Energy and Education

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IES Conference
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10-31-11

A Message for School Boards and Administrators

In our modern world, one of the most compelling, relevant, and critical global issues is environmental stewardship and the conservation of our natural resources. As world population grows, and finite raw materials are consumed in ever greater numbers, we must look to find ways to steward the sustainability of our planet's natural resources and ecosystem. At some point, for the future of our children and subsequent generations, there is no greater purpose. Perhaps as we look to the future, we should look first to the past.

"If you are thinking a year ahead, sow a seed.
If you are thinking ten years ahead, plant a tree.
If you are thinking one hundred years ahead, educate the people."
-- *Chinese Poet, 500 BC*

The many strategies to reduce the negative impact of human activity with nature, needs to begin with the education of our students. School leaders everywhere must help grow our collective awareness of environmental stewardship, and find ways to help young people positively interact with the natural and built environment.

AEDG Forword

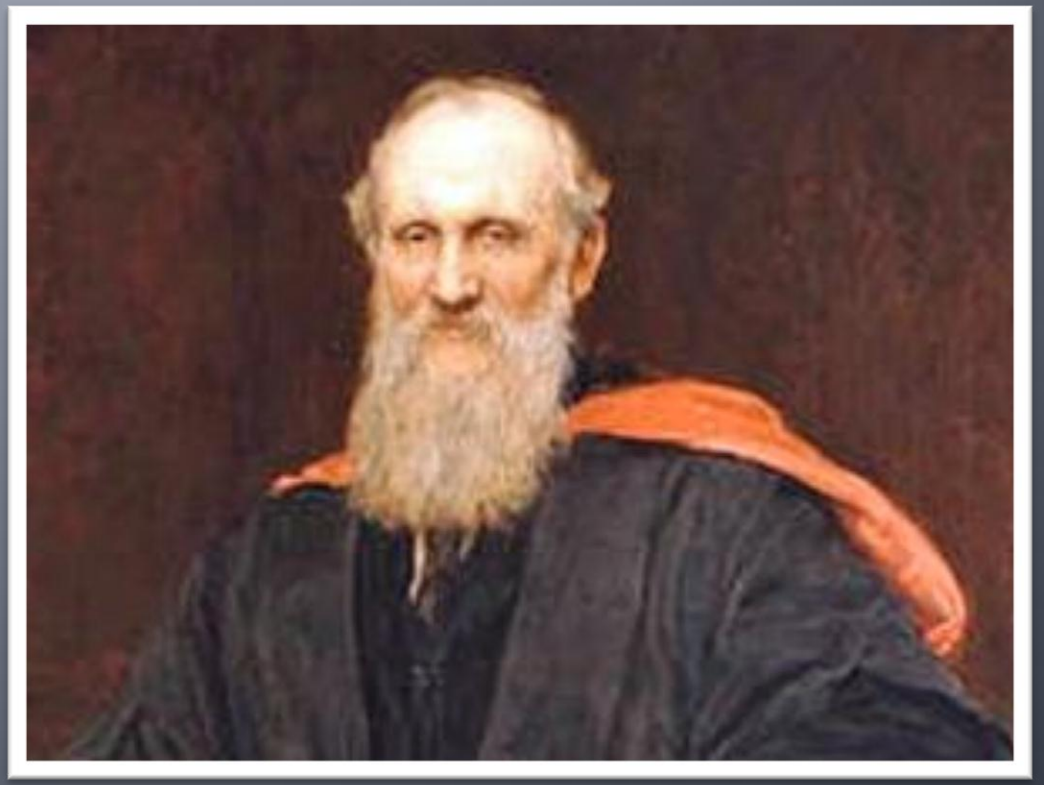
Impact of Facilities on Learning

There is significant research to demonstrate that the quality of the physical environment affects student achievement, as well as staff attitudes and behavior (Cash, 1993; Crook, 2006; Hickman, 2002; Hines, 1996; Lee,2006) . (Also The impact of facilities on student performance at NCEF@Edfacilities.org).

