Moving to the Head of the Class:

An Energy Efficiency Resource Guide for Pennsylvania Schools

"If schools can reduce the amount of wasted energy dollars, they can redirect that money toward their primary mission: education."

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The Purpose of this Manual

"Energy costs are the largest operating expense for school districts after salaries and benefits, and in recent years those costs have increasingly strained their budgets. The good news is that energy is one of the few expenses that can be decreased without negatively affecting classroom instruction."

Energy Star for K-12 School Districts Website

"If schools can reduce the amount of wasted energy dollars, they can redirect that money toward their primary mission: education."

Schools Operation and Maintenance
Princeton Energy Resources International

Schools across Pennsylvania face difficult decisions on how to meet their educational goals in the face of increasingly tight budget constraints. One area to look for savings, without sacrificing educational needs, is the schools' energy use. It has been estimated that America's schools could reduce their energy bills by as much as a quarter to a third by taking reasonable steps to use energy more efficiently.[1] [2]

Schools across the nation have improved their energy efficiency and are saving millions of dollars each year as a result. This Manual is intended to help identify the steps that Pennsylvania schools can take to reduce their energy costs. These include common sense measures that can be taken by students, teachers, administrators, facility and custodial staff that can produce immediate savings at little or no cost to school districts. They also include a variety of programs that are available to assist Pennsylvania schools, including programs

[1] U.S. Environmental Protection Agency (2011). Energy Efficiency Programs in K-12 Schools: A Guide to Developing and Implementing Greenhouse Gas Reduction Programs. Pp 1-52. Retrieved from: www.epa.gov/statelocalclimate/resources/strategy-guides.html

[2] Princeton Energy Resources International, et al. (2004). Schools Operations and Maintenance: Best Practices for Controlling Energy Costs. Retrieved from: http://energywisepa.org/sites/energywisepa.org/files/Schools%20Operation%20and%20Maintenance.pdf

sponsored by Pennsylvania's major electric utilities under a state law designed to help the Commonwealth's schools and other public entities use energy more efficiently.

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Getting Started

Making schools more energy efficient is a long-term project that requires a team effort by the entire education community – from students and teachers, to custodians and facility managers, to principals, superintendents, and school board members. But there are steps that can be taken immediately at nearly every school to get started in the right direction at little or no additional cost to the school district.

First, it is important to recognize that many school buildings are only occupied about half the days of the year, and are open during less than half the hours of those days. That means that many schools are in active use only about a quarter of the hours over the course of the year. A primary goal should be to avoid spending any more than necessary for heating, cooling, or lighting during the many hours that those schools are not occupied or when the buildings are only partially occupied. The same is true for classrooms or other parts of the school building that are not in use during all or a part of a school day. By carefully determining exactly when and where energy is needed, a school can begin the process of ensuring that money is not wasted in heating, cooling or lighting buildings and rooms that are not in use.

There are a number of low-cost, or even no-cost, steps that schools can take to begin to save energy, including:

- Assigning a wing of the school for after-school activities to allow shutting down energy use in the rest of the school;
- Establishing an appropriate thermostat setting policy, such as 68 to 70 degrees for heating and 76 to 78 degrees for cooling, to ensure comfort without incurring unnecessary costs;
- Keeping classroom doors closed when HVAC is operating and keeping doors between conditioned and non-conditioned space closed at all times;
- Maximizing the use of natural daylight in those parts of the buildings that are amenable to such use;
- Opening and shutting blinds and shades to better control heat and cold;
- Creating a student energy patrol to make sure lights are off and equipment is turned off when not needed;
- Minimizing unnecessary energy use by computers and other equipment by utilizing appropriate "sleep" and "shutdown" settings over the course of the day and at the end of every day (free network software to assist in this task is available at http://www.energystar.gov/index.cfm?c=power_mgt.pr_pm_easy_save)
- Making sure that there is nothing in front of vents, such as bookcases or desks, that would block airflows;
- Replacing incandescent bulbs with compact fluorescent lights (CFLs) wherever possible and installing light-emitting diode (LED) lights for certain uses such as lighted exit signs, exterior security lighting, and other uses where lighting is on for extended periods of time;
- Upgrading fluorescent bulbs from T-12 to T-8 (lower numbered bulbs have smaller diameters and are more energy efficient) or to T-5 where appropriate for areas that require high lighting output (and making sure that ballasts are upgraded as well);
- Installing motion sensors on lighting fixtures to turn lights off automatically when a room or building area is not in use;
- Cleaning or replacing HVAC filters and performing regular maintenance on boilers, chillers and other HVAC systems;
- Utilizing the building automation systems that are built into many school HVAC systems to monitor and control energy usage and ensuring that school district personnel are properly trained to use these systems to the maximum benefit;
- Stopping leaks with weather stripping and caulking wherever necessary.

The United States Department of Energy provides a set of "Energy Smart Schools Tips" ranging from "quick wins" to "long-term facility management strategies" that pay for

themselves in energy savings at: http://apps1.eere.energy.gov/buildings/publications/pdfs/energysmartschools/ess_o-and-m-guide.pdf. Another list of practical tips to help schools get started on the road to energy savings is offered by the Alliance to Save Energy at: http://www.ase.org/resources/energy-saving-tips-schools.

Engaging Students, Teachers, Administrators and Custodial Staff

> ***"There is no 'One Thing' or 'Single Activity' that will conserve energy. It must be a complete program to achieve success and sustainability."***
> *Tom Schneider, North Penn School District.*

> ***"When people know how much it costs to power their school, they can see why it's worth some extra effort to avoid waste."***
> *Alliance to Save Energy, Energy Saving Tips for Schools.*

Some school districts have developed and approved comprehensive energy management plans as a way of ensuring that their energy efficiency goals are clearly established and properly implemented over time. In Pennsylvania, for example, the Upper Merion Area School District (UMASD) approved such a plan in 2008. The plan establishes specific energy conservation and building management regulations for classrooms, office equipment, air conditioning, heating, lighting and other areas. A copy of the UMASD Energy Management Plan is available at: http://www.psba.org/districts_policies/u/624/POLUMER717.pdf. Importantly, the Plan states that: "The implementation of this policy is the joint responsibility of the administration, teachers, students, support personnel, and community members using

district buildings. The success of the district's energy management program depends on cooperation from all individuals."[3]

In its excellent publication on *Energy Efficiency Programs in K-12 Schools*, the United States Environmental Protection Agency (EPA) recommends a "team approach" both to the policy development process to help ensure that energy efficiency programs are carefully crafted, as well as to the implementation and application of those policies within individual school buildings.[4] According to EPA, these energy teams should include a cross-section of interested individuals with diverse backgrounds who can work together to share their knowledge of school operations to achieve the best overall results. EPA has developed a factsheet providing information on building a team to develop and implement energy efficiency programs, available at: http://www.energystar.gov/ia/business/challenge/get_started/CreateATeam.pdf. Similarly, the Alliance to Save Energy, a nationally recognized leader in the effort to improve energy efficiency in schools, has demonstrated in its highly successful PowerSave Schools Program that it is vital to get the entire school involved in these programs and to ensure that the benefits are widely publicized and understood throughout the school and community.[5]

