

Ideas on How Schools Can Reduce their Carbon Footprint

Changes Schools Can Make to their Building Operations, Management and Equipment to Reduce their Energy Consumption and Save Money

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Overview of presentation

- **School Energy Use and Costs**
- **Energy Efficiency Programs**
- **Low and No-Cost Changes to Improve Efficiency**
- **Lighting**
- **Maintenance**
- **Mechanical Improvements/Upgrades**
- **Minnesota Schools Cutting Carbon Project**

Energy Efficiency

- **Energy Efficiency Should**
 - Improve Economical Efficiency
 - Promotes Well-Being of the Occupants
 - Incorporates the Environment
- **Energy Efficiency Should Not**
 - Reduce safety, health, security or comfort

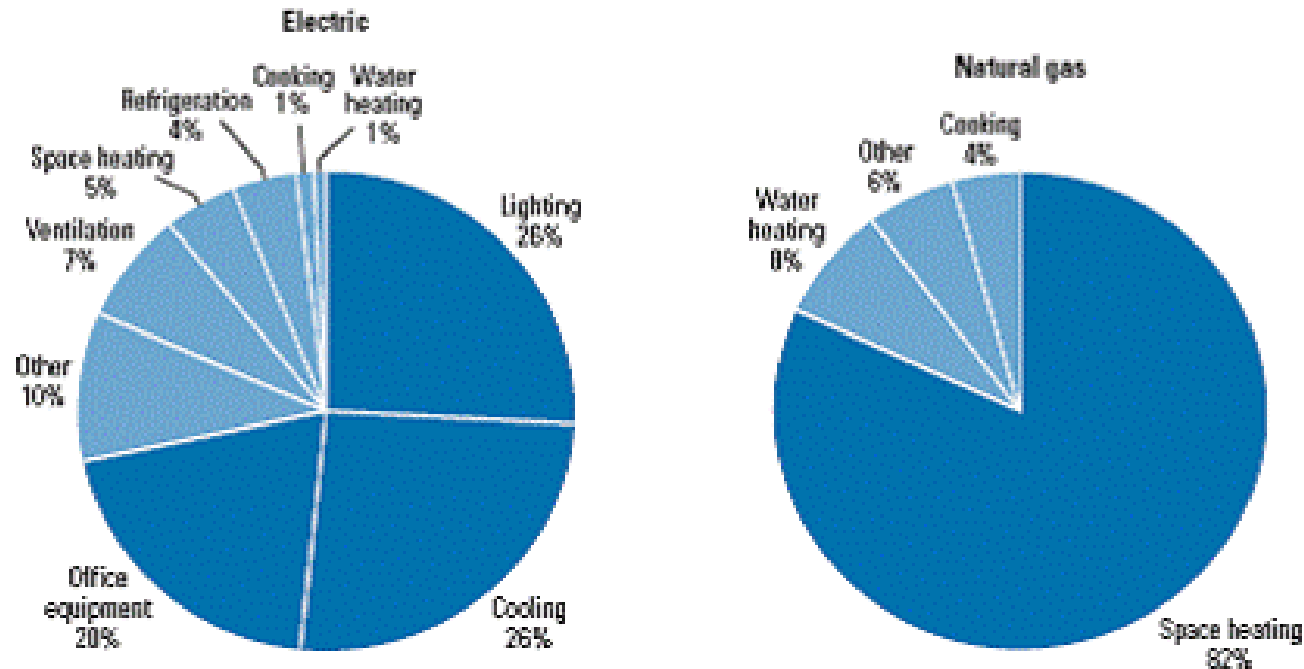
School Energy Costs

- **Typical Costs of Energy per year for Schools**
 - Elementary Schools
 - \$70,000 to \$150,000
 - Middle Schools
 - \$100,000 to \$200,000
 - High Schools
 - \$200,000 to \$650,000
- **Just a 10% Reduction can result in \$7,000 to \$65,000 in savings per year**

Source: USGBC

Figure 10.1: Electric and natural gas end-use profiles for educational facilities

Most of the electricity consumed by educational facilities is used for lighting, cooling, and plug loads such as computers and copiers; most of the natural gas is used for space heating. Each school's energy profile is different, so these charts are not representative of all schools. For example, school buildings in warmer climates will tend to show a larger share of electricity used for space cooling than those in cooler climates.

