Boone County School District

Energy Management Plan

2011

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Energy Management Plan

Boone County School District
Energy Management Action Plan
Fiscal Year 2011

I. Executive Summary

Boone County School District is committed to improving district-wide energy performance. The following Energy Management Action Plan details key strategies to reduce energy consumption and save money. This plan outlines district procedures and guiding principles that relate to the energy performance of the Boone County School buildings, including education and awareness, temperature, lighting, plug-load, new construction, water conservation, renewable energy, and green purchasing.

The current version of the plan was developed in collaboration with the District Energy Committee led by Cathy Reed. This plan will be reviewed on an annual basis by the District Energy Committee with the next review scheduled for June 2012.

Boone County School District is working in partnership with ENERGY STAR, the Kentucky Energy Efficiency Program for Schools (KEEPS), National Energy Education Development Project (NEED), Kentucky Green and Healthy Schools (KYGHS), Kentucky School Boards Association (KSBA), the School Energy Management Program (SEMP) to broaden our energy initiatives and maximize our opportunities for improving our energy performance.

Boone County School District has 22 school buildings and 5 related facilities that combined total 2,350,362 square feet. The combined energy usage for the district in 2010 was 258,159,328 kBtu/sq.ft. It is the goal of the District Energy Committee to reduce energy consumption by 10% annually.

II. District Profile

Boone County School District
8330 US Hwy 42
Florence, KY 41042

Table 1: Key District Contacts

Name	Title	Phone
Mike Blevins	COO/Deputy Superintendent	(859) 282-2369
Cathy Reed	Energy Manager	(859) 282-4679

Table 2: District Survey

Age range of Buildings:	2 to 80 years
Combined square footage:	2,350,362
# of Elementary Schools:	13
# of Middle/High Schools:	9
# of Administrative/ Operations Buildings:	5
# of Computers:	7,704

III. Energy Policy

On August 12, 2010, the Boone County Board of Education adopted [KSBA Energy Management Policy Facilities 05.23 referencing KRS 160.325] an Energy Management Policy **[Appendix A: District Energy Policy]**, further demonstrating our district's commitment to improving energy performance and reducing operating costs. The Boone County Energy Management Policy supported the formation of a district-level Energy Committee to develop and implement an Energy Management Action Plan.

IV. District Energy Committee

Boone County established a district-level Energy Committee to develop an energy management program and create and implement an Energy Management Action Plan. The district level team is comprised of the following individuals:

Table 3: Fiscal Year 2011 Energy Committee Members

Mike Blevins	Assistant Superintendent/ Chief Operations Officer
Cathy Reed	Energy Manager
Rick Dames	Director of Facilities
Karen Cheser	Assistant Superintendent
Kevin Macke	HVAC Foreman
Carl Hutchinson	Electrical Foreman
Lisa Jackson	Financial Analyst
Cindy Densler	Administrative Assistant
Connie Crigger	Principal
Joe Beil	Principal
David Clagett	Principal
Tim Hitzfield	Principal
Mike Heath	Duke Business Relations Manager
Mike Wilson	Purchasing Agent

The District Energy Committee meets monthly on the 3rd Tuesday at 8:00AM at the Boone County Schools Central Office. Minutes for each meeting are distributed to each member and to be posted on the Boone County District website.

V. Performance Goal and Supporting Objectives

The following energy-related goal and objectives were defined by the District Energy Committee:

Performance Goal:

- Reduce district wide energy consumption 10%/sq.ft. by June 2012.

Objectives:

- Track, monitor and report district progress, and identify trends and opportunities for savings;
- Create a sense of responsibility among students, teachers, staff, administrators, parents and community members;
- Operate at optimal efficiency and avoid unnecessary costs associated with reactive maintenance practices and procedures;
- Reduce future energy costs in new facility construction and renovation whenever feasible;
- Conserve water resources where possible;
- Increase the use of renewable energy and educate our students, teachers, staff, and community on the economic and environmental benefits of diversifying our energy portfolio; and
- Reduce our district's overall environmental impact and provide a healthier and safer educational environment.

VI. Energy Consumption and Cost

Tracking utility consumption and cost is critical to our district's energy management program. By tracking utility consumption we can establish an energy performance baseline, monitor and track progress in real-time, identify trends and opportunities for improvement, target facilities for follow up and monitor excessive variations. All of which, will assist our district in meeting our goal of 10% energy reduction.