Many of the most cost effective energy efficiency measures that a school can adopt do not involve major capital expenditures or equipment purchases but depend instead on behavioral and operational changes by students, teachers, administrators and custodial staff. In Pennsylvania, Tom Schneider, who serves as Manager of Energy and Operational Efficiencies for the North Penn School District's award-winning energy savings program, has stressed the need for support of these programs from both the top down and the bottom up. It is important that goals of energy management and sustainability be identified and supported at the highest levels, starting with the school board, superintendent and principals. This support is then

[3] Upper Merion School District (2008). Energy Management. Pg. 1-6. Retrieved from: http://www.psba.org/districts_policies/u/624/POLUMER717.pdf

[4] U.S. Environmental Protection Agency (2011). Energy Efficiency Programs in K-12 Schools: A Guide to Developing and Implementing Greenhouse Gas Reduction Programs. Page 9. Retrieved from: www.epa.gov/statelocalclimate/resources/strategy-guides.html

[5] Alliance to Save Energy (2011). PowerSave Schools Program: Overview. Retrieved from: http://www.ase.org/programs/powersave-schools

translated into action by school staff and students. Tom Schneider recommends that each school try to identify a few teachers who are passionate about this issue. These teachers can share ideas and help students develop their own suggestions about how to make their schools more energy efficient. The students in turn can help engage the remaining teachers and staff.[6] Many schools have formalized this effort through the creation of student energy teams as an important extracurricular activity.

Involving students throughout the process has a dual benefit. First, it provides an enthusiastic resource for generating and implementing energy saving ideas at the schools; second, it allows students to take these practical lessons home with them so that they can encourage additional energy savings in their homes and throughout their communities.

One way that the Alliance to Save Energy recommends initiating student engagement is by forming a student energy patrol. These students can ensure that lights are out when classrooms and other parts of the building are not in use. This can include creating "Last Out, Lights Out" signage throughout the school. Students can also make sure that computers are in the appropriate sleep mode or turned off at the end of the day consistent with instructions from the school's technical staff. Students can also locate energy leaks in the school building using simple "draftmeters" made from plastic wrap and pencils to identify where drafts are coming from.

Energy programs also can be integrated into the school's curriculum, particularly in science, technology, engineering and math (STEM). As noted by the Alliance to Save Energy, the school building can serve as a "real-world learning laboratory to create a deep understanding of energy's links to the environment and economy."[7] An excellent series of such lesson plans has been developed by the National Energy Education Development (NEED) Project and can be downloaded from the NEED website at: http://www.need.org. These lesson

[6] Schneider, Tom (2012). *K-12 Energy Management*. KEEA Conference PowerPoint September 24, 2012. Retrieved from: http://energywisepa.org/sites/energywisepa.org/files/Tom%20Schneider-K12%20Energy%20Management_0.pdf

[7] Alliance to Save Energy (2011). PowerSave Schools Program: Overview. Retrieved from: http://www.ase.org/programs/powersave-schools

plans include activities to teach students how to determine the annual consumption and operating cost of lighting and equipment throughout the school building as well as the amount of carbon dioxide produced when powering these devices. Students are also introduced to the concept of "payback period" so they can understand the comparative costs and benefits of implementing various energy efficiency measures.[8] Another excellent resource is the ENERGY STAR® for Kids Website, which provides learning opportunities on energy efficiency for teachers, parents and students at: http://www.energystar.gov/index.cfm?c=kids.kids_index.

Contests are another good way to get student involvement in energy efficiency activities, and allow students to have fun while working in groups and competing with students in other classrooms and other schools. Energy activities can be worked in around Earth Day and larger environmental programs. PowerPoint, poster, and essay competitions can all be used to encourage student leadership and engagement.

There is no question that, as stated by Tom Schneider, students are "an untapped resource" in the quest to achieve greater energy efficiency in schools. By tapping this resource effectively, schools can improve their own energy budget bottom lines, while also helping students contribute to the economic and environmental well-being of their homes and communities.

Getting Ready for Summer (or Winter) Break

One key time for school officials to think about energy savings is when they are preparing to shut down buildings for the summer. While some schools are closed completely for the summer, there are also a number of important summer programs that are a part of many school districts' curriculum and extra-curricular activities. One way to reduce summer energy usage is to consolidate as many of those summer programs into as few school buildings as possible, rather than spreading the programs among multiple buildings throughout the

[8] National Energy Education Development Project (2013). Curriculum Guides and Program Resources. Retrieved from: http://www.need.org/curriculum-guides

district. The schools can also coordinate teacher in-service day meetings in a single location. It may also be appropriate to coordinate summer cleaning programs, for example, by scheduling intensive cleaning programs at one school at a time rather than scheduling multiple schools for cleaning simultaneously over longer periods of time. To the extent that the number of buildings that must be heated, cooled or lighted during cleaning programs is reduced, less additional energy costs will be incurred. The same general principles apply to winter breaks, weekends, and other closings during the course of the year.

Many school districts have found that the preparation of a detailed "checklist" of actions to take before a school closing can pay large dividends in energy savings throughout the period. Here is a model Summer Shutdown checklist prepared by the Alliance to Save Energy that is designed to eliminate unnecessary energy and water usage at schools that will be shut down for the summer:

The Alliance to Save Energy's PowerSave Schools
Summer Shutdown Checklist

Building

- ○ Check that all windows and doors to the outside are closed and locked.
- ○ Close all curtains and blinds to help buffer the building from the sun's effects.

Water

- ○ Check all drinking fountains, faucets, showers, and toilets for water leaks.
- ○ Turn off any automatic flushing systems.
- ○ Check water meters to verify there is no use (movement of the meter) due to water leaks.
- ○ Turn off all water heaters that will not be needed.

Refrigeration

- ○ If possible, turn off, or unplug drinking fountains containing individual refrigeration units.
- ○ Consolidate items from multiple refrigerators into one and turn others off.
- ○ Coordinate with School Food Services to see if they can empty the coolers and freezers so they can be shut down for the summer.
- ○ Milk coolers not in use should be turned off.

Electricity

- Check to make sure that all unnecessary electrical appliances are turned off and unplugged! This includes copiers, computers, printers, television, fax machines, radios, water coolers, and task lighting.
- Unplug vending machines (Be sure to inform the vendors).
- Check computer labs. Turn off and unplug computers, monitors, and printers.
- Turn off intercom and classroom bell systems, when feasible.

Lighting

- For exterior lights that will be operated during the summer, check that time clocks are set correctly for summer hours and/or photocells controlling exterior lights work correctly.
- Restrict the use of interior lighting to only those areas of the school being worked in or occupied.
- Turn off all display case lighting.
- Whenever possible, turn off all interior lights, except exit lighting.

HVAC

- Confirm that all kitchen equipment, both gas and electric, are turned off. Only an approved technician can turn on and off pilot lights.
- Check to see that all compressors used in auto, wood or other shops are turned off.
- Turn off all automatic and manual exhaust fans.
- Review the need for building ventilation and shut down all unnecessary ventilation fans. Only an approved technician can turn on and off exhaust fans unless they have an easily accessible switch such as those near a light switch.
- Adjust your HVAC time clocks according to required schedules.
- Turn off electric water heaters at circuit box.
- Turn off any hot water boosters for kitchen dishwashers.
- Turn off domestic hot water circulating pumps, if feasible.

