

Green Guide for Schools

Strategy: Energy

Reduce Energy Use in New and Existing Schools

Fast Facts-

- In the United States buildings account for: □
 - 72% of electricity consumption,□
 - 39% of energy use,□
 - 38% of all carbon dioxide (CO₂) emissions,□
 - 40% of raw materials use,□
 - 30% of waste output (136 million tons annually), and□
 - 14% of potable water consumption (USGBC, 2008; WBDG, 2009).
- Building “green” could cut CO₂ emissions by 35% in North America (CEC, 2008).
- Fewer than 4% of new buildings meet LEED standards (CEC, 2008).
- Heating, cooling, lighting and operating of commercial buildings account for about 1/3 of energy use from existing local power plants (OEQ, 2008).
- Worldwide, better insulation of buildings would save 1.6 gigatonnes of CO₂ emissions annually (Enkvist et al., 2007).
- Payback for insulating hot water pipes may take up to a year, but saves 150 pounds of CO₂ emissions and \$15 annually (Energy Saving Trust, 2009).
- Inefficient windows and doors in U.S. buildings waste \$40 billion each year, the amount of energy provided by the Alaska pipeline (Common Fire Foundation, 2009).
- White roofs can cut a building’s energy use by 20%; the average house would cut CO₂ emissions by 10 metric tons per year (San Francisco Business Times, 2008).

Actions for Schools:
Adhere to LEED standards in construction of new buildings.
Employ energy modeling programs early in the design process.
Think smaller; make building sizes appropriate to use.
Build for the site.
Orient buildings to take advantage of natural sunlight and breezes.
Utilize natural daylight by installing skylights and windows appropriately.
Plant trees to shade buildings in summer (see Strategy – Landscaping in land use and development section).
Install skylights and utilize natural daylight to reduce energy usage.
Use alternative energy sources for central heating, cooling and heating water (see Strategy – Use alternative energy sources).
Use roofing materials that provide maximum energy efficiency, such as “green” or “white” roofs.
Use only Energy Star appliances.
Install energy efficient windows and doors.
Use maximum insulation in walls (R-30), roofs (R-50), and floors and around hot water pipes.
Install water efficient fixtures.
Buy construction products locally.
Buy used and salvage materials when possible to reduce energy needed for new production.
For retrofitting existing buildings:
Install storm windows over existing windows.
Plug all leaks; install caulking or other draught-proofing around windows, doors and floors.

Resources:

Energy Star plus for New Schools- Southface

<http://www.southface.org/web/resources&services/schools/design-guide.htm>

Tips for building design-

Cool or white roofs <http://sciencenow.sciencemag.org/cgi/content/full/2008/916/4>

DOE - Buildings - energy data book <http://buildingsdatabook.eren.doe.gov/>

Green Building Initiative <http://www.thegbi.org/> Green roofs <http://www.greenroofs.com/>

Greener Buildings <http://www.greenerbuildings.com/news/2008/05/20/epa-recognizes-energy-efficient-building-designs>

NAHB – National Association of Home Builders

<http://www.nahb.org/generic.aspx?genericContentID=80110>

Schlumberger http://www.seed.slb.com/en/scictr/lab/engineer/energy_building.htm

US Green Building Council <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1935>

Whole Building Design Guide http://www.wbdg.org/design/minimize_consumption.php

Tips for energy reduction-

Energy Star (US EPA/ USDE) http://www.energystar.gov/index.cfm?c=about.ab_index.

Duke Energy <http://www.duke-energy.com/ohio/savings/lower-your-bill.asp>

Freeware for calculating building energy use and costs <http://www.doe2.com/>

Manage Heating and Cooling Systems**Fast Facts**

- About 86% of U.S. annual energy use is created by the combustion of fossil fuels (Energy Star 1, 2008).
- Total U.S. residential energy consumption is projected to increase 17% from 1995 – 2015 (Solar Energy International, 2008).
- The U.S. uses about 15 times more energy per person than the typical developing country uses (Solar Energy International, 2008).
- The average household spends 45% of its energy dollars (~\$1,000) on heating and cooling (DOE, 2008).
- Heating and cooling systems in the United States emit 150 million tons of carbon dioxide into the atmosphere each year (DOE, 2008).
- Geothermal systems use 50% less energy to heat homes and 25% less to cool them (Common Fire Foundation, 2008).
- For every degree you lower your thermostat in winter or raise it in summer, you cut 3% of your energy use (Consumer Reports, 2008).
- Proper use of programmable thermostats will save the average homeowner \$180 per year and eliminate 1.5 tons of CO₂ emissions (Energy Star 2, 2008; Consumer Reports, 2008).