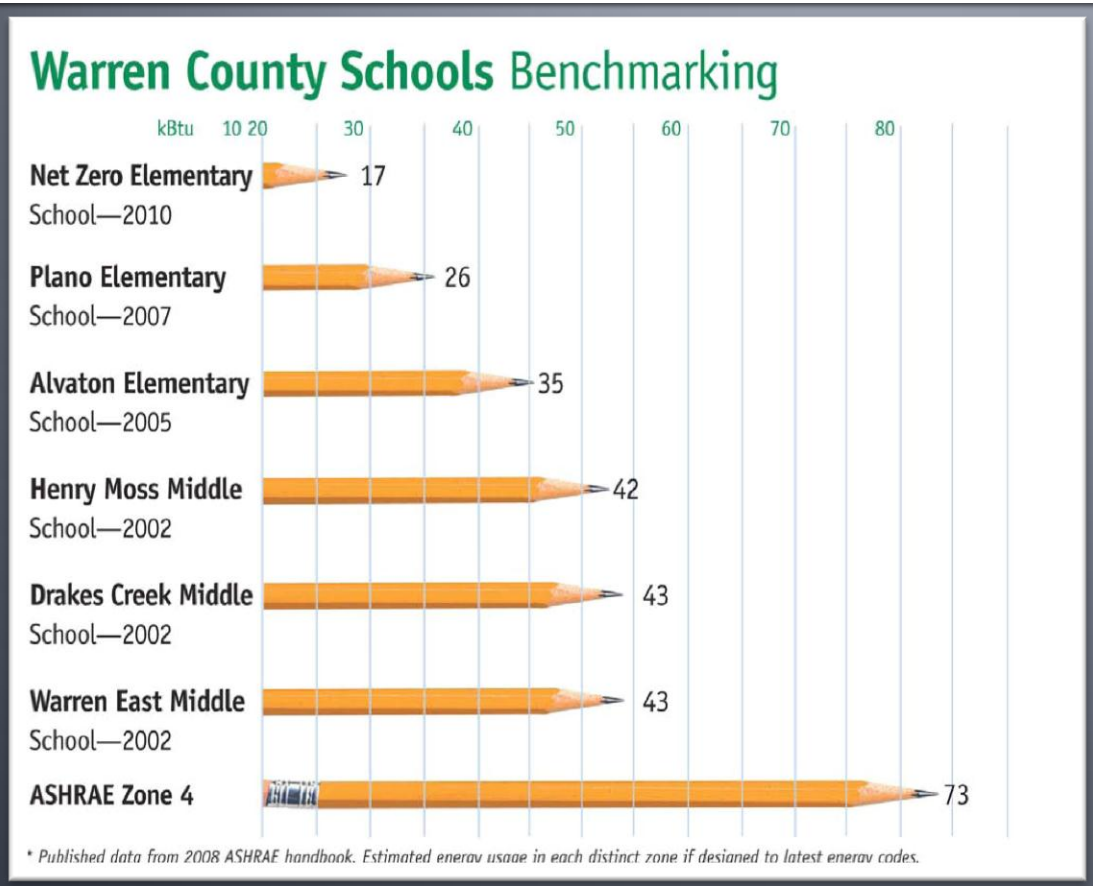
Lord Kelvin

"If you cannot measure it, you cannot improve it."

-Lord Kelvin
1895



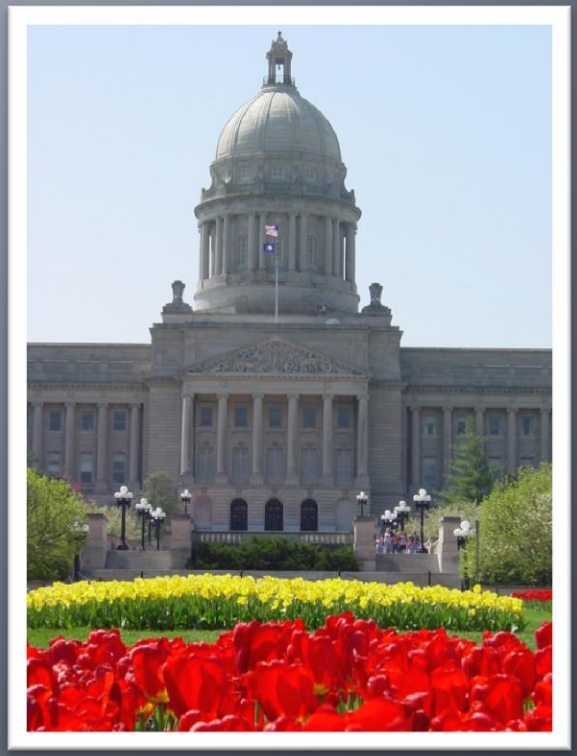
Energy Performance



50% AEDG for K-12 School Buildings

KDE's Interest In Net Zero School

- Impact On Other Design Projects & School Operations
- Impact On Education & Curriculum
- Provide A Clear and Practical Vision of Green Design Legislation



Outcomes

New Benchmark For School Building Energy Performance
Changed Educational & Operational Programs
New Legislation
Project Knowledge

Net Zero Energy School
Richardsville Elementary

Site Design & Building Orientation
Daylight Harvesting
High Performance Envelope
Geothermal HVAC
Healthy Kitchen Design
Information Technology
Renewable Energy