Objective: To track, monitor and report district progress, and identify trends and opportunities for savings, the district energy committee will establish a program for collecting and analyzing monthly energy consumption.

The following section details strategies/actions for achieving this objective:

a. Develop system for tracking monthly utility bills

   Boone County Schools will utilize utility tracking tools to monitor energy usage. The Receptionist will provide the Energy Manager with copies of utility bills when received. The Energy Manager will report progress and trends to the Chief Operations Officer regularly.

b. Determine baseline
   A baseline year is the starting point for evaluating the school district's energy management efforts. The evaluation is a comparison of energy consumption in future years to the consumption in the baseline year. The Energy Committee defined Boone County's baseline year as Fiscal Year 2010 (July 2009 – June 2010). Boone County partnered with the School Energy Manager's Program (SEMP) in July 2010. Through that partnership with SEMP, our district established a system for tracking utility consumption and cost, so as to ensure that utility information from FY2010 was both complete and easily accessible.

See Section VI.a. for more information on Monthly Utility Tracking. Billed consumption and cost data were recorded in the KEEPS Utility Tracking Tool and School Dude Utility Tracking Software used to develop **Table 4: Energy Consumption and Cost**

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c. Establish projected consumption and cost data

Projected consumption and cost data is based on the 10% efficiency reduction goal outlined in Section V and the current utility rate for each energy type.

*The major sources of energy at Boone County are electricity and natural gas. **Table 4** outlines energy consumption and cost for each of these energy sources for baseline and current years*

Table 4: Energy Consumption and Cost

Baseline	
Year	2010 (July 2009 – June 2010)
Total square footage	2,350,362
Total Consumption of Electricity (kWh)	29,901,712
Total Cost of Electricity ($)	$2,815,422.52
Total Consumption of Natural Gas (ccf)	1,345,346
Total Cost of Natural Gas ($)	$663,330.38
Average kBTU/sq.ft.	94.93
Current	
Year	2011 (July 2010 – June 2011)
Total square footage	2,435,544
Total Consumption of Electricity (kWh)	31,609,578
Total Cost of Electricity ($)	$2,999,509.56
Total Consumption of Natural Gas (ccf)	989,823
Total Cost of Natural Gas ($)	$563,137.09
Average kBTU/sq.ft.	76.16

d. Conduct annual rate review and utility bill analysis

An annual rate review will be scheduled with utility representatives by the Energy Manager each July.

e. Report monthly consumption data to district stakeholders

The Energy Manager will track, monitor and report to district administrators, including the superintendent and school principals, the monthly change in

consumption and cost of utilities for each school and administrative building compared to the baseline year of 2010.

f. Obtain and analyze load profiles

The district Energy Manager/coordinator will analyze the power demand patterns of the highest energy-consuming schools in our district and look for load-shedding and/or load shifting opportunities. A load profile can be requested from our utility company. The highest energy-consuming schools will be identified using the utility tracking software.

g. Benchmark facilities using ENERGY STAR's Portfolio Manager

Many tools are available to help benchmark individual schools and facilities within school districts, including ENERGY STAR Portfolio Manager [PM], a free program available online at: www.energystar.gov. Benchmarking will allow our district to identify and prioritize energy efficiency measures based upon energy consumption patterns in each of our schools. By using PM, we may also be eligible to apply for ENERGY STAR's building labeling program.[1]

VII. Education, Awareness, and Behaviors

Education and awareness are an important part of the long-term success of Boone County's energy program. The district energy committee recognizes that energy is a controllable operating expense.

Objective: To help create a sense of responsibility among students, teachers, staff, administrators, parents and community members, the school energy teams will establish an Energy Awareness Program.

The following strategies/actions will assist our district in establishing a robust and sustainable Energy Awareness Program:

a. Establish school energy teams

Each school will establish a school-level energy team comprised of any combination of the following individuals by September 2011.

- Principal
- Head custodian
- Food service representative
- Teacher
- Parent
- Student(s)

The school energy teams will meet regularly on a designated day/time/location. The school energy teams will assist the district energy team in implementing a district-wide energy awareness and behavior program. Roles and responsibilities including the following: conduct school behavior assessment; support efforts to incorporate energy education into the classroom. School energy teams will lead school-level energy projects, including educating and creating awareness among both internal and external stakeholders.

b. Conduct facility behavior assessment[i]

Four baseline behavioral assessment(s) were completed in 2011 at 4 school buildings by the Energy Manager in conjunction with KEEPs and Owen Electric. The remaining schools are to be assessed in the 2012 school year by the district Energy Manager and our energy partners.

c. Develop, print and post light switch stickers[ii]

The school energy teams will develop, print and post stickers on light switches throughout school buildings to remind students, faculty and staff to turn off lights when leaving classrooms, restrooms, custodial closets, etc.

d. Institute district-wide energy curriculum

As part of our district's commitment to education and fostering a green and healthy environment for our children, each school will map out their participation in both Kentucky Green and Healthy Schools (KGHS) and the National Energy Education Development (NEED) project.

i. **Kentucky Green and Healthy Schools**[iii] program began in 2007. It is a joint project of the Kentucky Environmental Education Council and the Kentucky Department of Education.

The program was designed with the following goals in mind:

a) Increase environmental awareness and action in communities, schools, and individual students and teachers.
b) Increase student empowerment by giving them the tools to make changes at their schools that will benefit both the environment and student health.
c) Increase student engagement by offering teachers the tools they need to complete hands-on, inquiry-based investigations and projects with their students.

In the KGHS program, students implement projects to improve the health, safety or sustainability of their schools in the following nine categories: Energy, Green Spaces, Hazardous Chemicals, Health & Safety, Indoor Air Quality, Instructional Leadership, Solid Waste, Transportation and Water Quality.

Each school will take steps to join the KGHS program by December 2011.

Participating schools are eligible to apply for grant funding (up to $800) for projects that save energy at the school or in the school community. The funds must be used to purchase materials for physical improvements, including, but not limited to, the following: window tinting film, shade trees, CFL light bulbs, vending machine misers, bike racks, recycling containers, etc.

Student energy teams will develop projects and apply for funds through KGHS Energy Saving Project funding[iv].

ii. **Kentucky NEED** is the state affiliate of the National Energy Education Development (NEED) Project, a nonprofit education association, dedicated since 1980, to equipping students and teachers with a realistic understanding of the scientific, economic and environmental impacts of energy. Kentucky NEED takes a holistic approach to energy, providing core content-aligned curriculum for students, professional development for teachers and energy management programs for school operations and maintenance staff.

NEED teaches the science of energy and provides objective information about energy sources—their use and impact on the environment, economy, and society. NEED educates teachers, students, families, and the general public about energy consumption, efficiency and conservation and provides tools to help educators, energy managers, and consumers use energy wisely. NEED believes in the power of a Kids Teaching Kids approach to an expanded knowledge of energy. Students learn about energy by teaching their peers and their parents.

Each school will encourage teachers to incorporate resources from the NEED project into classroom curriculum. When offered schools will support teacher participation in NEED training, conferences and workshops.

The district energy committee will develop a system for tracking school participation in both KGHS and KY NEED.

e. Develop and institute a district-wide energy efficiency/awareness training program

The long-term success and sustainability of our district's energy management program requires engagement, involvement, and buy-in from all of our stakeholders. To ensure continued savings and cost avoidance, the district energy committee will develop a district-wide energy efficiency training program

to educate faculty, staff, students and community members on the district's commitment to energy efficiency.

VIII. Facility Procedures/Operations and Maintenance (O&M)

Effective O&M is one of the most cost-effective methods for ensuring reliability, safety, and energy efficiency of the district's mechanical systems. The U.S. Department of Energy defines operations and maintenance as "all scheduled and unscheduled actions for preventing equipment failure or decline with the goal of increasing efficiency, reliability, and safety."

Objective: To operate at optimal efficiency and avoid unnecessary costs associated with reactive maintenance practices, the Boone County District Energy Committee will establish district facility procedures and O&M strategies related to building temperature, off-schedule events, heating and cooling, preventative maintenance, lighting, building envelope, plug-load, food services, water heating, common areas, vacation shut-downs, and transportation.

The following section details these procedures:

a. Establish building temperature set points

Instituting clear guidelines for thermostat settings during both warmer and cooler months allows faculty, staff, students and other building users, including parents, to dress appropriately. Education and awareness are an important part of the long-term success of Boone County's energy program.

During occupied building hours thermostats will be set as follows:*

i. Cooling Occupied Set Point: [74 – 76 degrees Fahrenheit][v]
ii. Heating Occupied Set Point: [68 – 70 degrees Fahrenheit]

During vacation periods (winter/summer break and long weekends), the thermostats will be set as follows:

iii. Unoccupied Cooling [78 - 76 degrees Fahrenheit][vi]
iv. Unoccupied Heating [55 – 60 degrees Fahrenheit]

b. Utilize programmable thermostats or building automation system (if applicable)

Significant savings can be realized by setting back the HVAC during unoccupied hours. Studies have shown average savings of 1% (of the annual heating and cooling cost) per degree setback for 8 hours/day.[vii]

*revised 12/15/11

To better realize the benefits of temperature setbacks, the district will utilize programmable thermostats, or the building automation system, and modify thermostat settings at all of their facilities:

c. Determine procedures for off-schedule events

Classes, meetings, and other school activities should be scheduled 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.

To ensure comfort and accountability during after school, or off-schedule, events, the following procedures have been instituted by the District Energy Committee:

- Off-schedule requests will be submitted in writing at least 10 days in advance to the School Principal for approval and then filed with the HVAC Foreman/Energy Manager to ensure facility needs are met. Information requested includes, building name, date of request, date of event, time/duration of event, and space requested. Participants in off-schedule events are asked to follow energy conservation procedures upon event completion

d. Maintain a district-wide preventative maintenance program

The Maintenance Department will maintain a preventative maintenance program for mechanical equipment and associated controls to increase and maintain equipment efficiency, and therefore control energy consumption and cost.

e. Establish guidelines for indoor, outdoor and decorative lighting

Interior lighting will 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.

Exterior lighting will be turned off except when necessary for security or extracurricular activities. To facilitate this process, programmable timers will be installed for any outside lights not already on a Building Automation System (BAS) or timer. These timers will be programmed for the academic year.

Decorative lighting (string lights, floor lamps, etc.) 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.

Occupancy/motion sensors will be installed, where it makes economic sense, to reduce and/or turn off lights in unoccupied, vacated areas. Manually turning off lights; however, is an effective energy conservation measure, with no additional cost.

Day-lighting controls will be installed, if economically feasible, to 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.

Gymnasium Lighting will be upgraded to fluorescent fixtures (high bays or compact fluorescent fixtures).

Exit Signs will be lit with LED lights, which use 3 Watts of energy and have an expected lamp life of 25 years.

f. Develop and implement procedures for building envelope

Keeping doors and windows closed can result in 1 to 2 percent savings in energy consumption.[viii] If a window is open, for example, conditioned air is wasted by venting to the outside. To reduce unnecessary energy waste, the following best practices will be implemented:

- Windows and doors will be kept closed during the heating season and during the summer in those areas that have mechanical cooling;
- Gym exhaust fans will be turned off when the air conditioning unit serving that area is operating; and
- Every member of the school district will be responsible for closing windows, turning off office equipment when not in use, and shutting off the lights when leaving a room. Reminder check lists posted by exit doors will be used to prompt building occupants to do their part to conserve energy.
- All concession areas will be professionally winterized when the athletic season is over for the next year.

g. Establish procedures for plug-load management

1. Computers/Monitors/Printers/Copiers/Fax-machines

- Computer monitors and CPUs should be set to enter “sleep mode” after 20 minutes of inactivity;
- Computers will be set to turn off via Windows Group Policy at 9:00 PM
- Computers should be turned off when school will be out for extended periods such as Fall Break, Christmas Break, Spring Break and Summer Break.

2. 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 and must be unplugged when not in use

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.

The issue of energy efficiency is also important because 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.

i. Implement water heating set points and guidelines for management

a. Energy is wasted if the water heater temperatures are set higher than appropriate for end use. The expected life of a water heater is 10 to 15 years.

