SAVING ENERGY AND MONEY THROUGH BEHAVIORAL CHANGE

STEAMBOAT SPRINGS SCHOOL DISTRICT GUIDE FOR FACULTY, STAFF, AND STUDENTS

This guide focuses on behavioral changes that faculty, staff, and students can make to raise awareness about energy use and increase energy efficiency in our schools. The document begins by defining where energy is used at school and outlines how to reduce energy use in the classroom and throughout a school through simple changes in behavior.

To be truly effective, this guide should be used in conjunction with a review of district-wide energy systems and policy.

Why should we make Steamboat Schools more energy efficient?

Energy costs are second only to personnel costs as the leading draw on K-12 school district operating budgets, totaling approximately $8 billion annually nationwide. An estimated $2 billion of that total can be saved by improving energy efficiency in K-12 schools, an amount equivalent to the cost of nearly 40 million new textbooks. As a result, many school districts are taking steps to improve the energy efficiency of their school buildings. Along with achieving significant energy cost savings, investing in energy efficiency can produce environmental, economic, and educational benefits (U.S. EPA 2011).

SCHOOL ENERGY EDUCATION 101

Steamboat schools, like almost all schools around the country, have an increase demand for energy use with a static or decreasing budget. This increase in demand comes from greater use of technology in schools, aging buildings and HVAC systems, and lack of budget for facilities upgrades and proactive maintenance.

The first step in energy conservation is understanding the equipment and processes that require the greatest energy demand. The following section defines energy demand in schools. However, this is not a comprehensive discussion of energy use across the district but focuses on energy use that can be reduced through behavioral changes.
Common appliances and electronics energy demand

Although appliances and electronics are not the highest consumers of energy, modifying behaviors associated with appliance and electronic use is easy with quick results in cost savings. The following table includes common appliances and electronics found in schools and their energy demands.

<table>
<thead>
<tr>
<th>Appliance/Electronics</th>
<th>KW hrs/yr</th>
<th>Annual cost (per appliance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vending Machine</td>
<td>3,500</td>
<td>$280</td>
</tr>
<tr>
<td>Copier (large)</td>
<td>1,000/2,800*</td>
<td>$80/$224*</td>
</tr>
<tr>
<td>Refrigerator</td>
<td>1,044</td>
<td>$84</td>
</tr>
<tr>
<td>Microwave oven</td>
<td>720</td>
<td>$58</td>
</tr>
<tr>
<td>Toaster oven</td>
<td>441</td>
<td>$35</td>
</tr>
<tr>
<td>Copier (small)</td>
<td>375/1,038</td>
<td>$30/$83*</td>
</tr>
<tr>
<td>Monitor awake</td>
<td>216</td>
<td>$17</td>
</tr>
<tr>
<td>CPU awake</td>
<td>173</td>
<td>$14</td>
</tr>
<tr>
<td>Laser Printer</td>
<td>175/550</td>
<td>$14/$44*</td>
</tr>
<tr>
<td>36&quot; TV</td>
<td>96</td>
<td>$8</td>
</tr>
<tr>
<td>Clock radio</td>
<td>88</td>
<td>$7</td>
</tr>
<tr>
<td>Flat screen</td>
<td>86</td>
<td>$7</td>
</tr>
<tr>
<td>27&quot; TV</td>
<td>81</td>
<td>$7</td>
</tr>
<tr>
<td>Laptop</td>
<td>72</td>
<td>$6</td>
</tr>
<tr>
<td>CPU asleep</td>
<td>65</td>
<td>$5</td>
</tr>
<tr>
<td>19&quot; TV</td>
<td>63</td>
<td>$5</td>
</tr>
<tr>
<td>Monitor asleep</td>
<td>43</td>
<td>$3</td>
</tr>
<tr>
<td>DVD Player</td>
<td>23</td>
<td>$2</td>
</tr>
<tr>
<td>Smart Board</td>
<td>2</td>
<td>&gt;$1</td>
</tr>
<tr>
<td>Coffee maker</td>
<td>1</td>
<td>&gt;$1</td>
</tr>
</tbody>
</table>


* Off at night/On 24-hours

Stand-by Power

A surprisingly large number of electrical products—from copiers to computers cannot be switched off completely without being unplugged. These products draw power 24 hours a day, often without the knowledge of the consumer. We call this power consumption "standby power." According to Lawrence Berkeley National Laboratory, in particularly inefficient designs, the stand-by power use can be as high as 15 or 30 watts. For a single appliance, this may not seem like much, but when we add up the power use of all the electronics and appliances used in a school, the power consumption is substantial. Almost any product with an external power supply, remote control, continuous display (including an LED), or battery charging will draw power continuously.


