

DOLLARS
FOR
STUDENTS
NOT
ENERGY

KENTUCKY

HIGH
PERFORMANCE

SCHOOLS

PROFILES IN
EXCELLENCE





ENERGY EFFICIENCY IN KENTUCKY

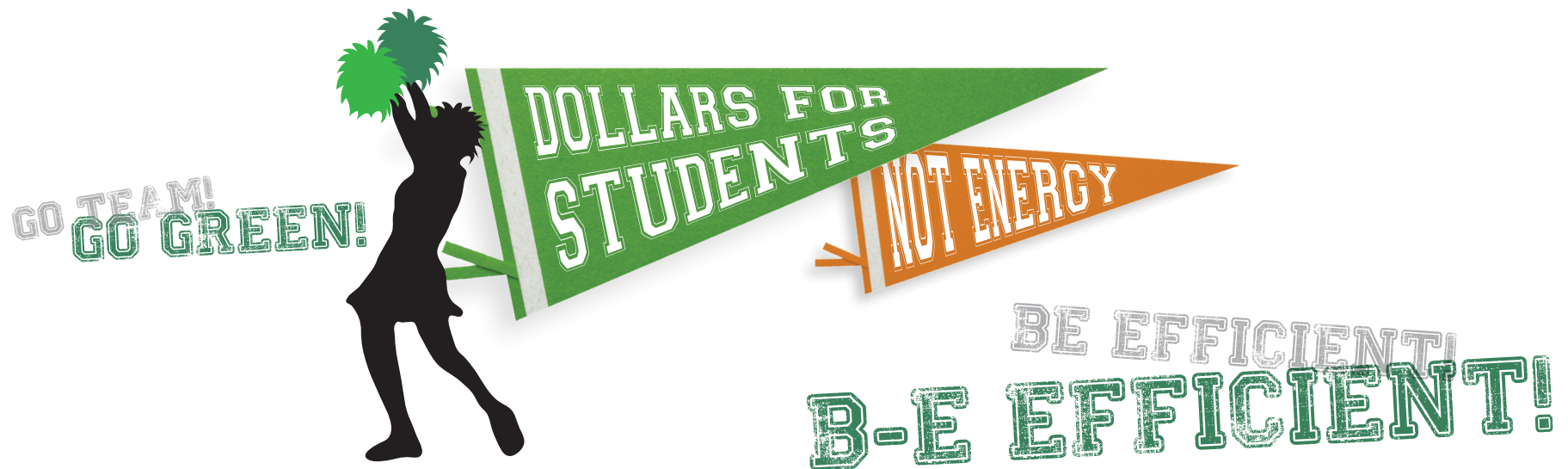
In Kentucky a “high performance school” means that it is:

- more energy efficient,
- more cost effective, and
- more sustainable.

Following the 2008 enactment of Kentucky Revised Statute KRS 160.325 directing local boards of education to address rising energy costs, a statewide energy management infrastructure focusing on intelligent energy choices for new and existing public schools was established. Energy managers were hired, providing a new level of technical support for many of the 173 school districts.

Development and implementation of energy management plans led to an increase of more than 1,800 percent in ENERGY STAR® rated schools since 2008, increasing from 12 ENERGY STAR® schools to 254 in just five years. This has resulted in over \$34 million in cumulative avoided energy costs that were freed up for educational purposes.

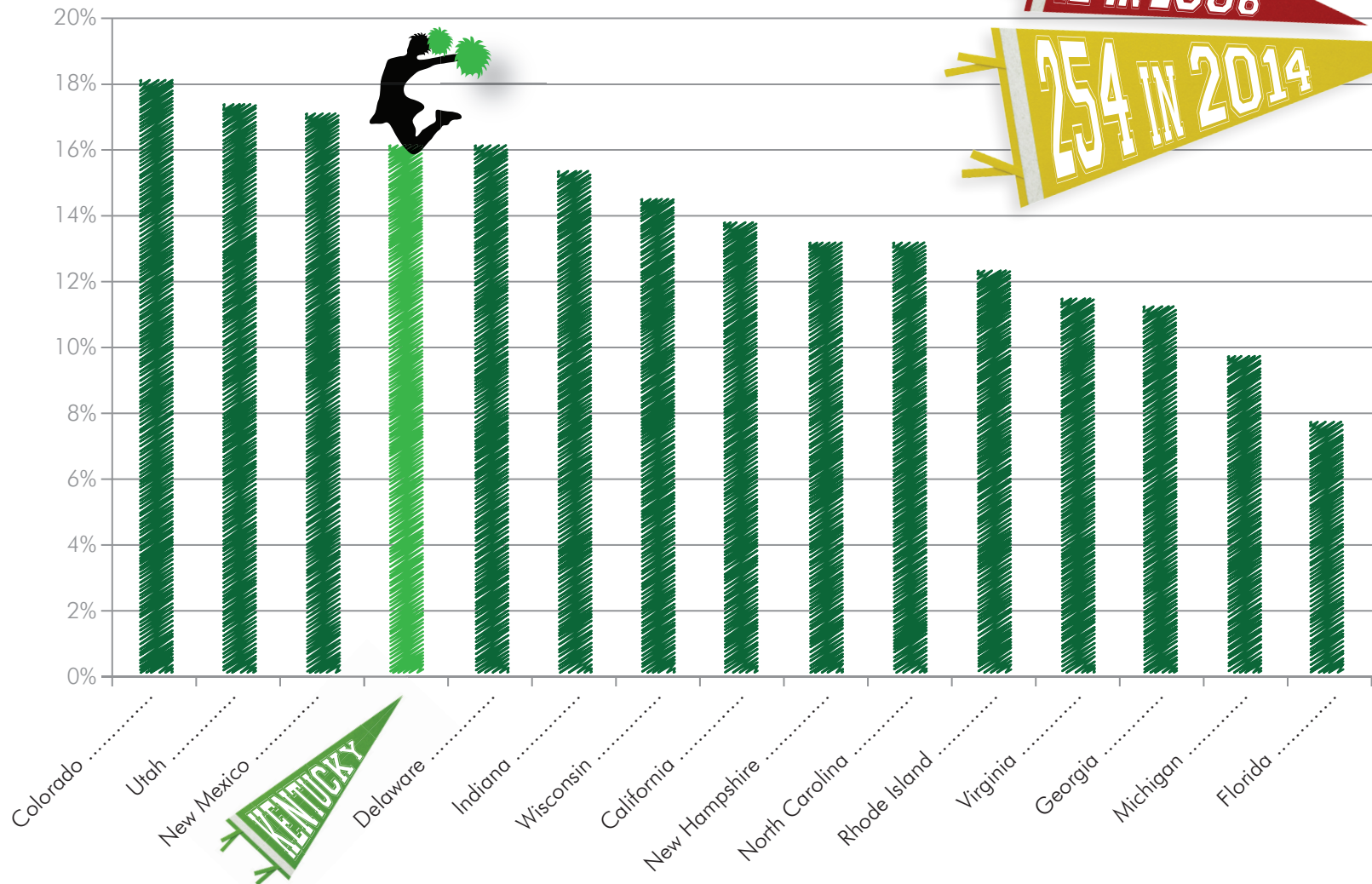
This publication describes elements and benefits of building or renovating to a high performance school level.