Richardsville Elementary Financial Model

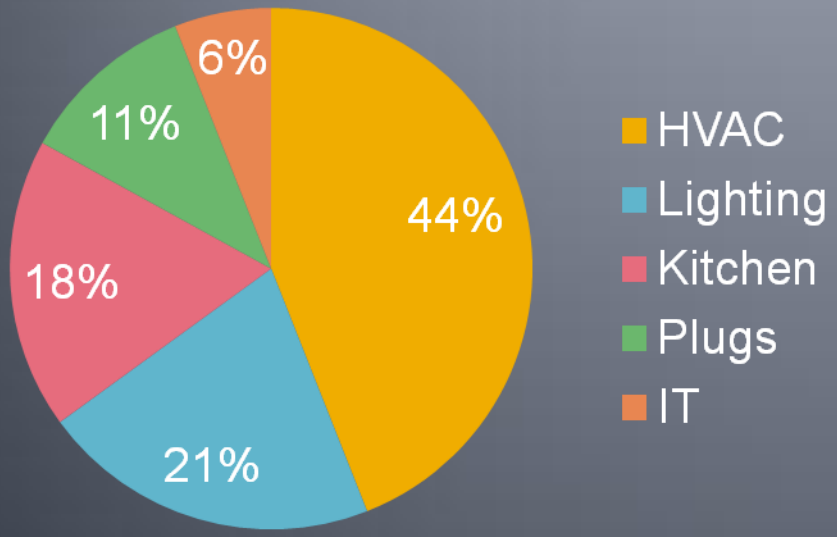
$.013/kWh Avg. Utility Rate
$2.76M Solar PV Cost
$0.223/kWh (TVA Agreement)

Year	Annual Energy Cost 65 kBtu School	Richardsville 17 kBtu Energy Cost	Richardsville PV Revenue	Annual Savings
1	$109,039.00	$46,080.00	$84,183.00	$147,142.00
2	$112,310.00	$47,462.00	$86,708.00	$151,556.00
3	$115,679.00	$48,886.00	$89,310.00	$156,103.00
4	$119,150.00	$50,353.00	$91,989.00	$160,786.00
5	$122,724.00	$51,863.00	$94,749.00	$165,610.00
6	$126,406.00	$53,419.00	$97,591.00	$170,578.00
7	$130,198.00	$55,022.00	$100,519.00	$175,695.00
8	$134,104.00	$56,673.00	$103,534.00	$180,965.00
9	$137,127.00	$58,373.00	$106,641.00	$185,395.00
10	$142,271.00	$60,124.00	$109,840.00	$191,987.00
11	$146,539.00	$61,928.00	$113,135.00	$197,746.00
12	$150,935.00	$63,785.00	$116,529.00	$203,679.00
13	$155,464.00	$65,699.00	$120,025.00	$209,790.00
14	$160,127.00	$67,670.00	$123,626.00	$216,083.00
15	$164,931.00	$69,700.00	$127,334.00	$222,565.00
	$2,027,004.00	$857,037.00	$1,565,713.00	$2,735,680.00