**Lights and Lighting**
Throughout their life cycle, the single largest environmental impact of lighting systems is their energy use. In many schools, lighting accounts for as much as 50% of the electricity used by the school. Minimizing the electrical energy used for lighting depends on four steps:

- Design the lighting for adequate light levels and lighting quality
- Select highly efficient equipment
- Implement daylight harvesting strategies to reduce electric lighting when daylighting is present, and
- Implement occupancy controls to reduce electric lighting in unoccupied spaces (Davis 2011).

Two of these four steps can be assisted by changes in behavior – daylighting and occupancy controls. In addition, other simple changes, like adjusting lighting for adequate light levels through delamping, can be made without large costs or mechanical work.

Below are a few definitions used in the discussion about lighting and energy efficiency.

**Daylighting:** Daylighting is the practice of placing windows or other openings and reflective surfaces so that during the day natural light provides effective internal lighting. Particular attention is given to daylighting while designing a building when the aim is to maximize visual comfort or to reduce energy use. Energy savings can be achieved either from the reduced use of artificial (electric) lighting or from passive solar heating or cooling. Artificial lighting energy use can be reduced by simply installing fewer electric lights because daylight is present, or by dimming/switching electric lights automatically in response to the presence of daylight, a process known as daylight harvesting.

**Adequate light levels:** According to the Illuminating Engineering Society's and the National Electrical Code's current recommendations, for general room lighting, a level of 50-60 footcandles should be provided at all student stations within the room and at the instructor area. Although low light levels are often acknowledged as a problem, too much lighting also can create difficulties (e.g. glare, reflection, eye strain, etc.). General lighting should be uniformly distributed throughout the room, with no noticeable pooling or hot spots.

**Delamping:** delamping is defined as permanently removing or reducing the total number of light bulbs - properly called lamps - in fixtures throughout the building. Changing the lamps and the ballast of existing light fixtures to reduce electricity is a permanent delamping strategy.

**Heating, Ventilation and Air Conditioning**
In most parts of the country, heating and cooling systems, along with ventilation systems (HVAC), use more energy than any other systems in a school. Ventilation systems are necessary to provide fresh air and remove stale air and indoor air pollutants. Between 52–
72 percent of the average school district’s energy bill is used to keep schools at comfortable temperatures, provide hot water, and provide fresh air for the buildings.

Thermostats often control heating and cooling systems in the building. Thermostats can be set for the desired temperature in the rooms. A thermostat is basically an “on-off” switch. In the heating season, when the temperature in a room falls below the setting, heat is delivered to the room. During cooling season, cool air is delivered in the same way.

Many school districts control how high or low the temperature can be set in different rooms. The most advanced systems use central computers to control heating, cooling, and ventilation. Temperature sensors in the rooms send information back to the computers, which adjust the temperature in the rooms to pre-programmed levels. They automatically control the temperature of buildings for time of day and can save energy and money.

During heating seasons, for example, they can lower the temperature at night and weekends when no one is in the buildings. If requested, the building operator can adjust the program to provide heat and cooling outside of regular building hours for sporting events, meetings, or concerts.

It is important that faculty, staff, and students understand about energy use for heating, air and ventilation. Even if school buildings have energy efficient systems, a lot of energy can be wasted if the energy is not managed wisely.

**Energy Myths**

Another important piece of understanding energy demand is debunking energy myths. Energy myths are the “facts” that you hear about electricity use, light and heat that might seem true but usually are not. Below are the common energy myths you might have heard and the truth behind the myths.