Percent ENERGY STAR® Schools

April 2014

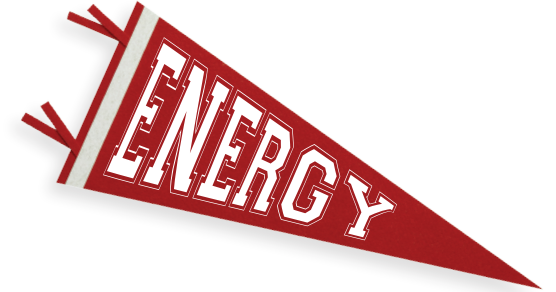
Kentucky
ENERGY STAR®
Schools





DID YOU KNOW?

- Kentucky public schools have nearly 2,300 acres of indoor conditioned space. ENERGY STAR® buildings make up approximately 20 percent of that square footage.
- Kentucky's public schools use over one billion kilowatt hours of electricity annually.
- Electricity comprises 68 percent and natural gas 30 percent of all the energy used in one year.
- Kentucky public schools spent over \$134 million on energy for fiscal year 2012-13.
- Kentucky public schools used over 5.9 million MMBtu's of energy during fiscal year 2012-13.
- This was down from over 6.4 million MMBtu's used in fiscal year 2009-10.



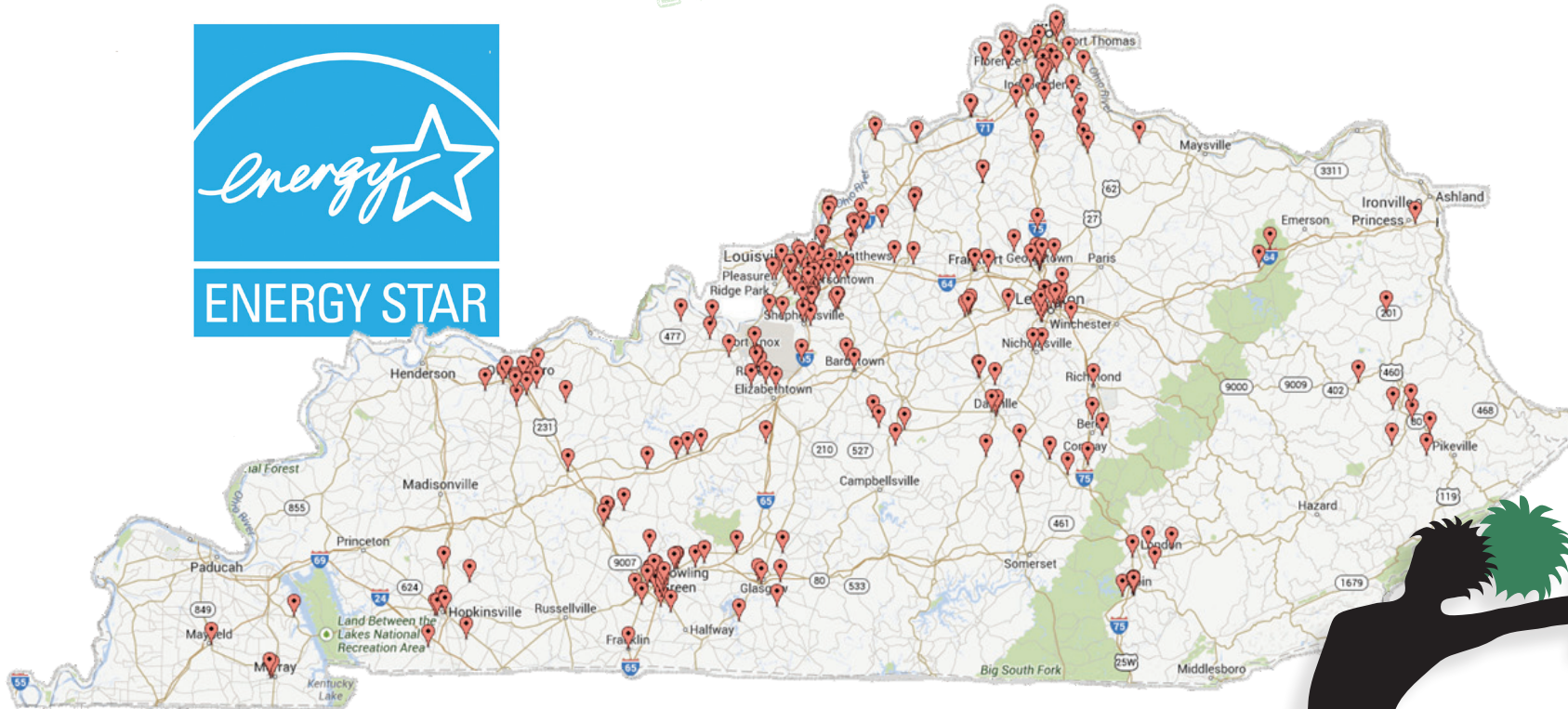
- ▶ An average U.S. SCHOOL uses 72 kBtu/sf/yr
- ▶ The average KENTUCKY school uses 58 kBtu/sf/yr
- ▶ A typical ENERGY STAR® school uses 50 kBtu/sf/yr
- ▶ A typical NET-ZERO energy ready school uses <25 kBtu/sf/yr