Actions for Schools:

Use combined heating and cooling systems, rather than window air conditioners.

Use Energy Star certified heating and cooling systems.

Improve air conditioner efficiency of buildings to federally mandated standards of 30%.

Regularly maintain air conditioners, heat pumps and chillers.

Inspect all heat/air ductwork, piping, coils and fittings to ensure there are no leaks. Repair or replace if necessary.

Clean or replace air filters on heating/cooling systems monthly.

Install programmable thermostats on heat/ air units.

In winter, set thermostats between 66^o and 68^o F and lower at night. In summer, set thermostats between 76^o and 78^oF.

References:

DOE (U.S. Dept. of Energy). 2009. Energy Efficiency and Renewable Energy. Available from http://www1.eere.energy.gov/consumer/tips/heating_cooling.html (accessed January 22, 2009).

Energy Star 1. 2008. Fast facts on energy use. *In* Energy Star [database online]. Available from http://www.energystar.gov/ia/business/challenge/learn_more/FastFacts.pdf (accessed 01/13/2009).

Energy Star 2. 2008. Programmable Thermostats. *in* Energy Star [database online]. Available from http://www.energystar.gov/index.cfm?c=thermostats.pr_thermostats (accessed January 20, 2009).

Reduce Energy Use by Equipment / Appliances**Fast Facts**

- Appliances account for about 20% of a household's energy consumption, with refrigerators, clothes washers, and clothes dryers at the top of the consumption list (DOE, 2008).
- Since their inception, Energy Efficiency Ratio (EER) standards have saved consumers over \$200 billion, about \$2,000 per household, while cutting electricity use 5% (NRDC, 2004).
- Energy Star appliances use 10-50% less energy than a standard appliance, saving almost \$80 a year (Common Fire Foundation, 2008).
- If just 1 in 10 homes used Energy Star appliances, the change would be like planting 1.7 million new acres of trees (Common Fire Foundation, 2008).
- If all computers sold in the United States meet the ENERGY STAR requirements, the savings in energy costs will grow to about \$2 billion each year and greenhouse gas emissions will be reduced by the equivalent of those from 2 million cars (Energy Star, 2009).
- A typical laptop uses 15 watts of energy, while a typical desktop uses 130 watts (Lance, 2007).
- Refrigerators with freezers on top use 10-15% less energy than a similar side-by-side model (NRDC, 2004).
- A water heater blanket saves over 400 pounds of CO₂ emissions and \$55 per year, but costs only about half that amount (Energy Saving Trust, 2009).
- Adding a heat trap to your water heater will save about \$15-30 on your water-heating bill annually, so has a payback time of 1-2 years (DOE, 2008).

Actions for Schools:
Upgrade to Energy Star appliances.
When comparing similar units, buy the one with the higher EER rating.
Unplug appliances and equipment when not in use.
Adjust computer sleep modes to turn on more quickly; screen savers use as much energy as word processing.
Use laptops instead of desktop computers when possible; they save 80-90% in energy.
If window air conditioners must be used, use the appropriate size.
Demand Energy Star vending machines at your place of employment.
Encourage staff to turn off PCs, monitors, printers, copiers and lights every night and weekends. If the entire computer systems cannot be turned off, turn off monitors and printers.
Install heat traps and water heater blankets on water heaters.
Use refrigerators with automatic moisture control.
When possible, choose appliances that run on natural gas rather than electricity – no efficiency is lost to transport from power plants.

Resources:

Energy Star for K-12 School Districts

http://www.energystar.gov/index.cfm?c=k12_schools.bus_schoolsk12

Fast Facts on Energy use http://www.energystar.gov/ia/business/challenge/learn_more/FastFacts.pdf

Appliances

Commercial equipment standards - US DOE-

http://www1.eere.energy.gov/buildings/appliance_standards/residential/central_ac_hp.html.

Moisture control refrigerators-

<http://www.nextag.com/Amana-ATB1932MR-19-cu-556029173/prices.html>

Incentives

Rebates for Energy Star products- http://www.energystar.gov/index.cfm?fuseaction=rebate.rebate_locator

http://www.pnm.com/rebates/energy_star_builder.htm

http://www.energystar.gov/index.cfm?fuseaction=CFSrebate.CFSrebate_locator

Energy Star 1. 2008. Office equipment; computers. *In* Energy Star [database online]. Available from

http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CO

(accessed 01/13/2009).

Energy: Electricity/Lighting

“The economic benefits for municipalities to invest in LEDs are clear – they save energy, reduce environmental impact and improve the quality of light.”

(Charles Meeker, Raleigh mayor; The Energy Blog)

Fast Facts

- Lighting accounts for 20-25% of the electricity used in the US (Flex your power, 2009).
- Ohioans spend about 10% of their household energy budget on lighting (Alliance to Save Energy).
- If Ohio households replace the four most-used bulbs with CFLs, they will save \$120 over the life of the bulbs (Alliance to Save Energy).
- LED holiday lights save 10 to 100 Killowatt hours of energy and \$1 to \$10 per strand Consumer Reports, 2007).
- If everyone in the U.S. switched inside and outside holiday lights to LEDs, the savings would be \$250 million per year (Britt, 2008).
- Vancouver’s replacement of mercury vapor street lights with high pressure sodium ones saves the city \$600,000 per year (Rocky Mt. Institute).
- Denver’s replacement of incandescent pedestrian and traffic signals with LED lights saves the city \$360,000 per year and allowed it to earn \$500,000 in rebates from the local utility company (Southwest Energy Efficiency Project).

Actions for Schools:
Reduce or replace inefficient lighting in buildings, and exit signs in parking lots.
Replace T8 ballasts with T12 ballasts in fluorescent tubes.
Replace incandescent exit signs with LED exit signs.
Install timers or occupancy sensors to turn off lights when rooms are unoccupied.
Replace incandescent bulbs with more efficient bulbs such as compact fluorescent lighting (CFLs) or LEDs.
Install lighting sensors to turn off outdoor lights.
Take advantage of natural daylight when possible to reduce lighting cost

Web Resources:

Greening Schools-Energy Efficiency-Lights

http://www.greeningschools.org/resources/view_cat_admin.cfm?id=86

The NEED Project-Putting Energy into Education <http://www.need.org/>

SEE Schools for Energy Efficiency <http://www.seeprograms.com/overview.htm>

Tips to save energy and money-

Consumer energy Center <http://www.consumerenergycenter.org/tips/index.html>

Duke Energy <http://www.duke-energy.com/ohio/savings/lower-your-bill.asp>

Rocky Mountain Institute <http://nc.rmi.org/Page.aspx?pid=217&srcid=217>

Salt River Project- Phoenix <http://www.srpnet.com/energy/biztips.aspx>

Save warm. save money <http://www.energysavers.gov/tips.html>

Tips for energy reduction from Energy Star (US EPA/ USDE)

http://www.energystar.gov/index.cfm?c=about.ab_index

Energy Efficiency: Management for Energy Efficiency

"The most cost effective means of meeting our energy needs whilst tackling climate change is by using energy more efficiently and utilizing renewable energy." (Towards Sustainability, 2009)

Fast Facts

- Government agencies spend more than \$10 billion a year on energy to provide public services and meet constituent needs (ENERGYSTAR, 2009).
- Retail companies spend nearly \$20 billion on energy each year (Energy Star, 2009).
- Operations and management programs targeting energy efficiency can save 5% to 20% on energy bills without significant capital investment (DOE, 2007).
- Save Energy Now energy assessments have helped manufacturing plants save over \$2 million, equal to 8% of their energy costs (DOE, 2008).
- Ford Motor Company has saved over \$75 million through effective energy management (Energy Star).
- Tax incentives could reduce energy bills by \$27 billion

Actions for Schools:
Develop an energy management plan.
Take advantage of federal and state incentives for energy efficiency upgrades for building structure, and cooling systems and weatherization programs.
Encourage staff to turn off PCs, monitors, printers, copiers, and lights every night and every weekend. If computer can't turn off, turn off the monitor and the printer.
Form a local 'save energy' partnership.
Provide incentives for energy saving innovation.
Create a 'wall of pledges' for individuals to commit to conserve energy.

References:

DOE, EERE. 2007. Operations and maintenance. In EERE online database, available from

http://www1.eere.energy.gov/femp/operations_maintenance/index.html (accessed January 21, 2009).

DOE, EERE. 2008. Energy assessments. In EERE online database, available from <http://www1.eere.energy.gov/industry/saveenergynow/assessments.html> (accessed January 21, 2009).

Energy Star. Fast facts on energy use. in Energy Star [database online]. Energy Star, 2008 [cited 01/13 2009]. Available from http://www.energystar.gov/ia/business/challenge/learn_more/FastFacts.pdf (accessed January 13, 2009).

Michigan School Business Officials-Energy Management
http://www.msbo.org/services/energy/energy_management.shtml

Ohio Energy Project <http://www.ohioenergy.org/mission.html>

Ohio Department of Development –Energy Efficiency
<http://development.ohio.gov/cdd/oeo/BuildOperandFacManag.htm>