**Energy Myth 1 - It doesn’t use that much energy to leave my computer on:** The U.S. EPA estimates that over 11 billion kilowatt-hours (kWh) could be saved through computer monitor power management. This would amount to $935 million per year saved at 8 cents/kWh, enough energy to power over one million households for a year, and CO₂ reductions equivalent to preventing the emissions from 1.5 million cars or planting 2.5 million acres of trees.

**Energy Myth 2 – Leaving a fluorescent light turned on is cheaper than turning it off and on:** You should turn off your fluorescent lamps if the space is not going to be occupied for more than a few minutes (3-5 minutes is a good rule of thumb). The modern electronic ballast and T8/T5 lamp combination do draw a higher level of current during startup, but it only lasts for a fraction of a second, which is negligible compared to normal current requirements of the lamps.

**Energy Myth 3 – Keeping your thermostat at the same temperature day and night uses less energy than turning it down at night and heating your home up again in**
the morning:  Wrong!  It takes less energy to warm up a cold building in the morning
than it does to maintain a constant temperature throughout the night.

Energy Myth 4 – The higher you set your heater’s thermostat, the faster your room
will heat up: Wrong!  It will take the same amount of time for the temperature to reach
70 degrees whether the thermostat is set at 70 or 90 degrees. Setting the thermostat all the
way up only wastes energy and increases your heating costs.

GETTING IT DONE
Saving Energy - Saving Money

You now have a better understanding of where and how energy is used in schools. The
following list provides the next steps to:

1. Identify the specific energy demands of each school
2. Commit to making change
3. Make a plan
4. Put the plan into action
5. Celebrate progress

Identify Energy Demands

The best way to identify energy demands is through an energy audit. This can be done
through a formal process or simply by walking around the school and taking notes.
Conducting an energy audit is a great opportunity for a student group, class, or interested
teachers to learn more about the specific energy use of the building. (See resource list at
the end of this document for examples of audits.)

Whether the audit is a formal or informal process, here are the energy demands to be
should be looking for:

- High energy demand appliances/electronics
  - Number and location of vending machines
  - Number and location of refrigerators
  - Number and location of microwaves
  - Teacher’s lounge – are there a lot of different appliances that aren’t being
    used frequently (multiple microwaves, coffee makers, toasters, etc.)?
  - Are banks of computer’s being shut-off at night?
  - Do copiers go into sleep mode and are they on timers so they turn off at
    night and on weekends?
  - Are computers, smartboards, and document cameras on a powerstrip?
- Items that affect lighting
  - Are there shades on windows?
  - Is the lighting adequate (too high or too low) for the activity of that room?
  - How often is the room used?
• Items that affect temperature
  o Are rooms a comfortable temperature?
  o Are outside doors sealed properly?
  o Are outside doors/windows being used to control temperature in a room?
  o Are there cracks in outside windows?

Make a Plan

Conducting an audit will develop a better sense of the energy demands in each school. It is now time to make a plan for changing behavior to reduce energy use. The most cost savings will be seen if a plan is made on a district-wide level but this can be done school-wide or even by classroom.

Making a plan on the district level provides consistent messaging to each school and identifies energy and cost savings as a priority for the district. Many school districts prepare a district-wide energy plan that defines how the district will use energy efficiently (see resource list for example of a district-wide energy plan). Below are examples of guidelines included in an energy plan:
  o Guideline for temperature reduction on weekends and holiday breaks.
  o Policy on acceptable temperature settings. Temperature ranges can vary depending on the functions of the rooms. Gymnasiums, for example, don’t need to be heated as much as classrooms. Auditoriums, hallways, store rooms, and other infrequently used rooms don’t need to be heated and cooled as much, either.
  o Schedule for all computers, copiers, and other office equipment in the district to be turned off at night, on weekends, and during holiday breaks.

None of these energy saving behaviors require a lot of work, money or time. And most people are willing to make these simple changes in their building, classroom, or office. It is just a matter of raising awareness and educating staff. Take the time to talk about the benefits of saving energy and the energy demands in the school. Here are some examples of ways to motivate faculty, and staff to make changes to save energy and money.