Kentucky's 254 ENERGY STAR® Schools

(Representing 21,000,000 sf)

DOLLARS FOR STUDENTS
NOT ENERGY



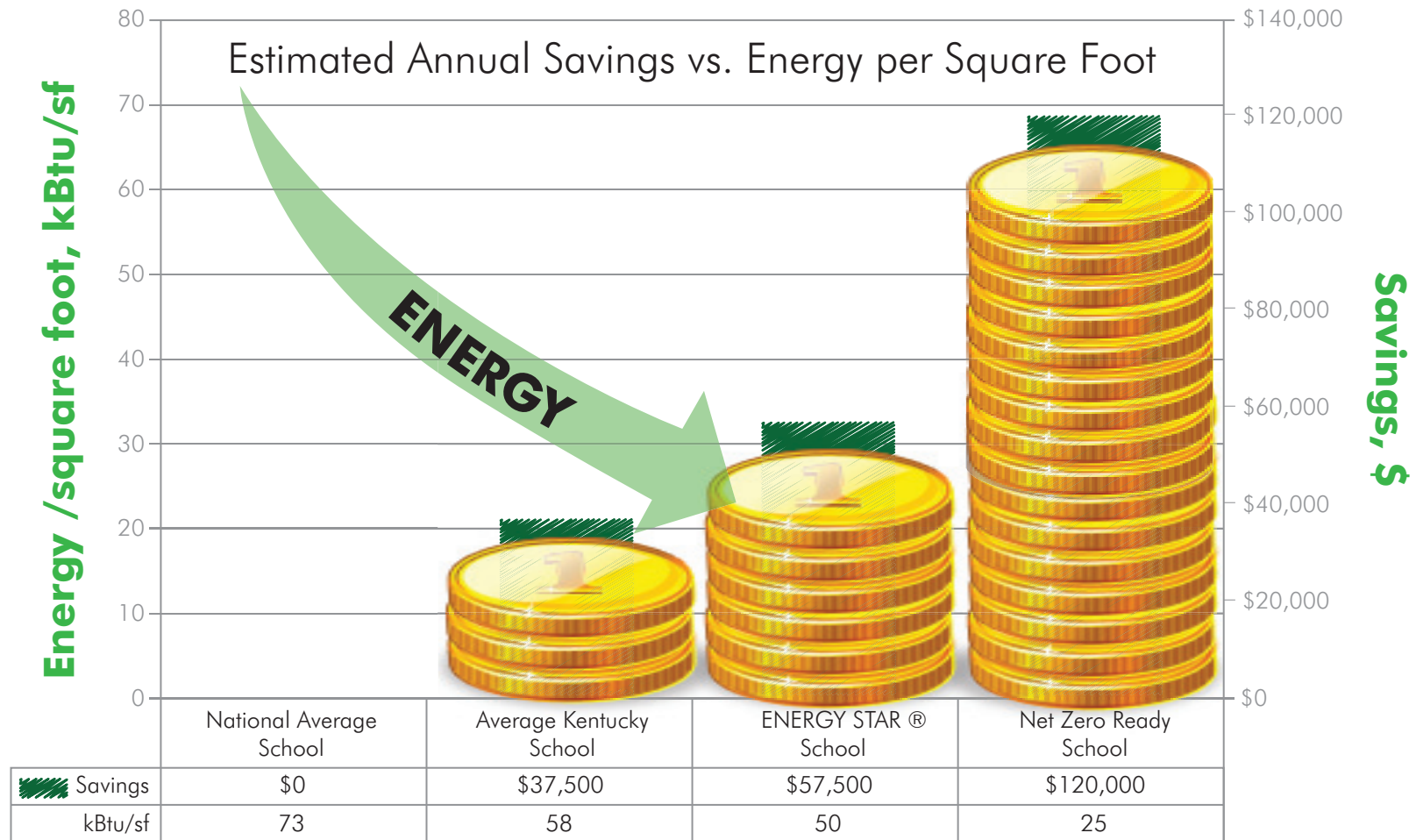
Typical ENERGY STAR® schools uses 50 kBtu/sf/yr





As Energy Use Comes Down, Savings Go Up

School districts can do many things to manage energy costs, including behavior modification, real-time monitoring, remodeling, and new construction. The chart below shows the national average performance of schools as compared to the average Kentucky school, an ENERGY STAR® school, or a Net-Zero Ready school.