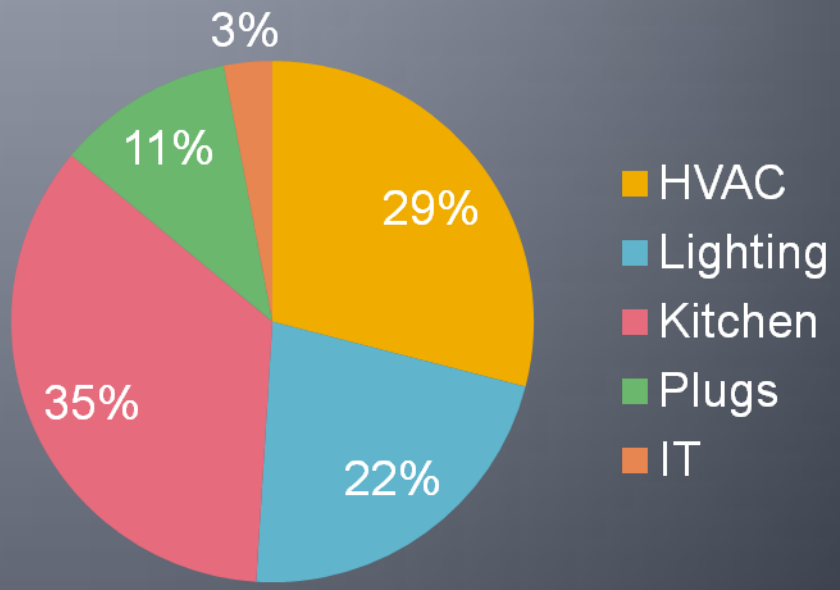
Courtesy of CMTA Engineers

Richardsville: Energy Usage

Actual: 18.2 kBtu/sf yr

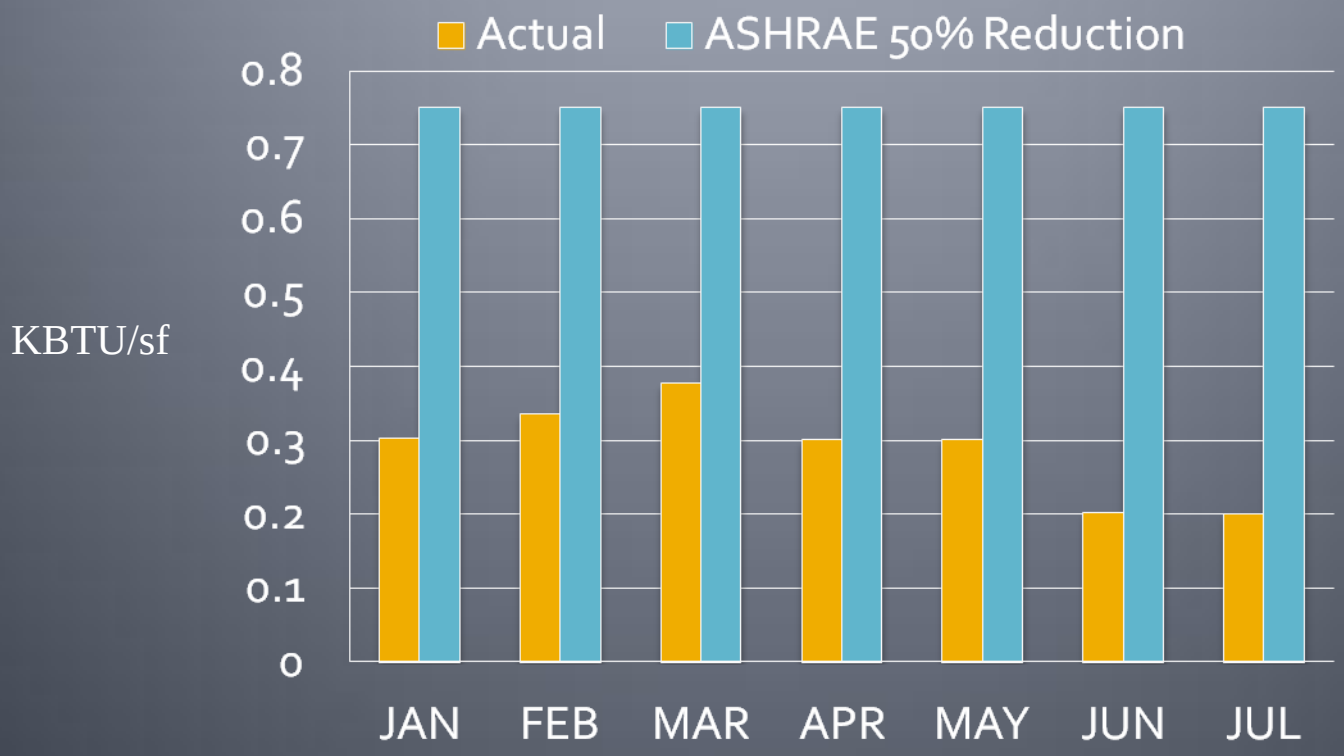


Goal: 17.2 kBtu/sf yr