• Discuss these behaviors district-wide to develop a consistent message between schools.
• Get buy-in from custodians and maintenance staff. A lot of the energy-saving school-wide changes depend on them. They know the buildings, HVAC systems, and school schedule better than anyone else and will appreciate being included in the discussions about how these changes will be made.
• Identify a teacher or faculty member who will work as the “energy champion” for each school. He/she is responsible for monitoring energy use, education, and keeping everyone motivated.
• Present this information at staff meetings. Plan together how to make these changes.
• Track energy use from year to year to show progress.
• Reward energy savings. In some school districts, reduction in energy use is tied to a monetary reward. The schools that are greatly reducing their energy use are giving a check and the faculty and staff of that school decide how the money is spent.

Plan into Action

With a plan in place, it is time to move into action. Below is a list of suggestions for school and classroom to reduce energy use.

School-wide
• Work with maintenance and facilities staff to develop a schedule for lighting. When the custodian arrives in the morning or works after school is closed, she/he does not need to turn on all lighting but can turn only lights necessary for cleaning and set up/break down.
• Work with teachers and staff to reduce the number of vending machines, refrigerators, microwaves, and nonessential appliances in the school.
• Please let your maintenance/facilities staff know if windows are cracked or doors are not properly sealed so they can be fixed.
• Rooms and areas with windows in direct sunlight can be equipped with blinds to help control temperature—closed in cooling months and opened in heating months when sunlight is on them.
• Teacher’s lounge/Copy room
  o Reduce the number of appliances.
  o Get appliances onto a powerstrip to reduce standby power at night, on weekends, and during breaks.
  o Ensure that copiers have a standby mode and get copiers and office equipment on timers so they turn off on weekend and holiday breaks.
• Use daylighting wherever possible to reduce the number of lights on in hallways, common areas, and offices.
• Windows and doors should be closed when the heating and cooling systems are operating.

In the Classroom
• Make these changes part of the routine in the classroom and get students involved. This work can be tied to curriculum for many grade levels and provides a great opportunity for place-based education.
• Make sure the lights are turned off in your classroom when the room is empty. At the elementary schools, assign the lights as a job for a student each day. It is the student’s job to make sure the lights are off when everyone is leaving the room (lunch, specials, recess, etc.).
• Use the shades as a way to manage light and heat. This could also be a student job at the elementary schools. The student is responsible to open the shades in the morning, close them at night, and monitor them during the day to help regulate light and temperature in the room.
Almost every room has a powerstrip for the computer and document camera/smart board. Make sure the powerstrip is in a location that is easily accessible and remember to turn it off at the end of the day.

Are there extra appliances in a classroom that don’t use all of the time (microwave, mini-fridge)? Unplug them when not in use!

Please don’t open outside door or window to heat or cool a room when either the heat or air conditioning is running. If the room temperature is uncomfortable, let maintenance know so that the problem can be fixed.

**Celebrate Progress**

Once cost savings from these behavioral changes are evident, it is really important to track these saving and celebrate. Documenting the progress within the district provides a continual reminder to faculty and students to conserve energy. In the community, much of the school-related news is about budgets and budget-cuts. It is great publicity for the schools and the district to show active participation to reduce costs without impact teachers or student programming! The following are different forms of communication that can be used to promote an energy conservation program.

- Posters and notices around the school
- Emails to faculty and staff
- Newsletters that go home to parents
- Articles and press releases to local media

Another way to keep schools motivated to continue these changes is through a challenge. In this town especially, there is nothing more motivating than a little competition! Last year the High School EcoClub, Groundworks Colorado and YVSC started the Take-Charge Challenge and we hope to make this an annual event. During the Challenge, the four schools in the district compete to see which school can reduce its energy use by the greatest amount. **This year, the Challenge is scheduled for January 28th through February 15th.**

The Take-Charge Challenge is a great time to reiterate energy saving behaviors and celebrate the work being done to reduce energy use.

**CONCLUSION**

Reducing energy use in schools is one of the easiest ways to save money and the benefits go beyond the bottom line to create a healthier learning environment. Immediate energy and cost savings can be seen with simple changes in behavior. Significant cost savings will be achieved when these behavioral changes are used in conjunction with district-wide energy policy and energy efficient upgrades to aging lighting and HVAC systems.
RESOURCES

The following are a list of documents referenced in this guide and provided at the end of this guide. Please contact the Yampa Valley Sustainability Council for additional material or assistance in helping reduce energy use at your school.

- District Energy Plan – Bullitt County School District, Sheperdsville, KY
  http://www.bullittschools.org/wp/departments/support-services/facilities/energy/energy-plan/
- Elementary School Energy Audit from Green Schools Initiative
  (http://greenschools.net/article.php?id=99)
- Poster for Take Charge Challenge
- Take Charge Checklist
District Energy Plan

Objective

In accordance with Policy 05.23 Energy Management, Bullitt County Public School District shall use energy resources in a safe and efficient manner with an on-going focus on identifying and implementing cost saving measures and developing staff and student commitment to identified energy management practices.

We shall implement these principles by demonstrating community leadership, collaborative planning and by adopting best energy management practices. We shall establish goals, objectives and indicators; conduct an annual self-evaluation of our progress; and communicate regularly with the Bullitt County Public School community.

Responsibility

Faculty, staff and students must use energy wisely. Everyone must turn off lights when rooms are not in use. Each person is responsible for turning off energy using devices such as office equipment when they are not being used. One should not assume that someone else will do it. Occupied space temperature set points shall be maintained at the temperatures set forth in this plan. Windows and exterior doors must be kept closed to prevent the loss of conditioned air. Faculty, staff and students should report inoperable equipment to Maintenance and wasteful practices to the Energy Manager so corrective action can be taken. The Energy Manager will monitor utility usage and strive to promote and implement the guidelines outlined in this plan.

General Guidelines

Temperature — To maintain reasonable comfort and lower energy expenditures, the school district has established the following standards for comfort heating and cooling. Summer thermostat settings (air conditioning) during occupied periods are to be 72–74°F. Winter settings (heating) during occupied periods are to be 68–70°F. Exceptions to these guidelines must be approved by the Energy Manager. To properly sense temperature in rooms, areas around thermostats must be clear of computers, televisions, and other electric appliances that give off heat.
Additionally, supply air vents must be clear of obstructions such as flags, banners, signs, etc., that may interfere with the design airflow which in turn affects occupant comfort.

**Request for Heating and Air-Conditioning** — The district strives to use resources in an efficient manner by setting temperatures back in schools during unoccupied periods. Thermostats are to be set back to 80 °F for cooling and 62 °F for heating. When activities are planned outside of the normal school operating hours, local overrides may be used or a request for heat/air-conditioning submitted to the Energy Manager via the maintenance workorder system.

The workorder should be submitted at least two (2) business days in advance of the event and must include the date(s), start/end times and area of the school to be used.

When a large crowd is expected for areas such as gymnasiums, it is advisable to include such information in the workorder so setpoint adjustments can be made if necessary.

**Building Resource Management** — Windows and doors should be kept closed during the heating season and during the summer in those areas that have mechanical cooling. Gym exhaust fans are to be turned off when the air conditioning unit serving that area is operating. Every member of the school district should assume the responsibility of closing windows, turning off office equipment when not in use, and shutting off the lights when leaving a room. Computer monitors should be turned off when not in use and printers should be turned off at the end of the day. Computers should be turned off when school will be out for extended periods such as Fall Break, Christmas Break, Spring Break and Summer Break. Energy management devices and strategies will continue to be added. Schedulers of classes, meetings, and other school activities should endeavor to minimize energy use. Evening activities should be concentrated in the fewest areas possible, and where appropriate, the areas used should be those that already have late night temperature setback.

**Lighting** — Interior lighting shall be fluorescent, whenever possible. New energy-saving fixtures, lamps and ballasts will be used to replace existing less efficient lighting whenever economically feasible and appropriate. Decorative lighting shall be kept to a minimum. Lighting levels recommended by the most recent edition of the IES (Illuminating Engineering Society) Lighting Handbook shall be used as guidelines. Where it makes economic sense, occupancy/motion sensors (ultrasonic or
infrared) wired to area lighting will be installed to reduce and/or turn off lights in unoccupied, vacated areas. Day-lighting controls will be installed, if economically feasible, to automatically adjust lighting levels as appropriate. Task lighting, such as desk lamps, is recommended to reduce overall ambient lighting levels. Teachers are encouraged to use task lighting at the end of the day after the students have left instead of the overhead fluorescent lighting. Compact fluorescent bulbs should be used in desk lamps. These are now readily available at local stores.

**Space Heaters** — Whether they are purchased by the school district or personal property, two issues affect the use of space heaters in buildings — fire safety and energy efficiency. All space heaters used must be approved for fire safety, as classified by the National Fire Protection Association. No liquid fueled space heaters (e.g., kerosene heaters) shall be used in any office or classroom. Some electric space heaters also pose an unacceptable fire hazard. All space heaters must meet the following four specifications: Heaters must (1) be UL approved, (2) have elements that are protected from contact, (3) be tilt-proof (when tipped over, heater goes off), and (4) be thermostat-controlled. Space heaters must be unplugged when not in use. The issue of energy efficiency is also important — electric space heaters are a very costly means of heating. If a member of the school district feels that a space heater is necessary for adequate warmth, this may indicate that the central heating system needs repair. Maintenance should be consulted if the central heating system is incapable of meeting comfort requirements. Maintenance should also be contacted if a space heater is to be used to offset excessive air conditioning. Excessive cooling of a space below the summertime Temperature Guidelines should be reported to Maintenance so that air-conditioning levels can be adjusted.

**Heating/Cooling Changeover** — Certain school facilities require a heating/cooling changeover in spring and fall. Maintenance performs the changeover on the basis of priorities established to (1) provide comfort to students, (2) maintain required temperatures to protect equipment, and (3) serve the greatest number of individuals and activities. Air conditioning may not begin until outside temperature has reached 75 °F for three consecutive days. Heating may not begin until the high outside air temperature has dropped below at least 55 °F for three consecutive days. Temperature projections are also considered. The wide swings in temperature during the spring of the year and the difficulty in switching between heating and cooling make this policy necessary. Special problems or hardships with this policy should be addressed to the Director of Buildings and Grounds.

**Filters** — Filters shall be changed within one week of delivery. The person
responsible for filter changes shall submit a quarterly filter log to their principal/supervisor who will sign and forward to the Maintenance Department.

**Holiday Periods** — A period of closure for the school district offers a great opportunity to save money on utilities that can be spent in other areas. Past history has shown that very few people occupy the buildings for any substantial time during the holidays. With this in mind, buildings shall be only minimally heated/cooled during holiday periods. The Energy Manager will work with school personnel to determine which areas need regular heating and cooling during these periods.

**New Construction** — The school district shall seek to reduce future energy costs in new facility construction and renovation whenever feasible. Current standards outlined in ASHRAE Standard No. 90.1 Energy Efficient Design of New Buildings Except Low Rise Residential Buildings shall be followed as closely as possible. Additionally, all city and state regulations shall be followed. All planning for major construction and equipment purchase/installation must include energy life cycle costing. New equipment purchased must carry the ENERGY STAR label as often as practical. As resources become available, Bullitt County Public Schools shall develop and implement design standards for new construction to include energy efficiency.

**Water Conservation** — Bullitt County Public Schools is committed to promoting the conservation of water in addition to energy. Faculty, staff, and students should report malfunctioning water faucets, toilets and urinals to Maintenance so corrective action can be taken. Faculty and staff shall educate students on the importance of turning off water after using restroom facilities. The school district shall seek to implement methods of capturing rainwater for use in non-potable applications and shall use native plantings where possible to reduce the amount of watering needed.

**Suggestions**

The Energy Team encourages suggestions for additions or modifications to this Energy Plan as well as other energy or water conservation suggestions. Please send to Andrea.Rock@bullitt.kyschools.us