HIGH PERFORMING SCHOOL: NEW CONSTRUCTION

School: Milton Elementary
Location: Trimble County Schools
Principal: Sharon James
Superintendent: Marcia Dunaway
School built: 2008
Engineering firm: CMTA Consulting Engineers
Size of school building: 47,012 sf
Cost per sf: \$150.38

27.2/kBtus/sf



"In today's economy, with decreased funding for school districts, it is important to cut expenses wherever possible. Cutting energy cost is the easiest way to cut expenses without affecting the education process."

— Sherman Adams, Energy Manager



Building energy efficiency features:

Milton Elementary is a great example of what can be achieved when keeping the design simple and following through with great execution. The architectural building envelope was designed to minimize building volume and simplify construction. The resulting design reduces the number of building envelope penetrations, thus reducing infiltration, which allows the HVAC system to be downsized and reduce its run time. The mechanical system consists of high efficiency ground source heat pumps and a Dedicated Outdoor Air System (DOAS) with a total energy recovery wheel. The geothermal hydronic distribution consists of a distributive pumping system to minimize total pumping horsepower and reduce pumping power during unoccupied operation. The HVAC system is controlled with a fully integrated Building Automations System (BAS), allowing for off-site control and remote diagnosis of the building. The heat pumps are interfaced with lighting occupancy sensors, allowing for automated unoccupied operation when the classrooms are idle for more than 30 minutes. The lighting system consists of highly efficient T8 lamps and high efficiency electronic ballasts. Occupancy sensors and a lighting control panel were utilized for all lighting controls.

"Trimble County Schools instituted an energy use plan to guide staff on energy efficient practices within its facilities. It also formed student energy teams to educate students and staff on energy efficient practices."

— Marcia Haney Dunaway, Superintendent





HIGH PERFORMING SCHOOL: RENOVATION

School: Garth Elementary

Location: Scott County Schools

Principal: Suzy Armishaw

School built: 1928

School remodeled/retrofitted: 1988/ 2003/ 2010/ 2013

Engineering firm: CMTA Consulting Engineers

Size: 74,466 sf

44.8/kBtus/sf



"I am very pleased to see the results of Garth Elementary as I am a lifelong resident of Scott County and a proud graduate of Garth High School before it was converted to an elementary school in 1959."

*— George Lusby, Judge Executive-Scott County
(Former teacher and Principal of Garth Elementary)*

Building energy efficiency features:

- Improved HVAC/lighting/other areas (1988)
- Installed Automated Logic HVAC Control System (2003)
- Converted T12 light fixtures to T8 with electronic ballasts and energy saving lamps (2010)
- Installed LED lights in gym and Media Center with occupancy sensors (2013)

Performance features:

- Savings for T12 to T8 conversion in 2010 resulted in over \$5,000 per year.
- Savings for LED lights in gym and Media Center in 2013 resulted in \$3,000 per year



"It is very important that we have our students involved in learning to conserve energy so that they can start now conserving energy."

— Jon Salyer, Garth Teacher/Student Energy Team Leader

"As school board chairman I could not be more proud of the results of our energy management program. Being a growing community, we have had the opportunity to build and renovate many schools during the past years. Our facilities team has done a wonderful job in designing and building these schools to be energy efficient."

— Roger Ward, Chairman, Scott County School Board

HIGH PERFORMING ELEMENTARY SCHOOL

School: West Louisville Elementary School

Location: Daviess County Public Schools

Principal: Nathan Satterly

Superintendent: Owens Saylor

School built: 2010

Architecture firm: RBS Design Group

Size of school building: 64,152 sf

Cost per sf.: \$152

Goal: When designing West Louisville Elementary, the district's most energy efficient building was evaluated to identify more efficient technology and processes.

24.4/kBtus/sf



"Our district goal as educators is to prepare our students to succeed for life. We believe that our conservation and efficiency measures not only save resources that can be used for better purposes, but also demonstrate to both students and staff ways to reduce personal cost and hopefully change the way they relate to their environment."

— Owens Saylor, Superintendent, Daviess County Public Schools

Building energy efficiency features:

- Closed cell spray insulation over all exterior concrete block walls rather than traditional sheet insulation; spray foam on interior eaves and gables to close penetrations and cracks
- T8 fluorescent lighting with occupancy sensors throughout
- Occupancy sensors in almost all rooms, including closets, which eliminated the need for key-switches
- Two-stage geothermal heat pumps and air source heat pump water heaters for restrooms located nearby so circulation pumps are not needed
- Gas-fired instantaneous water heaters for kitchen
- Wall-pack lighting only at entrances
- Parking lot lights controlled by building automation system; nearly dark campus after midnight and on weekends
- Walk-in freezer and cooler are on geothermal system
- Building automation system, but teachers who work longer have manual override control of their classrooms
- Direct Digital Controls (DDC) are used throughout

"While planning this building, we took a group of seven students and worked with them for several months to help them understand the basic physics behind the mechanical systems; during the opening of the school these students were able to give short presentations on various aspects of the building to visitors."

— Jim Barr, Energy Manager





HIGH PERFORMING MIDDLE SCHOOL

School: TT Knight Middle School

Location: Jefferson County Public Schools

Principal: Faith Stroud

Superintendent: Dr. Donna Hargens

School built: 1973

School remodeled/retrofitted: Summer 2011

Architecture firm: Sherman Carter Barnhart Architects

Engineering firm: CMTA Consulting Engineers

Size of school building: 101,500 sf.