   To reduce water heating inefficiency and increase the lifetime of our equipment, the following procedures will be established:

   1. Routine inspection practices to identify leaks and check burners, gauges and pumps.
   2. Periodic flushing (one to two times a year) of the water heater to remove sediments from the system and increase heat transfer efficiency.
   3. Vacation shutdown program to reduce unnecessary heating so of water during extended vacation periods.
   4. Water heaters will be set to as low as the local health department permits. ENERGY STAR recommends a water temperature of 120 F for general use.

j. Develop and implement checklist for common areas

   Each school will assign responsibility for decreasing energy consumption in common areas, including hallways, multi-purpose rooms, cafeterias, auditoriums, restrooms, gymnasiums, locker rooms, meeting areas, stages and storage rooms. Schedules can be annual or rotating, but must be established and accompanied with a common area checklist.

k. Develop and implement vacation shutdown program

   Long summer breaks, along with shorter fall/winter/spring breaks and long weekends, present opportunities to shut down equipment such as computers, vending machines, refrigerators, water heaters, water fountains, exterior lighting, kitchen equipment and computer labs. Other plug loads, like small appliances and electronics, should also be unplugged when not in use. Many appliances and electronics continue to use energy even when they are “off”.

l. Create building operating plan for all district facilities

   The district energy committee will develop and implement a district-wide building operating plan. This plan will summarize by space, the general operating requirements developed in this action plan, such as cooling season temperature, heating season temperature, humidity levels, lighting levels, etc.

IX. Facility Planning, New Construction & Renovation

According to the U.S. Department of Energy, "the country's least energy efficient schools use nearly four times as much energy per square foot as the most energy efficient schools."

Objective: To reduce future energy costs in new facility construction and renovation whenever feasible.

The following strategies/actions will be adopted to assist Boone County with meeting this objective:

a. Develop design standards

The District Energy Committee will develop district guidelines for energy efficient green design. These guidelines will apply to all new construction and renovation projects within budget constraints.

Examples of green design standards that the district energy committee will consider, including the following:

i. U.S. Department of Energy's EnergySmart Schools and Energy Design Guidelines for High Performance Schools[ix];
ii. U.S. Green Building Councils LEED standards[x];
iii. design to achieve ENERGY STAR[xi];
iv. ASHRAE Advanced Energy Design Guides (AEDG)[xii]; and
v. Kentucky Green and Health Schools Design Manual[xiii].
vi. ASTM Thermal Insulation standards

b. Earn the ENERGY STAR building label

Buildings achieving a rating of 75 or higher using ENERGY STAR's Portfolio Manager and professionally verified to meet current indoor environment standards are eligible to apply for the ENERGY STAR buildings label. The district Energy Manager will benchmark all school buildings in our district and set goals to achieve ENERGY STAR building labels where feasible on new and existing facilities.

c. Ensure energy efficiency improvements are a priority criteria in the facility planning process

Capital intensive energy efficiency improvements and upgrades must be incorporated into the facility planning process to receive funding. Building energy assessments, energy audits and overall energy intensity ratings will be provided to the facility planning team to help identify and prioritize district facility improvements.

[i] KEEPS has developed a facility behavioral assessment tool to assist districts with developing a baseline and benchmarking behavioral changes. For more information, please visit: www.kppc.org/keeps or contact your Regional Coordinator.
[ii] www.awarenessideas.com
[iii] www.greenschools.ky.gov
[iv] KGHS Energy Saving Project funding is available until all the funds are spent. For more information on the status of the funding program, please visit: http://www.greenschools.ky.gov/resources/
[v] Occupied temperature settings are based on best practices of Kentucky School Districts; however, individual districts should take into consideration what is appropriate for each school building.
[vi] KEEPS Energy Conservation Shutdown Checklist: https://louisville.edu/kppc/files/keeps/step-4/Energy%20Conservation%20Shut%20Down%20Checklist%20KPS11-1009.pdf
[vii] http://www.energysavers.gov/your_home/space_heating_cooling/index.cfm/mytopic=12720
[viii] U.S. Green Building Council (from KEEPS No Cost Energy Efficiency Measures document)
[ix] http://www1.eere.energy.gov/buildings/energysmartschools/
[x] http://www.greenschoolbuildings.org/Homepage.aspx
[xi] http://www.energystar.gov/index.cfm?c=cbd_guidebook.cbd_guidebook_energy_design_1
[xii] http://www.ashrae.org/technology/page/938
[xiii] http://www.greenschools.ky.gov/NR/rdonlyres/6C0916C6-6D22-4D54-AC8A-EB481530A14D/0/GuidlinesForBuildingAGreenSchool20080714.pdf