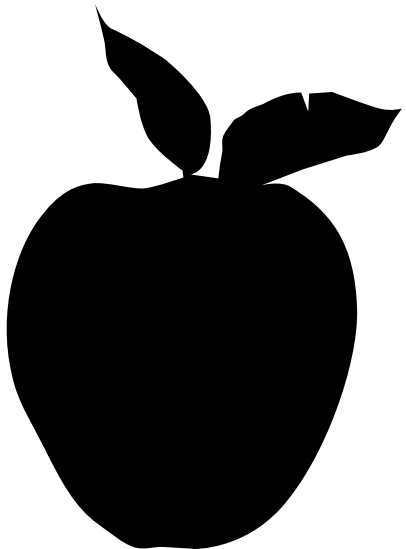
PV is the most popular solar application for schools. Usually roof-mounted, these systems now come with extensive long-term warranties and long-term maintenance agreements, which are proving to be attractive to school districts. "Where else can you find a roof that pays you money, lasts longer than a conventional roof, and provides a permanent science project?" says Craig Hoellwarth of Quest Consulting, Sacramento, California. The typical PV project installed on a school rooftop averages between one and four kilowatts in output, or enough to fully power a few classrooms.

Passive Solar

"Passive" solar uses sunlight for illumination and its warmth for heating without the aid of a mechanical device (no switches, pumps, fans, or wires). Passive solar technologies save energy because less energy is needed when the sun pitches in.

According to the Sustainable Buildings Industries Council in Washington D.C., the average middle school that incorporates daylighting will likely save $500,000 over its first 10 years.

There are four main types of passive solar design for buildings: direct gain, mass-wall, sunspace, and daylighting. With direct gain design, sunlight heats tiled or concrete floors; later, the accumulated heat is radiated back into the room. The mass-wall system puts a wall of concrete, brick, or containers of water behind south-facing windows. The wall materials absorb the heat, and the heat is then released slowly after the sun sets. Sunspaces (much like greenhouses inside or attached to a building) use glass walls or ceilings to gain as much heat from the sun as possible and are especially useful in colder climates like Wyoming's, where they're used in conjunction with direct gain and mass-wall systems. Daylighting is used most widely in larger buildings, like schools and offices, to admit sunlight without its heat. Because daylighting reduces the use of electrical lights, (which can be dimmed or turned off) and the heat they produce, the need for cooling is reduced, too. Therefore, air conditioning systems can be smaller, saving energy again and again every summer.



Market-Ready Cutting Edge Energy Efficiency and Renewable Energy School Technologies

Daylighting

PAYBACK PERIODS

Simple payback is the number of years it will take to recoup the first cost of the energy efficient or renewable energy investment based on the predicted energy savings, calculated without interest rates. According to the Solar Energy Industries Association, school daylighting generally pays back over zero to two years, solar hot water systems pay back between three to eight years, and a PV power system pays back in eight to 10 years.

Daylighting deserves special attention here. It is the practice of bringing light into a building interior and distributing it in a way that provides more desirable and better quality illumination than artificial light sources. This reduces the need for electrical light sources, thus cutting down on electricity bills and pollution generated by producing more electricity.

From an engineering perspective, daylighting offers school districts many other benefits. Daylighting reduces the need for electrical lighting, which also contributes to energy savings—since 40 percent of some electricity school bills are spent simply cooling the heat generated by inefficient lighting! Natural light is cooler than incandescent light by approximately one-third.

Solar Thermal

Solar thermal systems collect the heat from sunlight to produce hot water for kitchens, restrooms, locker-room showers, or swimming pools; heat for buildings; and/or electric power. This technology is very cost effective now, competing with the cheapest supply of electricity in many parts of the United States.

Applications range from simple pool water heating systems to multimegawatt electricity generating stations. Solar thermal differs from passive solar in that a mechanical device such as a pump or fan is used to distribute the heated water or air throughout the building.

Where to Get More Help

THE ALLIANCE TO SAVE ENERGY
202-857-0666
www.ase.org/greenschools

The premier energy efficiency advocacy organization in the United States, the Alliance manages a *Green Schools* educational initiative, which facilitates local school energy efficiency initiatives and provides technical assistance to schools interested in building energy efficiently.

THE AMERICAN COUNCIL FOR AN ENERGY EFFICIENT ECONOMY
202-429-8873
www.aceee.org

The ACEEE is an energy efficiency advocacy organization with a reputation for knowing the full range of energy efficiency applications available to school districts.

THE AMERICAN SOLAR ENERGY SOCIETY
303-443-3130
www.ases.org/solarguide

ASES is a trade association known for their members' technical knowledge of renewable energy applications and their helpful advice to the general public.

CENTER FOR EXCELLENCE FOR SUSTAINABLE DEVELOPMENT (U.S. DEPARTMENT OF ENERGY)
www.sustainable.doe.gov

Known for providing unparalleled hands-on technical assistance to local governments, this website also offers quick access to Department of Energy resources.

CENTER FOR RENEWABLE ENERGY AND SUSTAINABLE TECHNOLOGIES (CREST)
www.crest.org

Recently closed, CREST continues to sponsor one of the best renewable energy and energy efficiency-related websites in the world.

Where to Get More Help

ENERGYSMART SCHOOLS INITIATIVE
1-800-DOE-3732
www.eren.doe.gov/energysmartschools

An initiative managed by the *Rebuild America* Program, most of this U.S. Department of Energy program's mission is to coordinate state and local efforts to build cost-effective, healthy schools that incorporate energy efficiency and renewable energy technologies. The program has four primary goals:

- *Reducing energy consumption and costs, and increasing the use of clean energy technologies in K-12 schools nationwide*
- *Helping schools reinvest their savings from energy improvements*
- *Improving the learning environment of schools through daylighting, better temperature control, better air quality and other elements related to buildings and bus fleets*
- *Increasing student, teacher, and community awareness of energy and related issues including financial management, air quality, climate change, and new technologies*

ENERGY EFFICIENCY AND RENEWABLE ENERGY NETWORK
1-800-DOE-3732
www.eren.doe.gov

Sponsored by the U.S. Department of Energy, this national, well-staffed resource boasts more than 600 links, 80,000 documents, technical experts and other assets.

ENERGY QUEST
www.energy.ca.gov/education

This California Energy Commission website includes energy science projects, energy-related games and multiple resources for teachers and parents.

INTERSTATE RENEWABLE ENERGY COUNCIL
www.irecusa.org

The Interstate Renewable Energy Council (IREC) is a non-profit organization committed to accelerating the sustainable utilization of renewable energy resources and technologies in and through state, local government, and community activities.

NATIONAL CLEARINGHOUSE FOR EDUCATIONAL FACILITIES
www.edfacilities.org

NCEF provides information resources for people who plan, design, build, and maintain K-12 schools.

NATIONAL RENEWABLE ENERGY LABORATORY
303-275-3000
www.nrel.gov

NREL is world-famous for their renewable energy-related technical assistance. As prime supporters of the Department of Energy's *EnergySmart Schools Initiative*, they offer school districts a wealth of useful information.

REBUILD AMERICA
1-800-DOE-3732
www.eren.doe.gov/buildings/rebuild

Rebuild America is a program of the U.S. Department of Energy (DOE) that focuses on providing energy solutions to communities. *Rebuild America* "partners" with small towns, large metropolitan areas and Native American tribes, creating a large network of peers. *Rebuild America* supports communities with access to DOE Regional Offices, State Energy Offices, National Laboratories, utilities, colleges and universities and non-profit agencies. This network of partnerships can help your community be more environmentally and economically sound through smarter energy use in buildings. They help communities identify and prioritize problems, and then help solve them.

ROCKY MOUNTAIN INSTITUTE
970-927-3420
www.rmi.org

RMI is an energy efficiency advocacy organization with an excellent website and a reputation for providing useful technical assistance.

SCHOOLS GOING SOLAR
www.schoolsgoingsolar.org

Through this site, users will find practical solar school applications and numerous helpful resources including videos and brochures.

SUSTAINABLE BUILDINGS INDUSTRY COUNCIL
202-628-7400
www.sbic.org

The Sustainable Buildings Industry Council (previously the Passive Solar Industries Council) is perhaps the single-best national resource for daylighting and passive solar information.