Cost per sf: \$42.13

39/kBtus/sf



“Jefferson County Public Schools has a number of schools with older energy technology. When TT Knight Middle School was renovated in 2011, JCPS reaped a 30 percent reduction in operational costs and returned over \$50,000 per year to the general fund. This renovation created a better learning environment and great savings for the district — a win for everyone!”

— Kevin Stoltz, Energy Auditor

Building energy efficiency features:

- T8 high efficiency lighting throughout with occupancy sensors
- Existing constant volume re-heat system replaced with a VAV system, including central plant upgrades
- Boilers upgraded to high efficient condensing boilers; pumping changed to variable flow utilizing VFDs to reduce pumping energy
- New air cooled chillers installed and pumping system upgraded to variable flow utilizing VFDs
- New VAV air handler units installed with return and relief air fans to minimize fan power
- Occupancy sensors in classrooms interfaced with VAV unit serving the classroom to automate unoccupied mode

- Building automation system installed to allow building to be scheduled, monitored, and operated from the central maintenance office
- Interface to security system will put the building into unoccupied mode, which takes advantage of snow days or unscheduled holidays
- These combined features resulted in one of the most efficient VAV systems in the school district.

Architectural improvements included roof and window replacement; roof insulation increased to meet Energy Code requirements.

“Jefferson County Public Schools is a proud ENERGY STAR® partner because we know quality learning only happens in quality school environments. The renovations at TT Knight Middle School demonstrate our commitment to responsible management of resources and innovation and improvement in every aspect of our students’ educational experience. We are honored to be a leader in promoting energy efficiency and the health of our environment.”

— Dr. Michael Raisor, Chief Operations Officer

HIGH PERFORMING HIGH SCHOOL

School: Betsy Layne High School

Location: Floyd County Schools

Principal: Cassandra Akers

Superintendent: Dr. Henry Webb

School built: 1980

School remodeled/retrofitted: 11/2006

Engineering firm: CMTA Consulting Engineers

Size of school building: 66,162 sf

Cost per sf: \$175.00

24.4/kBtus/sf



"It's important to demonstrate to our students how they can participate in the efficient use of resources. Resource conservation is part of their everyday lives now and will grow in importance in the coming years. This is part of our mission to prepare our students for a changing world."

— Cassandra Akers, Principal

"Our students need real-world applications for energy concepts. The things we learn in class every day are applicable to their future in a world that is constantly changing and evolving."

— Kari Cornett, Betsy Lane Teacher, Student Energy Team Leader



Building energy efficiency features:

- New stand-alone classroom HVAC units (renovation)
- Low-flow restroom fixtures (renovation)
- Building automation system monitored from the central office
- T8 high efficiency lighting installed
- LED parking lot lighting
- LED wall pack lighting

Performance features:

- Integrated Automated Logic Control System
- Energy Recovery Wheel on each classroom
- 10 percent reduction in consumption

"Energy is our future — why wouldn't we learn and care about it? It impacts everything we do!"

— Destiny Kidd, Student





ENERGY STAR® PARTNERS OF THE YEAR

Each year the U.S. Environmental Protection Agency honors a select group of organizations that have made outstanding contributions to protecting the environment through superior energy efficiency. In 2013, a total of four school districts nationwide were recognized as Partner of the Year. Two of those school districts were from Kentucky.

- Kenton County Schools was recognized for making great strides in energy efficiency by committing to ongoing energy management, investing in energy efficient new construction, involving students in energy efficiency initiatives, and adopting new technology. Their E=WISE2 student program has been adopted by school districts across Kentucky, Tennessee, Ohio, and North Carolina. Previously earning recognition as an ENERGY STAR® Leader in 2009 and 2010, they were also recognized as an ENERGY STAR® Top Performer in 2012.
- Scott County Schools was recognized for demonstrating success in improving energy efficiency. In the first 28 months after implementing their energy management program, they saved \$990,500 in utility costs. In 2011 they participated in the ENERGY STAR® National Building Competition, and Northern Elementary School finished 13th in the nation with an energy consumption reduction of 28.5 percent. Ten of the district's classroom buildings have earned the ENERGY STAR® certification and have achieved an average of 84 across the district's portfolio of buildings.



The Kenton County group recognized includes (from left), Chris Baker, Energy Manager; Rob Haney, Facilities Director; Elizabeth Craig, EPA; Karen Collins, Board Chairwoman; Jean Lupinacci, EPA; and Dr. Terri Cox-Cruey, Superintendent.



Accepting the award on behalf of their districts are Patricia Putty, Scott County Schools Superintendent (left) and Karen Collins, Kenton County School Board Chairwoman (second from right).



The Scott County group recognized includes (from left) Ron Willhite, SEMP Director and Energy Advisory member; Patricia Putty, Superintendent; Jean Lupinacci, EPA; and Jim McClanahan, Energy Manager.

BUTLER COUNTY SCHOOLS: KENTUCKY'S BEST PERFORMING SCHOOL DISTRICT



North Butler Elementary: Built 2005
ENERGY STAR® Rating 86

Butler County Schools is a rural school district with an enrollment of 2,200 students and four classroom buildings totaling approximately 300,000 square feet of space. Two phases of performance contracting with Harshaw Trane have addressed energy and comfort issues in the high school, middle school, and central office. Harshaw Trane Intelligent Services was employed to ensure proper system operation and to drive additional savings. Butler County Schools invested \$810,000 in phase one and \$737,502 in phase two. They have seen an annual savings of \$170,000.