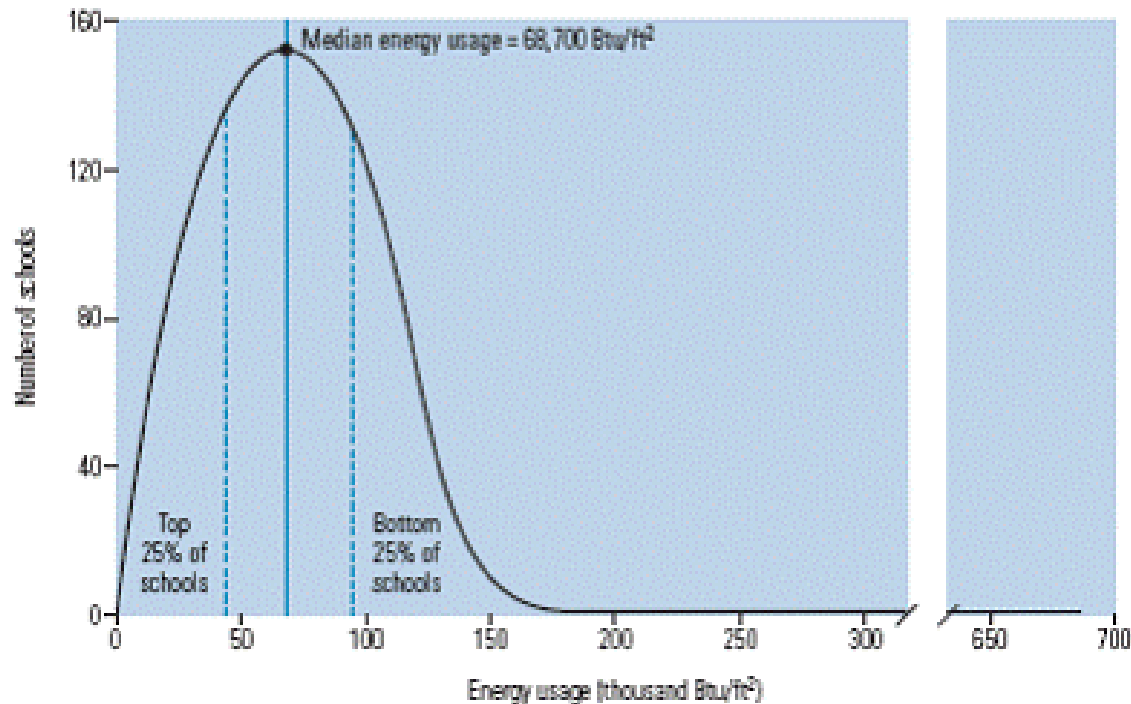


Courtesy: E source; from Commercial Building Energy Consumption Survey, 1998 data

Source – Energy Star Building Use Manual

Figure 10.2: Distribution of energy intensity in school buildings

This curve shows the overall distribution of energy use intensity among a national sample of K–12 school buildings. By fitting a curve to the survey data, we can see that most schools tend to cluster around the median energy use intensity of approximately 68,700 Btu per square foot (ft²) from all energy sources. Many school buildings are significantly more energy-intensive than the median.



Courtesy: E source; from Commercial Building Energy Consumption Survey, 2009 data

Source – Energy Star Building Use Manual

Why Implement Energy Efficiency Changes?