Benchmarking – the Key to Understanding a School's Energy Usage

One good way to start an energy efficiency program is to "benchmark" a school's energy usage. The benchmarking process allows the school to compare its usage to that of other schools of similar size and type. An excellent free benchmarking program that has been used by schools across Pennsylvania and the nation is the U.S. Environmental Protection Agency (EPA) Portfolio Manager. EPA Portfolio Manager is a free online tool that allows a school to track energy and water usage information and compare that usage to other schools, taking into account differences in weather, school size and other factors. Based on the school-specific data

that is entered into the program, the Portfolio Manager provides a rating for each building compared to similar school buildings nationwide, on a scale from 1 to 100. Schools that receive a score of 75 or above, that is, schools that rank in the top 25 percent in terms of overall energy efficiency, qualify to be awarded the EPA's ENERGY STAR® label. In order to receive ENERGY STAR recognition, the school's energy data must be verified by a professional engineer or registered architect. According to the EPA, energy costs in schools that qualify for the ENERGY STAR label are approximately 40 cents per square foot less than in average schools, without compromising comfort or services.[9] The EPA's benchmarking starter kit can be found at http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager_benchmarking.

It should be noted that under a recent ordinance passed by the City of Philadelphia, all commercial buildings above 50,000 square feet, including all school buildings, will be required to benchmark their energy and water usage beginning in the Fall of 2013 with EPA Portfolio Manager.[10]

Using Portfolio Manager to benchmark a school's energy efficiency has two major benefits. First, the school can see how it is doing in comparison with other schools and it can receive public recognition if the school is performing at or near the head of its class. Second, and perhaps more importantly, the initial benchmark provides a baseline from which a school district can measure improvement on a year-to-year basis within each school building. So even if a particular school starts off with a low score, there is no reason to be discouraged. After all, we know that at any given time half the schools in the country will be at or below average. Rather, the initial score provides a measuring stick with which the school can determine whether it is taking the steps needed to improve that score every year. Using Portfolio Manager on all the schools in a particular district also lets district officials identify those schools that are using the most energy and thus have the greatest potential for savings.

[9] ENERGY STAR (2013). ENERGY STAR for K-12 School Districts. Retrieved from: http://www.energystar.gov/index.cfm?c=k12_schools.bus_schoolsk12

[10] City of Philadelphia (2012). Bill No. 120428-A. An Ordinance. Retrieved from: http://phila.legistar.com/View.ashx?M=F&ID=2203035&GUID=73EB39F0-B915-4E33-92BD-B0D8F197EC75

Many school districts in Pennsylvania have used Portfolio Manager, and more than 230 school buildings in Pennsylvania have been awarded the EPA ENERGY STAR designation in one or more years. Here is a map that shows where the Pennsylvania ENERGY STAR recognized schools are located:

A full list of the schools across Pennsylvania that have received the ENERGY STAR since 2009 is available on the ENERGY STAR website.[11] It is important to note that many other schools across Pennsylvania have made great strides in reducing their energy usage, even though they have not received ENERGY STAR recognition.

A few of the school districts that have been particularly successful in their energy efficiency efforts are described in the next section of this Manual.

[11] ENERGYSTAR (2013). ENERGYSTAR Labeled Buildings and Plants. http://www.energystar.gov/index.cfm?fuseaction=labeled_buildings.showMap&ZIP=&S_CODE=PA&STARTNUM=1&CITY=&OWNER_ID=&STR=&MINI=&VIEW=&YEAR=&PROFILES=0&FILTER_B_ID=&PAGE=1&BUILDING_TYPE_ID=910
Retrieved from: http://www.energystar.gov/

School Districts Across Pennsylvania Leading the Way

North Penn School District

The North Penn School District in Montgomery County has reduced its energy consumption by more than 37 percent and experienced more than $2.5 million in energy cost savings since 2008. In 2012 alone, the District estimates that it saved more than $1.1 million in energy costs, and this was achieved through operational and behavioral changes without additional capital expenditures. The District's energy manager, Tom Schneider, is a strong advocate of the EPA Portfolio Manager and ENERGY STAR program. Starting with a baseline score of 61 in 2008, North Penn raised all 20 of its buildings to the top 25 percent of schools nationwide, including 15 buildings rated over 90 with 11 of those buildings rated 95 or higher. The District's overall average is a remarkable 94 rating. In light of North Penn's exceptional record, the District has been honored by the EPA as a 2013 ENERGY STAR Partner of the Year.

Many people assume that major energy efficiency improvements require substantial equipment upgrades, but according to Tom Schneider, nearly all of North Penn's success can be attributed to operational and behavioral changes that have been undertaken by students, teachers, administrators, custodians, and other facilities staff. These changes start with reducing or eliminating energy usage in buildings or portions of buildings that are unoccupied many hours of the day and many days of the year, and include a clear temperature policy and the development of specific checklists to prepare for such events as summer and winter breaks and holidays. The elements of the program at North Penn include reporting and accountability, operations and maintenance, training, retro-commissioning, energy purchasing, benchmarking and energy audits, community involvement, and student engagement.

North Penn also has benefitted from participation in the PowerSave Schools program of the Alliance to Save Energy. North Penn's participation in this program was funded in large part through a grant from Direct Energy, a major competitive energy supplier in Pennsylvania. The PowerSave Schools Program is described more fully below.[12]

Chambersburg Area School District

In 2007, Chambersburg Area School District in Franklin County took on a challenge to manage its energy resources in order to save on energy bills and to be a more environmentally sustainable district. The District hired an energy contractor to develop a comprehensive five year program, and also named one of its teachers to serve as the District's energy manager. By the end of 2012, all 17 schools in the District had achieved ENERGY STAR status and the District estimated that it had reduced electric, natural gas and fuel oil usage by 28.61 percent and had saved more than $3 million in energy costs. The District also estimated that it reduced its "carbon footprint" by 18,727 metric tons, or the equivalent of 3,375 passenger cars not driven for one year.

In addition to achieving operational and behavioral changes to reduce energy usage in the school buildings, the District incorporated energy savings lessons into the education process and sponsored contests for students from different age groups to present the best energy saving ideas. A description of the District's achievements can be found on its website at http://www.chambersburg.k12.pa.us.[13]

[12] Schneider, Tom (2013) North Penn School District Manager of Energy and Operational Efficiencies. Personal Interviews. March-May, 2013.

[13] Myers, Jason (2013). Chambersburg Area School District: Facility Management/Buildings and Grounds. "Sustaining Our Energy Resources". Web. Retrieved from: http://www.chambersburg.k12.pa.us/education/components/scrapbook/default.php?sectiondetailid=24729&

Hempfield Area School District

Since starting to utilize EPA Portfolio Manager, the Hempfield Area School District in the Greensburg Area of Westmoreland County has seen seven of its eleven schools achieve the ENERGY STAR designation, and five of those schools achieve this status for three consecutive years (2010, 2011, and 2012). The District estimated that in the 2009-2010 school year alone, it was able to reduce energy costs by more than $369,000.

After initially determining that many of its buildings' hot water systems had been operating inefficiently, the District reprogrammed the controllers for the systems to decrease water temperatures, and boiler pumps were also programmed to operate on a separate schedule to avoid unnecessary pump operation. In a 2010 Report to the Hempfield community, the District concluded that the energy savings initiative not only reduces costs, but also "represents a great example of teamwork as members of the board, administration, teachers and students work toward a common goal."[14]

West Chester Area School District

West Chester Area School District, located in Chester County, hired an energy consulting firm to conduct a district-wide Energy Conservation and Awareness Program before making lighting upgrades and operational improvements to its HVAC systems. The District established a multi-phased energy conservation program involving 16 district schools. The first phase of this program included a utility bill and trend analysis. The next phase incorporated a comprehensive education and awareness campaign for students, faculty and staff. Phase three included monitoring, data logging and retro-commissioning, during which the building managers tested their mechanical systems to determine if they were running at peak efficiency; phase four encompassed a comprehensive audit. One of the most successful elements of the program was a student-led "Power Down Friday" campaign. According to a case study prepared by Practical

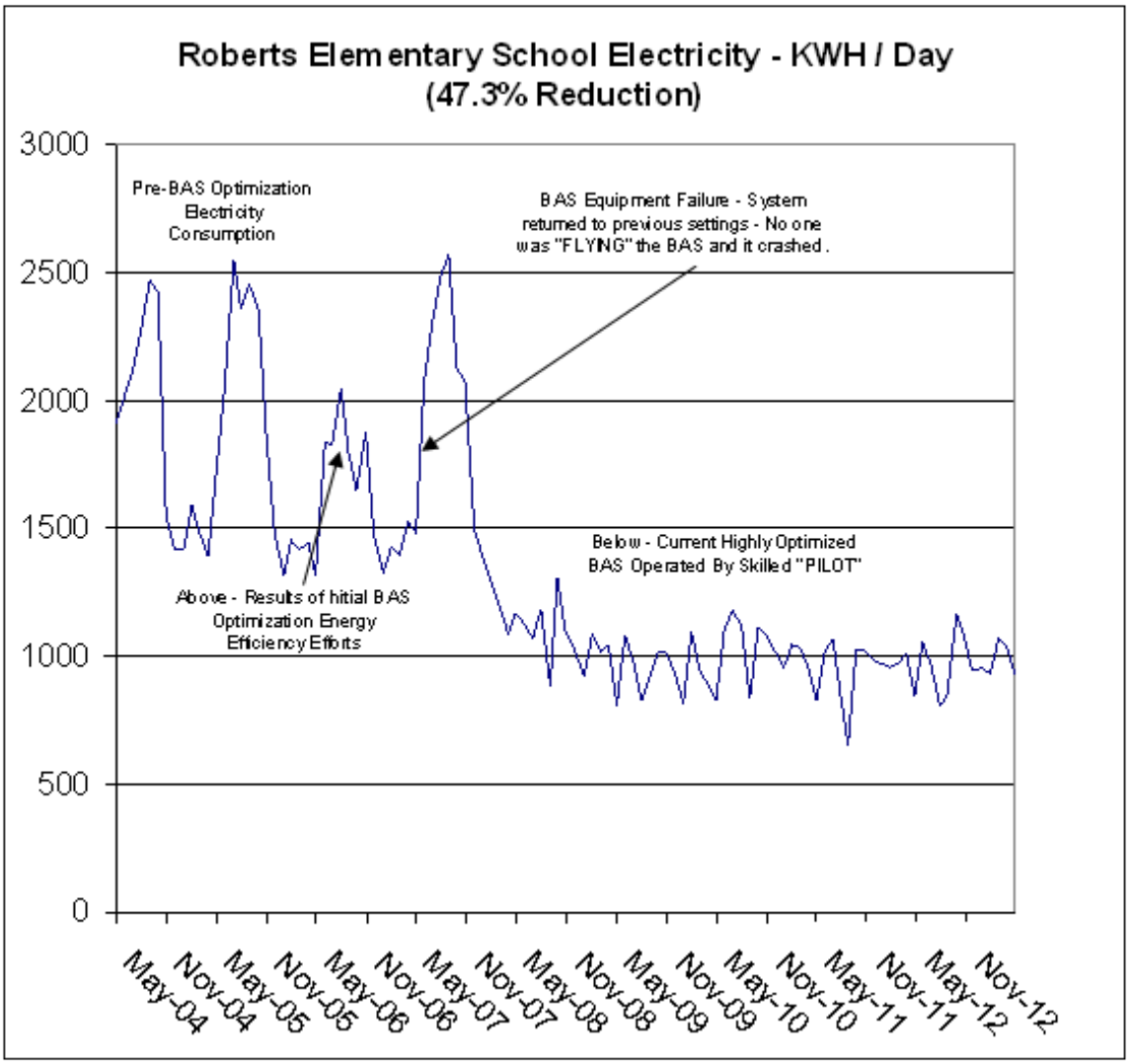
[14] Hempfield Area School District Annual Report to the Community (2010). Highlights of the 2009-2010 School year. Retrieved from: http://c1.hasd.schoolwires.net/215010223102644210/lib/215010223102644210/20092010_Hempfield_Annual_Report.pdf

Energy Solutions, the program, along with student and custodial involvement, cut electricity use by 16.5 percent, saved $1.2 million, and avoided more than 10,000 tons of CO^2 emissions.[15]

Upper Merion Area School District

Upper Merion Area School District in Montgomery County undertook a major energy management program in 2006 and, as noted above, adopted a comprehensive Energy Management Plan in 2008. This effort was part of a District-wide commitment to reduce energy use and lower operational expenses, while at the same time, improving the quality of the learning environment. The District's energy management approach included reaching out to local energy consultants for guidance, and collaborating with nearby schools on their energy programs' best practices. The maintenance staff identified low cost upgrades and operational improvements as their first step. The District also invested in the centralization of its Building Automation System (BAS) to enable remote monitoring and scheduling of building HVAC systems throughout the District, and hired a Maintenance and Energy Coordinator to operate the energy management system and monitor the performance of the buildings and equipment. According to UMASD Director of Operations Fred Remelius, once the school district implemented the monitoring and control systems available through the BAS that was already incorporated in many of the school buildings' HVAC systems, the savings were dramatic. Below is a graph prepared by Mr. Remelius that illustrates the change in electricity usage that resulted from the implementation of that program at the Roberts Elementary School in 2008:

[15] Practical Energy Solutions (2011). Energy Conservation Plus Awareness Program Case Study. Retrieved from: http://media.wix.com/ugd/84b6fb_69343e52f8565c4a53a5e01b1eaad2c3.pdf



Another UMASD school, Candlebrook Elementary, achieved a 50 percent energy savings over the life of the energy management program and the savings were reinvested into the school. The school's annual electric bill was reduced by 33 percent from its 2004 and 2005 levels and the school was able to save $105,000 over a five-year period. Candlebrook earned an ENERGY STAR rating of 98 out of 100 in 2009. As a result of its efforts at Candlebrook and

throughout the District, the Upper Merion Area School District was named an ENERGY STAR Leader in 2010 for reducing energy usage by more than 30 percent District-wide.[16]

Act 129 – the Pennsylvania Law to Increase Energy Efficiency

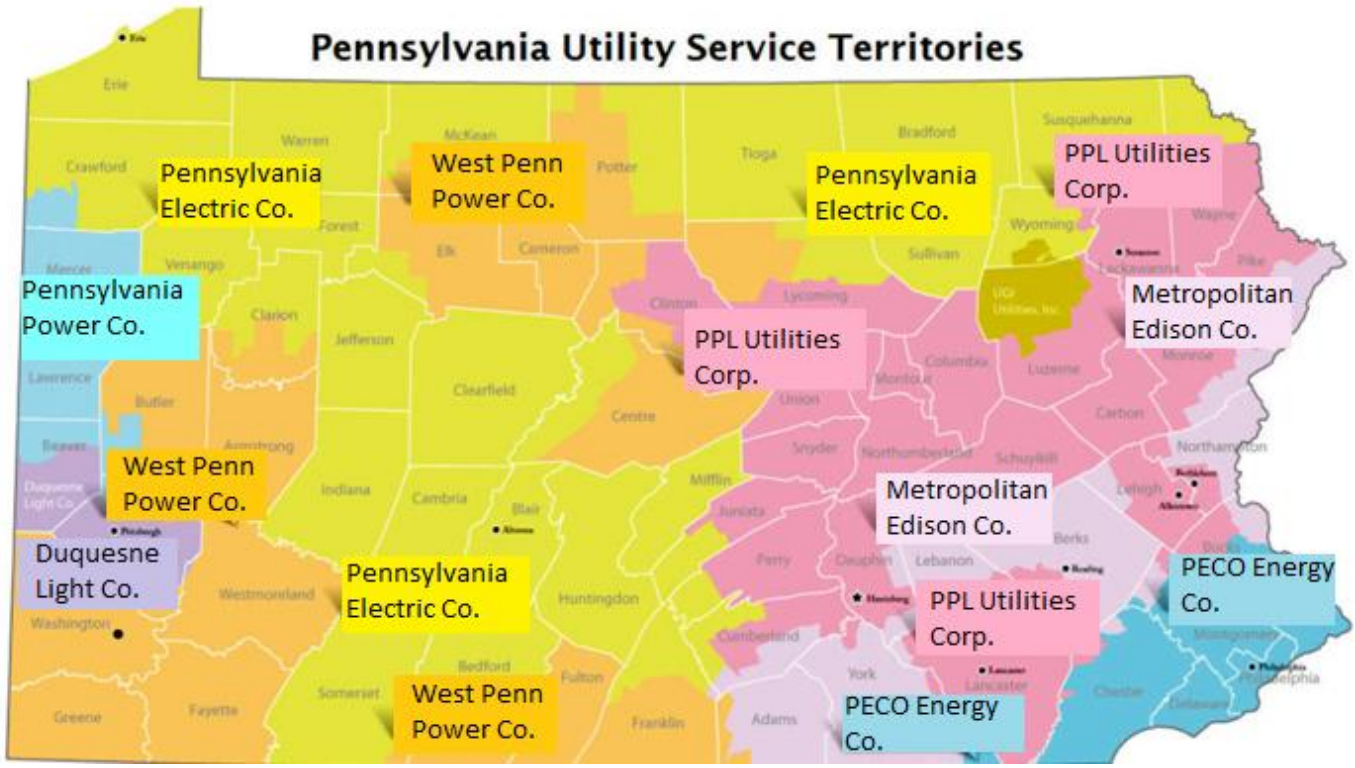
In 2008, the Pennsylvania General Assembly passed, and Governor Edward G. Rendell signed into law, Act 129. Act 129 made a number of changes in the way that Pennsylvania's electric utilities are regulated, including a requirement that the Commonwealth's major electric utilities take concrete steps to help their customers save energy through energy efficiency programs. The Act imposed mandates on each utility to ensure a specified level of energy savings over a prescribed period. The costs of the Act 129 programs are included in the rates charged to each utility's customers. Failure to meet the Act's mandates can result in direct penalties to the utilities ranging from $1 million to $20 million. The first phase of Act 129 programs came to an end on May 31, 2013. The second phase began on June 1, 2013 and continues through May 31, 2017.

One of the significant features of Act 129 is the requirement that at least 10 percent of each utility's mandated energy savings come from "units of Federal, State and local governments, including municipalities, **school districts**, institutions of higher education and nonprofit entities."[17] This requirement provides a valuable and timely opportunity to Pennsylvania schools in each of the major utility service territories to participate in these utility-sponsored energy efficiency programs. As noted above, the KEEA Energy Education Fund (KEEF) was able to secure a grant from the Emily Hall Tremaine Foundation to inform and educate Pennsylvania schools and municipalities about the benefits of energy efficiency, including the potential to participate in the ongoing Act 129 programs. This Manual is a part of that effort.

[16] Delaware Valley Regional Planning Commission (2010). Energy Efficiency Case Studies: Candlebrook Elementary. Retrieved from: http://energywisepa.org/sites/energywisepa.org/files/2011-01-21_Candlebrook_Elementary.pdf

[17] 66 Pa.C.S. Section 2806.1(b)(emphasis added)..

The Act 129 requirements apply to the seven major electric utilities that serve the great majority of consumers in Pennsylvania. A map of those utilities' service territories is shown below:



Each of these utilities offered a range of energy efficiency programs to schools and other governmental and non-profit entities during Phase One of their Act 129 programs and are continuing or expanding upon a number of these programs in Phase Two. Some of these programs are specific to schools, while other programs are also more generally available to other customers, such as commercial and small industrial customers.

The **PECO** program for government, institutional and non-profit facility customers includes financial incentives and technical assistance to enable those entities to obtain "Smart Equipment" designed to achieve significant energy savings. The PECO program features a major educational component that includes municipal forums, training sessions, and individual customer education about energy efficiency benefits in general and recommendations for

specific measures that are most effective in reducing energy use in public facilities. The program also includes an audit component to provide building assessments and identify energy efficiency opportunities for participating customers. Some of the equipment eligible for financial incentives includes energy efficient light fixtures, ballasts and bulbs, and improvements to heating, cooling and refrigeration units.[18] In addition to its Act 129 programs, PECO sponsors the PECO Energizing Education Program in conjunction with the Franklin Institute and the National Energy Education Development Project (NEED).[19] This program, which is aimed at students in grades 6-8, includes teacher training, a five-week classroom module, a student energy audit, an optional field trip to a PECO power station, and a cash grant to participating schools to support the implementation of energy-focused community projects.

Information about these utilities' energy efficiency programs can be found at the following Websites:

- PECO Energy -- Smart Ideas website. https://www.peco.com/Savings/Pages/default.aspx
- Duquesne Light Company- Duquesne's Watt Choices website. https://www.duquesnelight.com/wattChoices/default.cfm
- PPL Electric Utilities Corp- Save Energy and Money website. https://www.pplelectric.com/save-energy-and-money.aspx
- West Penn Power Company- Save Energy Pennsylvania website. https://www.firstenergycorp.com/content/customer/save_energy/save_energy_pennsylvania/west_penn_power.html
- Penn Power Company- Save Energy Pennsylvania website. https://www.firstenergycorp.com/content/customer/save_energy/save_energy_pennsylvania/pennpower.html
- Penelec (Pennsylvania Electric Company) - Save Energy Pennsylvania website. https://www.firstenergycorp.com/content/customer/save_energy/save_energy_pennsylvania/penelec.html
- Met-Ed (Metropolitan Edison Company) - Save Energy Pennsylvania website. https://www.firstenergycorp.com/content/customer/save_energy/save_energy_pennsylvania/met_ed.html

The **First Energy** utilities (**Met-Ed, Penelec, Penn Power** and **West Penn Power**) provide financial incentives to reduce the capital investment required by schools and other government and non-profit institutions to implement qualifying energy efficiency measures. One element of the program encourages customers within the government and institutional segment to recycle inefficient refrigeration and room air conditioning appliances and replace them with ENERGY STAR

[18] PECO (2013) Smart Equipment Incentives. Retrieved from: https://www.peco.com/Savings/ProgramsandRebates/Business/Pages/PECOSmartIdeasforyourbusiness.aspx
[19] http://www.need.org/peco

qualified equipment. Incentives are also provided to support the installation of more efficient HVAC and water heating equipment as well as to make efficiency improvements in both indoor and outdoor lighting. The program also provides schools and other qualifying facilities with assistance in obtaining comprehensive energy efficiency audits for their buildings as well as financial support and customer education to help implement the audit recommendations.

In addition to the types of Act 129 incentive programs offered to all governmental and non-profit institutions by PECO and the First Energy utilities, two Pennsylvania utilities – **PPL** and **Duquesne** – have developed Act 129 programs that are specifically targeted to assist schools in their respective service territories. **PPL** offers a benchmarking program to up to 25 schools in its service territory. Under that program, PPL, through its designated Conservation Service Provider (CSP) will work with individual school administrators to evaluate total building energy use and to develop short and long-term energy efficiency goals and action plans to reduce energy usage.[20] **Duquesne** has developed a program to help schools and colleges in its service territory assess the potential for energy efficiency projects and then to follow through with the installation of energy saving measures and verification of savings. Components of the Duquesne program for schools include auditing of energy use, targeted financing and incentives, project management, installation of retrofit measures, training, and technical assistance.[21]

PPL and **Duquesne** have also taken the extra step of developing programs that enable school students to learn about the benefits of energy efficiency and to bring those benefits back to their homes. **Duquesne** sponsors a "Schools Energy Pledge Program" in which students learn about energy efficiency at a school assembly; take home a pledge form where their family can agree to install a number of energy saving devices in their homes; and, if their families sign the pledge, receive a free energy saving kit that includes energy saving devices such as compact fluorescent light bulbs and weather stripping. In addition, participating schools receive a

[20] PPL Electric Utilities (2013). Save Energy and Money. Web. Retrieved from: https://www.pplelectric.com/save-energy-and-money.aspx

[21] Duquesne Light (2013). Programs and Solutions. Web. Retrieved from: https://www.duquesnelight.com/wattChoices/default.cfm

donation from Duquesne of $25 for every student whose family participates in the program.[22] **PPL** operates a "Student and Parent Energy-Efficiency Education Program" which includes school-based workshops for children of varying ages; training and classroom materials for teachers; and energy efficiency kits and educational materials to all participants. The PPL program also includes a component that targets schools in low-income communities and provides incentives to Parent Teacher Organizations for inviting parents to participate in energy efficiency workshops at schools in their community.[23]

It should be noted that some schools in Pennsylvania are served by electric utilities that are not covered by the Act 129 mandates. Those utilities include rural cooperatives, municipally owned utilities, and small investor-owned utilities. Schools in those areas can benefit, however, from the types of programs and practices that are discussed throughout the rest of this Manual.

How Electric Rates are Set and Energy Savings are Calculated

While energy efficiency programs are applicable to all types of energy usage – including natural gas, propane, and fuel oil – the focus of this section of the Manual is on electricity savings. In order to determine the costs and benefits of electricity energy efficiency, it is important to understand how electricity rates are set and how savings are measured.

Pennsylvania schools are typically served under rate schedules, or tariffs, that are applicable to general business customers. These rates are more complex than residential rates, which usually include only a fixed monthly customer charge and a flat per kilowatt hour energy charge. The distribution portion of business customer rates also includes a demand charge, which is measured in kilowatts and is based on the maximum level of electricity consumption

[22] Duquesne Light (2013). Act 129 Phase II Energy Efficiency Plans. Retrieved from: https://www.duquesnelight.com/wattChoices/default.cfm

[23] PPL Electric Utilities (2013). Save Energy and Money: For Act 129 Stakeholders. Retrieved from: https://www.pplelectric.com/save-energy-and-money/for-act-129-stakeholders.aspx

that the customer uses during any 15-minute or 30-minute interval over the course of a billing month.

Energy Charges

When measuring the benefits of energy efficiency programs, the greatest focus for schools has been on energy savings, which are measured on a per kilowatt hour basis. This is because most of the monthly bill (usually two thirds or more) is charged on the basis of energy usage. To use a simple example, if the energy component of the bill is 10 cents per kilowatt hour and the school adopts a measure that reduces energy usage by 10 kilowatt hours over the course of a month, the school will save $1.00 per month.

Most of the measures discussed in this Manual are designed to reduce energy usage on an ongoing basis. As noted above, some of these measures, such as turning off the lights in rooms that are not in use, have zero cost, yet produce substantial energy savings in terms of reduced kilowatt hour usage and lower electric bills every month. Other measures, such as replacing an incandescent light bulb with a compact fluorescent light (CFL) will have some upfront cost, but that cost may be quickly offset and overcome by the ongoing monthly savings from the CFL's reduced kilowatt hour usage.

Demand Charges

If the school reduces its energy usage during the period of the school's maximum monthly peak demand (measured in kilowatts), then the school can reduce its monthly demand charges as well. Many schools will see their highest peak demand in the hours leading up to and during the lunch period, so there is a particular benefit to reducing unnecessary usage during that period. In addition, to the extent that any energy efficiency measure reduces usage throughout the school day, that measure will also likely result in lower peak demand charges. For example, if the school replaces inefficient light bulbs with energy efficient bulbs, there is a good chance that those light bulbs will be in use during a school's peak demand period. As a result, changing those bulbs will not only reduce the school's monthly energy charges, which

are the predominant portion of the bill, but can also reduce the monthly demand charge and thus add to the savings.

Demand Response Programs

A number of Pennsylvania school districts also participate in programs under which they are paid to reduce their energy usage during times in which peak demands are highest in the electric system as a whole. Usually with the assistance of specialized energy management service companies, schools are able to participate in these "demand response" or "curtailment service" programs that are offered through PJM, which operates the regional grid over a large multi-state area that includes Pennsylvania. Through these programs, schools receive payments for agreeing in advance that they will reduce their electricity usage by a specified amount during periods in which PJM is facing extreme peak demands. These periods typically occur in the summer months when many schools have limited usage. But to the extent that school districts are willing and able to reduce that usage further upon request from PJM, these programs have been extremely beneficial, resulting in tens of thousands of dollars of payments to many school districts across Pennsylvania every year.

Shopping for Electric Generation Service

Another important feature of the Pennsylvania electric industry is that the largest portion of every customer's electric bill is subject to competition. While the **distribution** of electricity is still a regulated monopoly service provided by a single electric utility in each service area, the **generation** of electricity and the sale of that generation to retail consumers are open to competition. Across Pennsylvania, the majority of business customers, including schools, are purchasing their electric generation from suppliers other than their local utility. While Pennsylvania utilities are still obligated to provide generation service to those customers who do not switch to an alternative supplier, most business customers have found that they can save money by purchasing their generation from alternative suppliers. Competitive suppliers are also able to offer different types of generation service, such as generation that comes exclusively from "green" or renewable sources. Importantly, the utilities' Act 129 energy

efficiency programs discussed above are available to all the utility's distribution customers whether they buy their generation from the utility or from a competitive supplier. In addition, some competitive generation suppliers offer energy efficiency services to their customers as well. The key point here is that whether a school buys its electric generation from its local utility or from an alternative competitive supplier, the benefits of energy efficiency remain. The less electricity the school uses every month, the lower the school's electricity bill will be. Information about electric shopping for business customers can be found at the website operated by the Pennsylvania Public Utility Commission at www.papowerswitch.com.[24]

Smart Meters

Finally, it should be noted that Pennsylvania's major electric utilities are in the process of replacing their customers' meters with more sophisticated "smart meters" that are capable of providing information about a customer's electricity usage throughout the day. This information can be of great value to customers to better understand and control their usage. Among Pennsylvania utilities, PPL and PECO are farthest along in this effort, but all major utilities will be required to install such meters for all their customers over the next decade. As these meters are installed, Pennsylvania consumers, including schools, can expect to have access to rates that vary by the time of day or the day of the week. These new rates could provide Pennsylvania schools with additional savings opportunities depending on how they use electricity throughout the day and over the course of the year.

Contacting an Expert for Guaranteed Energy Savings

A number of Pennsylvania school districts have turned to private Energy Service Companies (ESCOs) to help them reduce their energy costs. These companies often provide guaranteed energy savings to school districts under performance-based contracts. An ESCO will first perform an audit of the school building or buildings to determine which energy efficiency improvements would be most beneficial and cost-effective. A school district may then enter

[24] Pennsylvania Public Utility Commission (2013). PA Power Switch. Retrieved from: http://www.papowerswitch.com/

into a long-term multi-year contract with the ESCO which could be initially financed by the district through a bond issuance or municipal lease purchase. Under these contracts, the ESCO guarantees that all the costs of the program will be paid through the energy savings produced by the energy efficiency improvements. In other words, the energy savings must equal or exceed the costs of the project or the ESCO must pay the school district the difference. [25] The types of improvements provided under these contracts typically include lighting retrofits, HVAC modifications, and building envelope projects, and the ESCOs must meet strict evaluation, measurement, and verification tests to demonstrate they have met their savings guarantees. In Pennsylvania, these contracts can work in conjunction with utility Act 129 programs because equipment rebates and other benefits provided by those utility programs can increase the level of overall savings.

There are a number of ESCOs operating in Pennsylvania, many of whom are members of the Keystone Energy Efficiency Alliance (KEEA) and can be found on the KEEA Website at: http://keealliance.org/keea/members. The National Association of Energy Service Companies (NAESCO) also has a list of member energy service companies: http://www.naesco.org/organizations/. ENERGY STAR provides a list of their Energy Service & Product Provider Partners as well: http://www.energystar.gov/index.cfm?fuseaction=estar_partner_list.showPartnerSearch.

Other Programs for Pennsylvania Schools

In addition to the utility programs under Act 129, a number of other statewide and national programs are available to help Pennsylvania schools save energy.

Alliance to Save Energy PowerSave Schools Program and "Energy Hog" Challenge

The Alliance to Save Energy is a leading national energy efficiency organization that maintains a major focus on schools and students. The Alliance administers the **PowerSave**

[25] See U.S. Environmental Protection Agency (2011). Energy Efficiency Programs in k-12 Schools: A Guide to Developing and Implementing Greenhouse Gas Reduction Programs at page 32. Retrieved from: www.epa.gov/statelocalclimate/resources/strategy-guides.html

Schools Program, which, as noted above, has been utilized with great success by the North Penn School District in Montgomery County. The PowerSave program was also successfully implemented by the Propel Schools in Pittsburgh. The goals of the PowerSave program are to lower school energy costs through behavioral and operational changes; to strengthen student learning by integrating energy into the curriculum and using the school building as a learning laboratory; to engage students as advocates for energy efficiency in their homes and communities; and to introduce students to careers in energy efficiency and sustainability. The program works by teaming two teachers, who enlist students and custodians to be a part of the PowerSave team. The Alliance hires and trains a local project leader to provide support and assistance for two years. Funding for this program around the Nation is generally provided by utilities, municipalities, or the participating school districts.[26] In Pennsylvania, funding for the PowerSave program in both the North Penn School District and the Propel Schools in Pittsburgh was provided by Direct Energy, a major competitive electric generation supplier. To learn how to participate visit: http://www.powersaveschoolsnational.com/

The Alliance to Save Energy also operates a program called the Energy Hog Challenge. This program is comprised of a set of classroom activities that guide children through lessons about different sources of energy, how we use energy at home, and how to bust "energy hogs" to save energy.[27] Information and curriculum can be found at: http://energyhog.org/adult/resources/.

United States DOE EnergySmart Schools Program

The United States Department of Energy (DOE) works with schools on numerous projects. DOE provides technical assistance through the **EnergySmart Schools Program** at http://doe.cefpi.org/. DOE works with public and private entities to improve energy efficiency in new and existing K-12 school buildings. The goal for existing schools is to reduce energy consumption by 30 percent. The program provides a guide that discusses planning, designing, financing, operating and maintaining energy saving measures. In addition, the DOE Energy

[26] The Alliance to Save Energy (2013). PowerSave Schools Program. Retrieved from: http://www.powersaveschoolsnational.com/
[27] The Alliance to Save Energy (2011). Energy Hog Resources. Retrieved from: http://energyhog.org/adult/resources/

Information Administration provides no-cost and low-cost energy saving educational materials compiled by the National Energy Information Center.[28]

Pennsylvania Pathways to Green Schools

The Pennsylvania Department of Education operates a website called **Pathways to Green Schools** at http://www.pathwaystogreenschools.org/. This website provides links to a wide array of resources for Pennsylvania schools to start on the path to greater energy efficiency and sustainability. This includes current information on state programs and grants available to Pennsylvania schools as well as curriculum resources, energy saving tips, case studies and best practices from school districts around the state. The Pathways to Green Schools website also serves as the platform for information on the Green Ribbon Schools award program which is discussed below.[29]

State Funding and Loan Programs

Pennsylvania schools may obtain financial assistance to support energy efficiency investments through a number of programs. The **Alternative and Clean Energy (ACE) Program** is administered by the PA Dept. of Community and Economic Development (DCED) and provides grants or loans for a wide variety of renewable energy and energy efficient building technologies.[30] Eligible projects include: high performance buildings (i.e. LEED Gold or better projects), energy efficient HVAC, lighting, as well as clean energy systems such as biomass, wind, geothermal, and fuel cells.