35.2 DISTRICT/kBtus/sf

"In 2004 we reviewed our building operations to identify a more efficient process, which led to energy usage savings. By 2010 we were still "guessing" our Demand Intensity during startup and decided to install metering and Dashboard software, which eliminated the guesswork. Now we know the demand of our buildings and are able to manage and make adjustments when a building requires a change."

— Jimmy Arnold, Energy Manager



Butler County High School: Built 1992
ENERGY STAR® Rating 92

Butler County Middle School: Built 1997
ENERGY STAR® Rating 89



Morgantown Elementary School: Built 1972
ENERGY STAR® Rating 87





DISTRICTS IN KENTUCKY WITH ENERGY STAR® SCHOOLS

Anderson County Schools

Anderson County High School
Emma B. Ward Elementary School
Saffell Street Elementary School
Turner Elementary School
Barren County Schools
Austin Tracy Elementary
Barren County Middle School
Eastern Elementary
Hiseville Elementary
Park City Elementary
Red Cross Elementary
Temple Hill Elementary

Bellevue Independent Schools

Grandview Elementary

Boone County School District

Burlington Elementary School
Charles H. Kelly Elementary School
Cooper High School
Florence Elementary School
Longbranch Elementary School
Stephens Elementary

Bowling Green Independent Schools

Parker Bennett Curry Elementary
TC Cherry Elementary

Boyd County Schools

Boyd County High School

Boyle County Schools

Boyle County High School

Bracken County Schools

Bracken County Middle School

Bullitt County Public Schools

Brooks Elementary School
Bullitt Lick Middle School
Cedar Grove Elementary
Crossroads Elementary School
Eastside Middle School
Freedom Elementary School
Lebanon Junction Elementary
Maryville Elementary School

Bullitt County Public Schools – continued

Mt. Washington Middle School
Nichols Elementary School
North Bullitt High School
Overdale Elementary School
Pleasant Grove Elementary School
Roby Elementary School
Shepherdsville Elementary
Zoneton Middle School

Butler County Schools

Butler County High School
Butler County Middle School
Morgantown Elementary School
North Butler County Elementary

Burgin Independent Schools

Burgin Independent School

Calloway County Schools

Calloway County Middle School

Campbell County Schools

Campbell Ridge Elementary
Crossroads Elementary
Grant's Lick Elementary

Carroll County Schools

Richard B. Cartmell Elementary School

Casey County Schools

Walnut Hill Elementary School

Christian County Public Schools

Belmont Elementary
Crofton Elementary
Indian Hills Elementary
Lacy Elementary
Millbrooke Elementary
North Drive Middle School
Pembroke Elementary
South Christian Elementary

Corbin Independent Schools

Corbin Educational Center
Corbin Elementary School
Corbin High School

Corbin Independent Schools – continued

Corbin Intermediate School
Corbin Middle School
Corbin Primary School
Danville Independent Schools
Danville High School
Hogsett Elementary School

Daviess County Public Schools

Audubon Elementary
Burns Elementary
College View Middle School
Country Heights Elementary School
Daviess County Middle School
Deer Park Elementary School
East View Elementary
Highland Elementary
Meadow Lands Elementary
Sorgho Elementary
Southern Oaks Elementary
Tamarack Elementary School
West Louisville Elementary
Whiteside Elementary

Fayette County Public Schools

Arlington Elementary School
Athens-Chilesburg Elementary School
Bryan Station Middle School
Harrison Elementary School
James Lane Allen Elementary School
Jessie M. Clark Middle School
Leestown Middle School
Meadowthorpe Elementary School
Rosa Parks Elementary
Russell Cave Elementary School
Wellington Elementary School
William Wells Brown Elementary School
Yates Elementary School

Floyd County Schools

Adams Middle School
Allen Central High
Allen Elementary School
Betsy Layne High
Prestonsburg Elementary School
Stumbo Elementary School

Frankfort Independent Schools

Frankfort High School
Second Street Elementary School
Franklin County Schools
Hearn Elementary School

Gallatin County Schools

Gallatin Lower Elementary
Gallatin Upper Elementary and Middle

Grant County Schools

Sherman Elementary School

Grayson County Schools

Caneyville Elementary School
Clarkson Elementary School
Lawler Elementary School
Wilkey Elementary School

Hardin County Schools

Creekside Elementary
Heartland Elementary
New Highland Elementary
North Middle School
North Park Elementary
Parkway Elementary School
Rineyville Elementary
Woodland Elementary

Henry County Schools

Henry County High School
New Castle Elementary

Jefferson County Public Schools

Audubon Elementary
Ballard High School
Blake Elementary
Blue Lick Elementary
Cane Run Elementary School
Conway Middle School
Fairdale Elementary
Farmer Elementary
Fern Creek Elementary
Hartstern Elementary
Hawthorne Elementary
Iroquois High School
Isaac Shelby Elementary



Jefferson County Public Schools – continued

Jeffersontown Elementary
Kammerer Middle
Luhr Elementary
Myers Middle School
Newburg Middle School
Jefferson County Public Schools (cont.)
Ramsey Middle School
Rutherford Elementary
Shacklette Elementary
Slaughter Elementary
Smyrna Elementary
Stopher Elementary
TT Knight Middle

Jessamine County

Brookside Elementary
East Jessamine Middle School

Kenton County School District

James A. Caywood Elementary
Kenton Elementary
Piner Elementary School
R.C. Hinsdale Elementary
Ryland Heights Elementary
Simon Kenton High School
Summit View Elem/Middle Campus
Taylor Mill Elementary
Turkey Foot Middle School
Twenhofel Middle School
White’s Tower Elementary