Courtesy of CMTA Engineers

Lighting - Monthly



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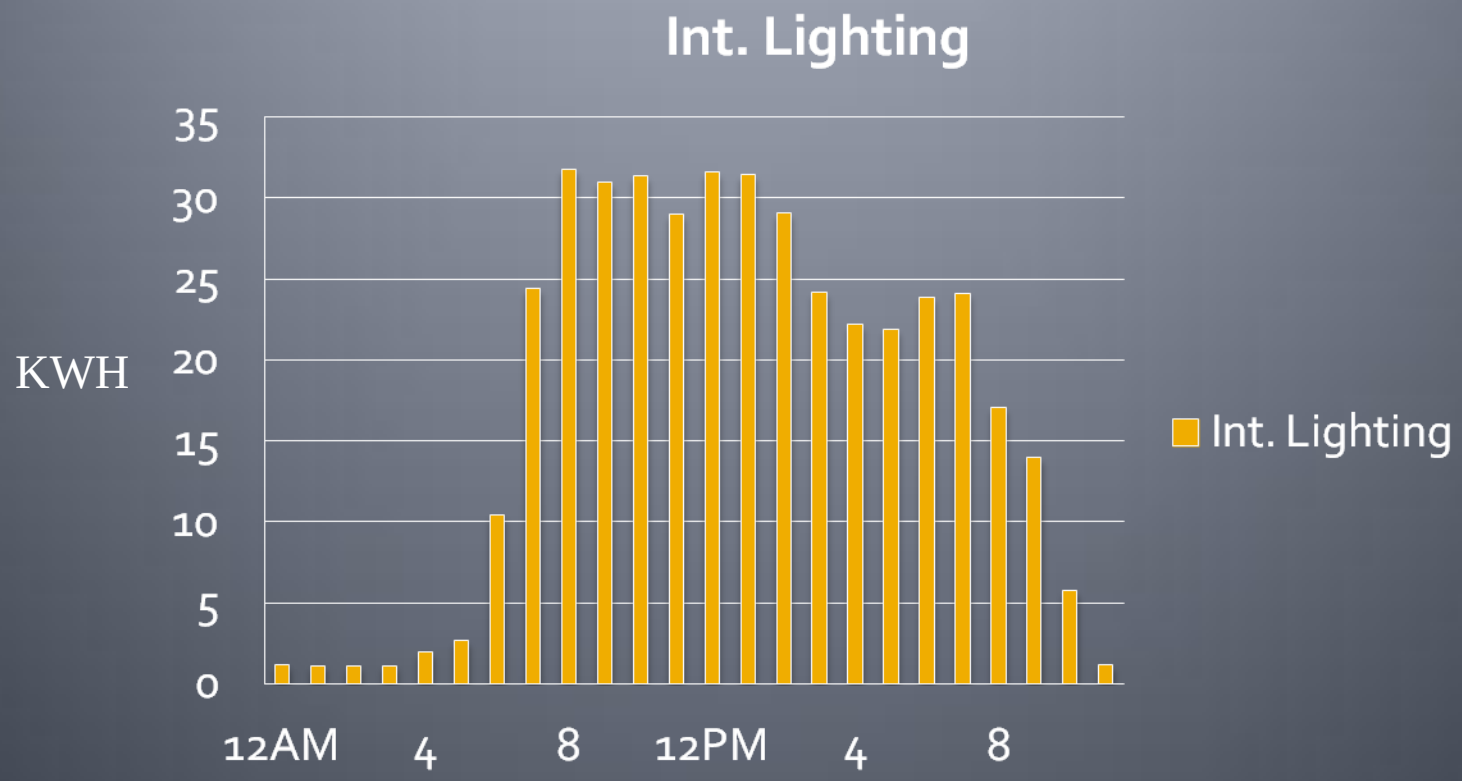
Interior Lighting Energy