- **America's Schools spend more than \$7.5B annually on energy – more than textbooks and computers combined! [Source – Energy Star Building Manual for Schools]**
- **As much as 25% of building energy is wasted! [Source – USGBC]**
- **Energy Costs can be reduced by 5%-20% by effectively managing, maintaining and operating school physical plants regardless of school age. [Source: US DOE Guidebook - School Operations and Maintenance: Best Practices for Controlling Energy Costs]**

Why Energy Efficiency Programs are Avoided

- **Energy Costs Represent Only 2-4% of a district's budget**
 - Administration officials may be tempted to pay little attention to managing or monitoring energy costs at a facility level
- **Lack of perceived technical expertise**
- **Perception that Efficiency Programs are expensive (i.e. require new equipment).**

Low Cost Changes to Improve Efficiency

- **Create and communicate an energy policy. 1-3% reduction [Source – USGBC]**
 - Roles and responsibilities
 - Temperature set points
 - Use of computers
 - Holiday shutdown guidance
 - Benchmarking – what gets measured gets done – Energy Star Portfolio Manager
- **Assign staff responsibilities for common areas (hallways, cafeterias, restrooms, locker rooms, etc). 1-6% reduction [Source – USGBC]**

Low Cost Changes to Improve Efficiency

- **Control Classroom Thermostats. 1 degree = 1% energy cost [Source – USGBC]**
- **Establish a plan for plug-in management 1-3% reduction [Source – USGBC]**
 - Plugs from computers and copiers represent about 20% of electricity used in a school. [Source – Energy Star]
 - PC Power Settings
 - Vending Machine Misers
 - Equipment Purchases (refrigerators, kitchen, water heater)

Low Cost Changes to Improve Efficiency

- **Keep Doors and Windows Closed and Inspect Dampers. 1-6% Reduction [Source - USGBC]**
 - Most buildings are designed for positive pressure. Openings in the buildings causes conditioned air to vent to the outside.
- **Shut off Exhaust Fans when not in use.**
 - Shop classrooms, kitchens, restrooms, etc.
- **Use a cover on a heated pool when not in use. 50 - 70% reduction of pool energy costs [Source – Energy Star]**

Lighting Changes

- 1. Utilize Day-Lighting whenever possible.**
 - 45-footcandles is acceptable for most school tasks
- 2. Change from T12 fluorescent lamps to T8 and electric ballasts. – Up to 35% lighting energy reduction [Source – Energy Star Building and Use Manual]**
- 3. Change to CFLs where possible. Up to 66% lighting energy reduction per lamp. [Source – Energy Star Building and Use Manual]**
- 4. Change from metal halide and sodium lamps in gymnasiums to High-Intensity Fluorescent Lamps in combination with occupancy sensors.**

Lighting Changes

- 1. Change to light-emitting diodes (LEDs) in exit signs. Last 25 years longer**
- 2. Utilize occupancy sensors for lighting.**
- 3. Turn off outside lighting (12am-6am). National Crime Prevention Council found that a dark or lit school does not deter larcenies and a dark campus actually deters vandals. [Source – USGBC]**

Key Maintenance Activities

- **Filter Changing**
- **Fan Belt Replacement**
- **Coil Cleaning**
- **Duct Leak checks**
- **Boiler maintenance – pipe insulation, steam traps, etc.**
- **Inspection outside air systems**
- **Understand building automation system**

Mechanical Improvements/Upgrades

- **System Controls (occupancy sensors, CO2, etc)**
- **Variable Speed Drives for electric motors**
- **Upgraded AC Systems**
- **Upgraded high efficiency boilers**
- **Install a flue gas analyzer for boiler system adjustments**
- **Repair leaking steam traps**
- **Heat Recovery Systems**

Opportunities for Student Involvement

- **Participate on a energy efficiency team**
 - Assist in energy walkthroughs
 - Create efficiency programs/awareness “Turn off the light campaigns”
- **Encourage changes to energy management**
 - Vending machine use, PC power settings, etc.

ERM's Role in Schools Cutting Carbon Project

- **Developing carbon footprints and conducting audits to identify opportunities to reduce impacts and costs at 100 schools**
 - School visits start in March
- **Working with school energy teams, will track impacts over time**

More Information

- **ENERGY STAR for K-12 School Districts**
 - <http://www.energystar.gov/k-12>
- **USGBC Webinar Series – Energy Efficiency Strategies for Schools**
 - <http://www.usgbc.org/webinars>
- **Minnesota Schools Cutting Carbon website**
 - <http://schoolscuttingcarbon.org>