Laurel County Public Schools

Bush Elementary School
Campground Elementary
Laurel County Day Treatment
Wyan-Pine Grove Elementary School

Lawrence County Schools

Blaine Elementary School

Lincoln County School District

Crab Orchard Elementary School
Hustonville Elementary School
Lloyd McGuffey 6th Grade Center
Waynesburg Elementary School

Madison County Public Schools

B. Michael Caudill Middle School
Farristown Middle School
Kingston Elementary School

Magoffin County Public Schools

North Magoffin Elementary School

Marion County Public Schools

Calvary Elementary School
Glasscock Elementary School
St. Charles Middle School
West Marion Elementary

Marshall County Public Schools

Jonathan Elementary School

Mayfield Independent Schools

Mayfield Elementary School

Meade County Schools

Brandenburg Primary
Ekron Elementary School
Flaherty Primary School
Payneville Elementary School

Mercer County Schools

Evan Harlow Early Learning Center
Mercer County Senior High School

Murray Independent Schools

Murray Elementary School
Murray High School

Nelson County Schools

Foster Heights Elementary
Thomas Nelson High School

Ohio County Schools

Beaver Dam Elementary School

Oldham County Schools

Camden Station Elementary
Crestwood Elementary
East Oldham Middle School
Goshen Elementary
Harmony Elementary

Oldham County Schools – continued

Kenwood Station Elementary School
Locust Grove Elementary School
North Oldham High School
North Oldham Middle School
Oldham County High School
South Oldham High School

Owen County Schools

Maurice Bowling Middle School
Owen County Primary School
Owen County Upper Elementary School

Pendleton County Schools

Northern Elementary
Pendleton County High School
Phillip A. Sharp Middle School
Southern Elementary

Rockcastle County Schools

Brodhead Elementary School
Roundstone Elementary School

Rowan County Schools

Rowan County Senior High School
Tilden Hogge Elementary

Scott County Schools

Anne Mason Elementary
Eastern Elementary School
Elkhorn Crossing School
Garth Elementary School
Georgetown Middle School
Northern Elementary
Ninth Grade School
Royal Spring Middle School
Scott County High School
Scott County Middle School
Southern Elementary School
Stamping Ground Elementary School

Shelby County Schools

Martha Layne Collins High School
Shelby County East Middle School

Simpson County Schools

Franklin Elementary School

Southgate Independent Schools

Southgate Public School

Trimble County Schools

Milton Elementary

Walton Verona Independent Schools

Walton Verona Elementary School
Walton Verona High/Middle School

Warren County Public Schools

Alvaton Elementary
Briarwood Elementary School
Bristow Elementary School
Cumberland Trace Elementary School
Drakes Creek Middle School
Greenwood High School
Henry F. Moss Middle School
Jackson Middle/High School
Natcher Elementary School
New Richardsville Elementary School
North Warren Elementary School
Oakland Elementary School
Plano Elementary School
Rich Pond Elementary School
Rockfield Elementary School
Warren Central High School
Warren East High School
Warren East Middle School
Warren Elementary School

Williamstown Independent Schools

Williamstown Independent Schools

Woodford County Schools

Huntertown Elementary School





KENTUCKY NET-ZERO INITIATIVES

Kentucky has become a leader in Net-Zero construction through KRS 157.455, which strongly encourages; 1) meeting or exceeding efficiency standards in the planning and design of new or renovated buildings, 2) use of life-cycle cost to evaluate different designs, and 3) consideration that each new school or renovation can become a Net-Zero school, either at the time of construction or when resources become available. Grants were awarded to Kentucky and administered through the Kentucky Department for Energy Development and Independence to promote Net-Zero schools.

A Net-Zero Energy school is . . .

A facility that produces as much on-site renewable energy, as would otherwise be provided from the grid.

A Net-Zero Ready school is . . .

A facility that is designed with the energy saving strategies necessary to reduce energy consumption to 25 kBtu's or less per square foot per year and has the infrastructure already in place to easily add renewable energy sources, such as solar panels, when viable.

Net-Zero Ready construction elements that can be added on new construction include:

- North/south classroom orientation
- Limited exposure - reduced perimeter
- Insulated concrete form (ICF) walls
- Compact building footprint
- Geothermal HVAC
- Daylighting
- Efficient kitchen strategies



NET-ZERO ENERGY SCHOOL

School: Richardsville Elementary

Location: Warren County Public Schools

Principal: Jan Casada

Superintendent: Rob Clayton

School built: 2010

Architecture firm: Sherman Carter Barnhart Architects

Engineering firm: CMTA Consulting Engineers

Size of school building: 72, 285 sf (77,466 sf with exterior covered structured overhangs and outdoor classroom)

Cost per sf: \$168.22

Cost per sf with renewable energy source: \$206.50

16.2/kBtus/sf

without solar



"The Warren County Board of Education embraces energy conservation and believes it to be our responsibility to ensure that every reasonable effort is made to conserve energy and natural resources while exercising sound fiscal management."