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Lighting – Unoccupied

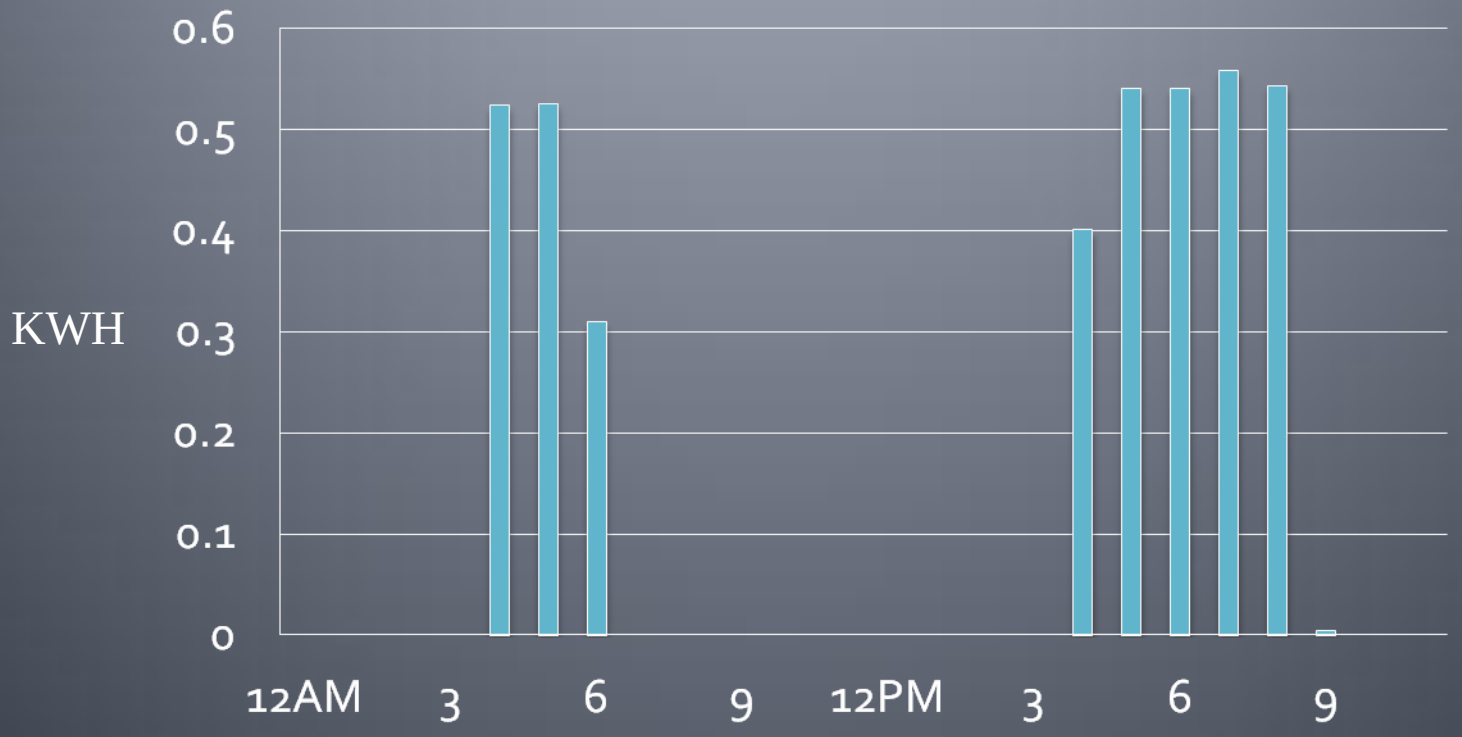
Dark Sky Approach

Local Police Collaboration

Façade Lighting Controls

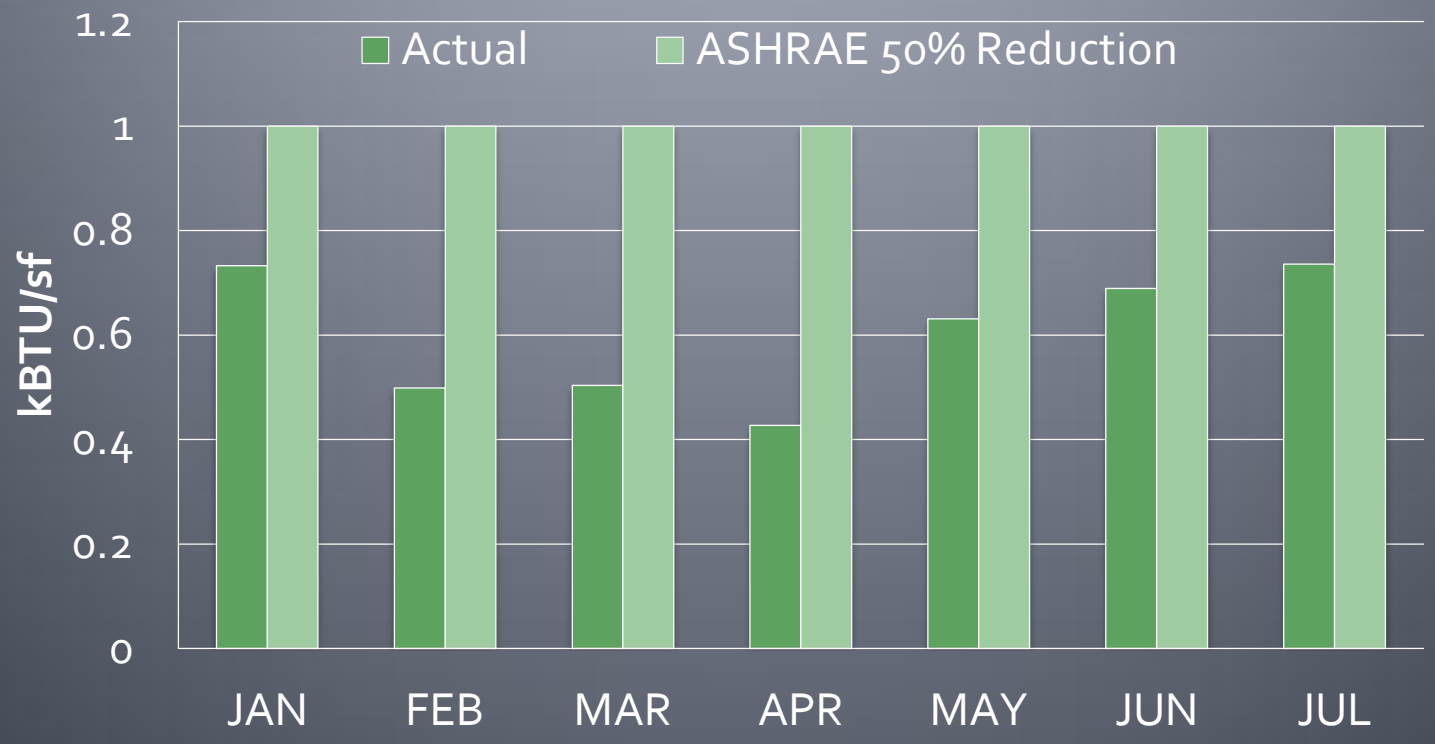
Eliminate Building Night Lighting

Exterior Lighting Energy



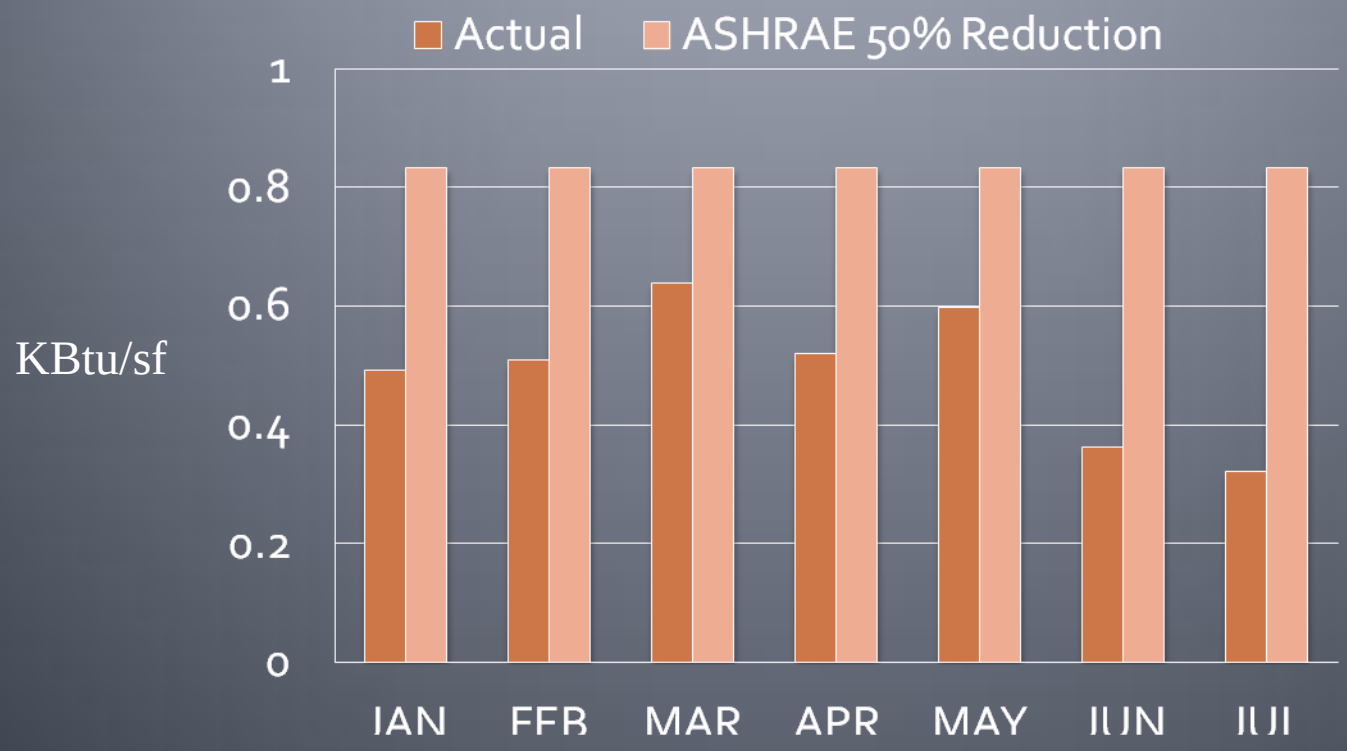
Courtesy of CMTA Engineers

Richardsville HVAC – Monthly



Courtesy of CMTA Engineers

Plug/Process Loads 2011



Courtesy of CMTA Engineers

Electric Utility Summary

Read Date	Days of Service	Bill Amount	Energy Cost	Demand Cost	Total Cost	Generation Credit	KWH	Actual Demand
07/18/2011	32	($3,036.40)	$2,354.83	$1,274.15	$3,628.98	($6,665.38)	24,800	134
6/16/2011	30	($1,489.46)	$2,845.49	$1,953.48	$4,798.97	($6,288.43)	33,000	196
5/17/2011	32	$234.63	$2,886.90	$1,787.78	$4,674.68	($4,440.05)	34,800	192
4/15/2011	30	($301.00)	$2,426.75	$1,510.80	$3,937.55	($4,238.55)	28,000	170
3/16/2011	30	$2,376.00	$2,755.35	$2,152.80	$4,908.15	($2,532.15)	32,800	194
02/14/2011	31	$4,102.00	$2,766.15	$2,720.90	$5,487.05	($1,384.71)	33,800	232
1/14/2011	30	$4,896.76	$2,474.86	$2,421.90	$4,896.76	$0.00	20,200	212
12/15/2010	30	$5,013.70	$2,711.40	$2,302.30	$5,013.70	$0.00	32,800	204
11/15/2010	32	$4,752.42	$3,048.12	$1,704.30	$4,752.42	$0.00	37,200	164
10/14/2010	29	$4,905.65	$3,081.75	$1,823.90	$4,905.65	$0.00	35,200	172
09/15/2010	33	$4,393.31	$3,316.91	$1,076.40	$4,393.31	$0.00	42,600	122
08/13/2010	29	$3,361.02	$2,451.67	$909.35	$3,361.02	$0.00	28,800	110

Courtesy of CMTA Engineers

Teaching Tool

Access, Monitor & Learn About The Schools Performance
Energy Based Curriculum
Introduce Students To Environmental Sciences Careers
Create Lifelong Environmental Stewards

Vital Signs for Twenhofel Middle School
http://www.twhvac.kenton.kyschools.us/

Green Schools – Turkeyfoot Middle School Part3
www.kygreen.tv/tag/kenton-county-school-district/

Legislation: KRS 157.450

It is the intent of KRS 157.450 and 157.455 to:

(1) Support the construction of new school buildings and the renovation of existing school buildings in a manner that will create a healthy environment for students and teachers while saving energy, resources, and operational expenses; and
(2) Encourage the use of a life-cycle cost, holistic approach to building design that considers school design, construction, operation, and maintenance in the initial decision-making process.

Effective: July 15, 2010
History: Created 2010 Ky. Acts ch. 134, sec. 1, effective July 15, 2010.

Legislation: KRS 157.455

(2) The General Assembly hereby finds that schools that are constructed or renovated using efficient school design are proven effective vehicles for accomplishing some or all of the following beneficial public purposes:
(a) Lower operating costs and increased asset value;
(b) Reduced waste sent to landfills;
(c) Conservation of energy and water;
(d) Reduced storm drainage runoff;
(e) Healthier, safer environments for occupants;
(f) Reduced emissions of greenhouse gases; and
(g) Improved student attendance and performance by:
1. Using the building as a teaching tool;
2. Using the local environment as a context for curriculum integration;
3. Providing rigorous, highly relevant, and applied learning; and
4. Improving productivity by making buildings healthier for occupants, especially through the increased use of natural light.

Legislation: KRS 157.455

(3) The Kentucky Department of Education and all school districts undertaking the construction of new school buildings or the major renovation of existing school buildings are strongly encouraged to:
(a) Meet or exceed efficient school design standards in planning and designing all new buildings and major renovation projects;
(b) Use life-cycle cost analysis to evaluate different design proposals; and
(c) Consider the possibility that each new school building or major renovation of a building could be a net zero building, either during the construction or renovation, or at a later date as resources become available.

Legislation: KRS 157.455

(5) The Department of Education shall develop and adopt guidelines for efficient school design, net zero buildings, and life-cycle cost analysis, including the identification of appropriate computer-based simulation programs for use in undertaking life-cycle cost analysis.

Legislation: Green Schools Caucus

Section 1. The House of Representatives enthusiastically endorses the creation of a Green Schools Caucus in the Kentucky General Assembly to advocate and encourage broader application of the design and construction practices for green schools, both for new construction and major renovation projects undertaken with school district funds. School districts are encouraged to consider seeking application for certification of green schools under the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system, or certification under a comparable system with requirements at least equivalent to the LEED Silver certification for new or retrofit construction, or other building performance certification systems, such as the U.S. Department of Energy's Energy Star program.

Seeing Things Differently Future and Now

Imagine a community where leadership works together in an integrated way to help provide practical and relevant solutions to complicated problems of our modern world. That is seeing things differently.

Imagine a community where local, state and federal governments work together for a common cause to educate young people about environmental stewardship and energy conservation. That is seeing things differently.

Imagine a community where government partners with business to share and develop new technologies, and to help ensure a highly educated and relevant work force for economic development. That is seeing things differently.

Imagine a community where all schools connect curriculum to science, technology, engineering, and mathematics and provide applied learning opportunities for environmental engineering, the natural and built environment, and the conservation of our natural resources. That is seeing things differently.

Imagine a community where school buildings not only house educational programs, but become laboratories and teaching tools for students and teachers.

That is seeing things differently.

Imagine a community where buildings create as much energy as they use. That is seeing things differently.