Pennsylvania's State Public School Building Authority provides a broad range of low-cost financing options and services to Pennsylvania school districts, career/technical schools, and

[28] The Department of Energy (2013). Operating and Maintaing EnergySmart Schools: Web-based Training. Retrieved from: http://doe.cefpi.org/

[29] Pennsylvania Department of Education (2012). Pathways to Green Schools: Promoting Green and Sustainable Schools in Pennsylvania. Retrieved from: http://www.pathwaystogreenschools.org/

[30] Pennsylvania Department of Community and Economic Development (2013). Alternative and Clean Energy Program. Retrieved from: http://www.newpa.com/find-and-apply-for-funding/funding-and-program-finder/alternative-and-clean-energy-program-ace

community colleges in an efficient and cost-effective manner. The Authority's two main categories of financing include long-term financing options and revolving loans.[31]

Recognition and Awards for Schools

The United States Department of Education **Green Ribbon Schools** (ED-GRS) recognition program honors schools that are exemplary in reducing environmental impact and costs; improving the health and wellness of students and staff; and providing effective environmental and sustainability education, which incorporates STEM, civic skills and green career pathways. The recognition award is part of a larger Department of Education effort to identify and disseminate knowledge about practices that are proven to result in improved student engagement, higher academic achievement, graduation rates, and workforce preparedness, as well as a government wide goal of increasing energy independence and economic security. Schools must submit applications to their state's department of education, which then submits nominees for the federal award.[32] As noted above, Pennsylvania's platform for Green Ribbon Schools is the Pathways to Green Schools Website http://www.pathwaystogreenschools.org/. The 2012 Pennsylvania Green Ribbon Award Winners from the A.W. Beattie Career Center, Radnor Middle School, Thaddeus Stevens Elementary School, and Springside Chestnut Hill Academy are pictured below:

[31] Pennsylvania State Public School Building Authority (2013). Financing Options. Retrieved from: http://www.phefa.org/spsbamain.htm

[32] Pennsylvania Department of Education (2013). Pathways to Green Schools: Promoting Green and Sustainable Schools in Pennsylvania. Retrieved from: http://www.pathwaystogreenschools.org/

In 2013, the Pennsylvania Green Ribbon award winners were Albert M. Greenfield Elementary School in Philadelphia, Broughal Middle School in Bethlehem, Nazareth Area Middle School in Nazareth, and Westtown School in Chester County. The Lower Merion School District was recognized with a District Sustainability Award.

In 2013, the national Green Ribbon program in Pennsylvania was supplemented by an additional **Moving to the Head of the Class Award** from the KEEA Energy Education Fund (KEEF) that recognizes those Pennsylvania schools that have made the greatest progress in energy efficiency. KEEF selected schools from among the Pennsylvania Green Ribbon applicants to receive awards that included services and products for energy efficiency improvements donated by KEEA member companies. The 2013 award winners were Cook-Wissahickon School in Philadelphia; Northwest Pennsylvania Collegiate Academy in Erie; Riverside Elementary West School in Taylor; and Upper Perkiomen High School in Pennsburg. Schools receiving honorable mention were Spectrum Charter School in Monroeville and Environmental Charter School in Pittsburgh. Representatives of several of the honored schools are pictured below:

Another competition in which schools can take part is **EPA's National Building Competition**. In this program, competitors from a wide variety of commercial buildings implement energy efficiency improvements with help from EPA's ENERGY STAR program. All buildings that submit complete energy use data for the previous calendar year are invited to compete. Participants measure, track, and report their building's monthly energy consumption using EPA Portfolio Manager; make improvements to their building's energy performance; and report their progress. The building that demonstrates the greatest percentage-based reduction in energy use intensity over the contest period is recognized as the winner.[33] In 2013, this national competition was won by a school in New Jersey that reduced its energy usage by 52%.[34]

Additional Resources

- KEEA website Schools section under the Resources tab. Available at: http://keealliance.org/Schools
- EPA's Energy Efficiency Programs in K-12 Schools: A Guide to Developing and Implementing Greenhouse Gas Reduction Programs. Available at: http://www.epa.gov/statelocalclimate/documents/pdf/k-12_guide.pdf
- U.S. Department of Energy Lesson Plans: Lesson plans, labs, projects and other activities for K-12 on energy related topics. Available at: http://www1.eere.energy.gov/education/lessonplans/default.aspx
- National Energy Education Development (NEED) Lesson Plans: Curriculum materials, lesson plans and activities organized by subject and grade-level. Available at: http://www.need.org/curriculum-guides

[33] ENERGYSTAR (2013). National Building Competition. Web. Retrieved from: http://www.energystar.gov/index.cfm?fuseaction=buildingcontest.index

[34] "New Jersey School Cuts Energy Use 52%, Wins EPA's Building Competition", *Energy Manager Today* (24 April 2013). Web. Retrieved from: http://www.energymanagertoday.com/new-jersey-school-cuts-energy-use-52-wins-epas-building-competition-091265/?goback=%2Egde_67258_member_242542826

- National Renewable Energy Laboratory (NREL) Lesson Plans: Provides educational resources about renewable energy and energy efficiency technologies, including hands-on projects and curriculum. Available at: http://www.nrel.gov/education/educational_resources.html
- Alliance to Save Energy Lesson Plan: How Big is Your Carbon Footprint? (6-12). Available at: http://ase.org/Carbon%20FootPrint%20Lesson%20Plan
- Interactive Energy Hog program. Available at: http://energyhog.org/childrens.htm
- ENERGY STAR Building Upgrade Manual Chapter 10 – K-12 Schools. Available at: http://www.energystar.gov/index.cfm?c=business.EPA_BUM_CH10_Schools
- Interactive ENERGY STAR for Kids website. Available at: http://www.energystar.gov/index.cfm?c=kids.kids_index
- DOE's Interactive Kids Saving Energy website. Available at: http://www1.eere.energy.gov/kids/
- EIA's Energy Kids website. Available at: http://www.eia.gov/kids/
- PASchoolbids.com: a project of the PA Association of School Business Officials (PASBO) to assist schools in publicizing their purchasing needs. Available at: http://www.paschoolbids.com/
- Pennsylvania Department of Education's Pathways to Green Schools: Promoting Green and Sustainable Schools in Pennsylvania. Available at: http://www.pathwaystogreenschools.org/
- U.S. Green Building Council Center for Green Schools. Available at: http://www.centerforgreenschools.org/home.aspx
- Green Schools Alliance Green Cup Energy Challenge. Available at: www.greencupchallenge.net/GCEnergy

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