— Kerry Young, Board Chairman

Building/performance energy efficiency features:

- **High Performance Building Envelope:** The envelope is compact in both configuration and volume. Insulated concrete form (ICF) walls and an R-42 roof further reduce energy consumption.
- **Building Orientation:** The building was sited with a north-south orientation, supporting daylighting of building spaces and maximizing the output of roof-mounted solar panels.
- **Geothermal HVAC:** The building's geothermal system has distributive pumping for heating and cooling as well as for hot water needs.
- **Monitoring Controls:** Occupancy, motion, and CO2 monitoring reduce the building's power demands.
- **Technology Strategies:** Wireless technology reduces plug load and allows the mobile and space-saving use of laptop computers.
- **Daylighting:** Exterior light shelves and roof-mounted solar tubes (vertical chases) direct light into interior spaces. A central "spine" clerestory harvests sunlight and redirects it into high volume spaces: the gymnasium, cafeteria, media center, and public corridors.
- **Solar Panels:** Energy is generated from two locations: a 208kW amorphous thin-film system covering the roof and a 140kW mono-crystalline shade structure in the parking lot. Combined, they produce over 100 percent of the school's energy needs. **In addition to "zeroing out" the energy bill, Warren County receives an annual check in excess of \$40,000 from TVA for the clean energy it purchases from the school.**
- **Kitchen Strategies:** ENERGY STAR® rated equipment was used, and equipment was selected to allow more efficient cooking while at the same time offering healthier menus. Ovens encourage baking and grilling instead of frying and eliminate the need for Class 1 hoods that require make-up air. The result is healthier food choices as well as reduced construction costs and operating costs.
- **Renewable Materials:** Construction of the LEED Gold registered building incorporated cost effective materials from renewable resources with easy maintenance characteristics – materials such as soy-based stained concrete, porcelain pavers, and bamboo flooring.



NET-ZERO READY SCHOOL

School: Turkey Foot Middle School

Location: Kenton County Schools

Principal: Debbie Obermeyer

Superintendent: Dr. Terri Cox-Cruey

School built: 2010

School remodeled/retrofitted: N/A

Engineering firm: CMTA Consulting Engineers

Size of school building: 133,000 sf

Cost per sf: \$175 without solar panels; \$185 with solar panels (actual cost to Kenton County); \$200 final cost including ARRA Fund Grant Assistance

23.6/kBtus/sf
without solar



The Kenton County School District has a history of building high performing, energy efficient schools. Our goal for Turkey Foot Middle School was to build the most energy efficient school possible without paying a premium for construction cost.

— Rob Haney, Executive Director, Support Operations

Building energy efficiency features:

Demand controlled ventilation; geothermal HVAC; geothermal walk-in cooler and freezer, insulated concrete form walls; 384kw solar panel system; solar light tubes; natural daylight harvesting; lighting controls system; energy efficient kitchen equipment; high efficiency transformers; electrical sub-metering; rainwater catchment tank, vegetative roof, vital signs system, dedicated heat recovery outside air systems

Performance features:

The building is currently performing at 11.5 kBtus/sf with solar, as compared to 79.2 kBtu/sf for the old school that was demolished. The new facility is 133,000

sf compared to the old building of 66,523 sf. The current annual energy cost for the new school is \$33,007 compared to the former building at \$94,954. To date the building is consuming 58 percent of its overall power demand from the solar panel power generation. The building has sold back to the power grid \$33,000 net of building consumption.

Energy efficiency and conservation programs/curriculum in school:

Project Lead the Way course “Energy and the Environment” engages students with the green technologies around the school as they use the school as a learning lab. Students research, monitor, experiment, design, improve, and report about a wide variety of environmental concerns on campus.

The Kenton County School District remains committed to maintaining a highly effective energy management program. This program is one of many threads of innovation that is woven through our school buildings and the everyday instruction in our classrooms. Offering substantial benefits to our students, our environment, and our community, this program empowers each of us with unique knowledge and access to top green industry professionals. This program delivers value-added data through diligent research and analysis.

— Dr. Terri Cox-Cruey, Superintendent

NET-ZERO BUILDING

School: Locust Trace AgriScience Farm Academic Building

Location: Fayette County Public Schools

Principal: Joe Norman

Superintendent: Tom Shelton

School built: 2011

Architecture firm: Tate Hill Jacobs Architects

Engineering firm: CMTA Consulting Engineers

Size of school building: Academic Building: 40,550 sf

Cost per sf.: \$212.83 without solar panels; \$232.72 with solar panels

(Cost per sf is based on entire campus (~70,000 sf) and includes extensive site work.)

16.2/kBtus/sf

without solar



"The impact of a Net-Zero facility on our students' education is immeasurable. To learn about energy conservation is one thing, to see it utilized every day is another. This facility is an education for students, staff, and visitors from around the world. From the permeable pavers that you drive up on to the variety of solar panels located on the roof of both the classroom building and equine barn, just walking our campus is an energy education."

— Joe Norman, Principal

Building energy efficiency features:

- Renewable energy – Photovoltaics for Net-Zero Energy
- Natural ventilation – Fans and louvers to minimize air-conditioning large lab-type learning spaces
- Daylighting – Passive and solar by windows, clerestories, and transoms between inside and outside spaces



- Solar hot water – Domestic and heating
- Geothermal heating and air-conditioning
- Digital Plug Load Control – To minimize energy usage during non-operational hours
- Green Screen monitors – To track performance of building utility usage and influence occupants' habits

Performance features:

- Photovoltaic array generates 175 KW max
- Solar thermal array was designed as the third largest in North America; 168 panels generate 1 million Btus annually.

Energy efficiency and conservation programs/curriculum in school:

The design of Locust Trace AgriScience Farm requires that environmental and sustainability initiatives be a topic of study for all students, and they all gain a basic understanding of how the building is designed and what makes it sustainable

This publication was developed by KSBA-SEMP, with the assistance of represented school districts, and made possible through the generous support of the following:

