

# Leadership and the Energy Management Process - Getting the Bang for Your BTUs

A Board's Role in Eliminating Wasteful Spending

National School Board Association

Boston, MA

April 2016



# Kentucky School Profile



- 173 Districts - Boards
- 675,000 Students
- \$50,428 Average Teacher Salary
- 1233 P-12 Schools
- 110,000,000 Square Feet
- 187 Day School Year

# School Energy Managers Project



## "ENERGY EFFICIENCY PROGRAM DELIVERY"

- Introduce Energy Managers into schools via partnerships
- Resultant Energy and Cost Savings
- As measured by
  - Increased Energy Efficiency
  - Reduced and Avoided Costs
  - # of ENERGY STAR Schools

Wasted Energy = Money on the floor waiting to be picked up



# Key Factors for Successful Energy Management Program

- Support from School Board & Superintendent
- Buy in by all Principals - the building leaders
- Buy in from all faculty and staff
- Educate students on saving energy
- Provide weekly and monthly report for competition
- Identify Energy Conservation Measures (ECM's)
- Implement ECM's
- Recognize achievements

# Fundamental Challenge

- Core Business of Schools is Education
  - Difficult to fund non-classroom position
  - Look for grants
- Personnel Background is Education - not finance or energy
  - Fill positions from within district
- “not my money....just pay the bill”

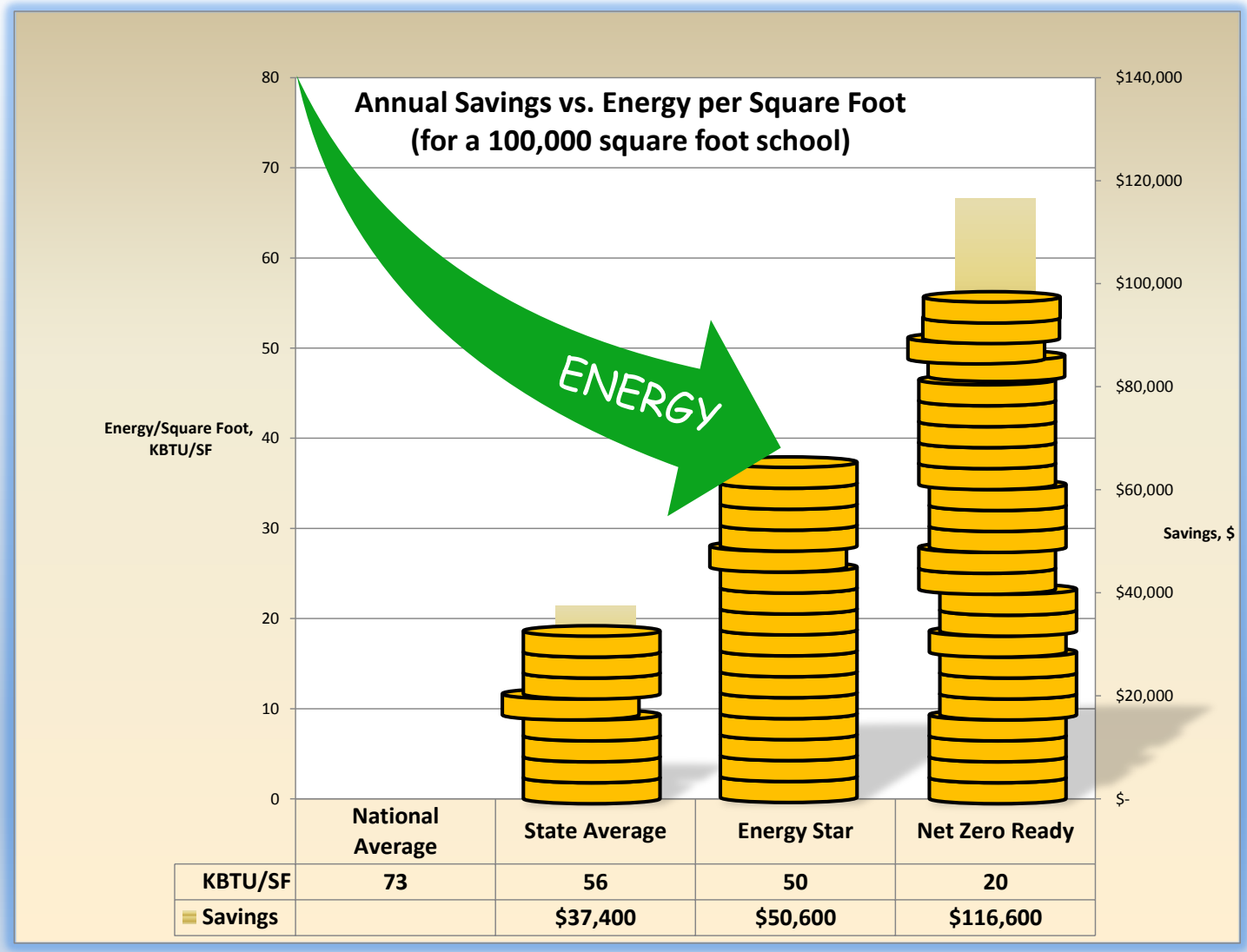


# KSBA - SEMP's Message

## Best Fuel Source - Energy Efficiency

- Doesn't require new technology
- Can do it today
- Reduces Greenhouse Gas
- Lowers Cost

# Relationship between Energy and Dollars





# Defining the Board's Role in Energy Management

1. Energy Leadership
2. Efficient Operation
3. Outreach & Communication
4. Energy Construction and Renovation
5. Energy Financing

Each Section will include Questions for Board Members plus Examples



# Energy Leadership



# Energy Leadership

- How do we want to be seen by our students, staff, and community on our views and usage of energy?
- How have we defined success in our district Energy Plan?
- What are our policies around energy?
- Are we just “paying the bills” or is anyone analyzing them?

*Our objective is to be good stewards of the resources (energy, water, dollars, etc.) given us. We will seek a reasonable working balance between personal comfort and resource consumption knowing that we must optimize student learning*

# Board Policy as a Driver

*"...use energy resources in a safe and efficient manner with an on-going focus of implementing cost savings measures..."*

- District Energy Oversight Committee
  - Develop and Implement Energy Management Plan
  - Track & Monitor Progress Managing & Reducing Costs
  - Superintendent Annual Reporting
- Benchmarking
- Statewide Reporting

# Energy Management Plan

- Objective
- Occupant Responsibility
- Thermostat Setbacks
- Building Resource Management
  - Windows and Doors
  - Computers
  - Plug Loads
- Holiday Period Operation
- Lighting
- New Construction Standards
- Annual Reduction Goal

# Efficient Operations



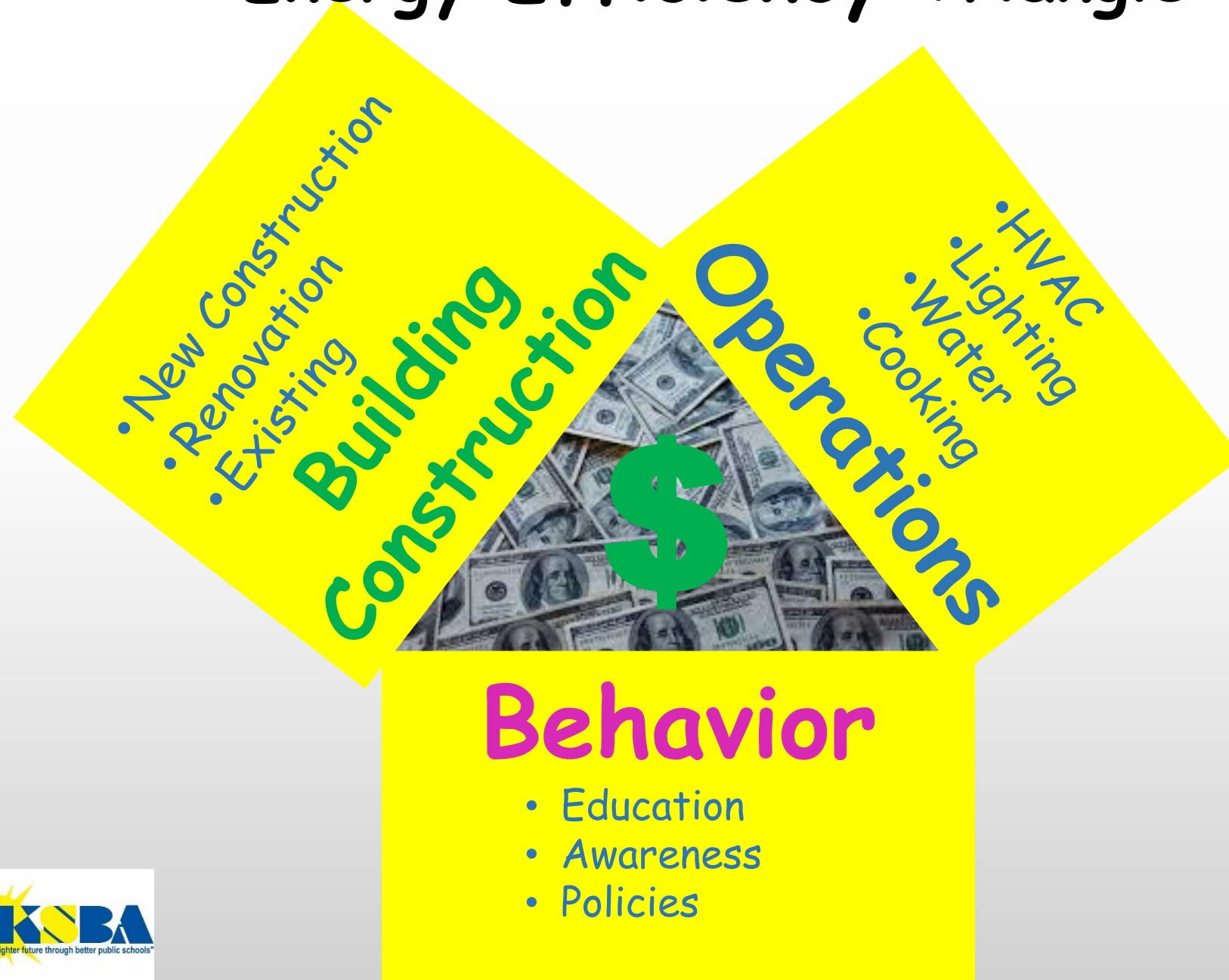
# Efficient Operations



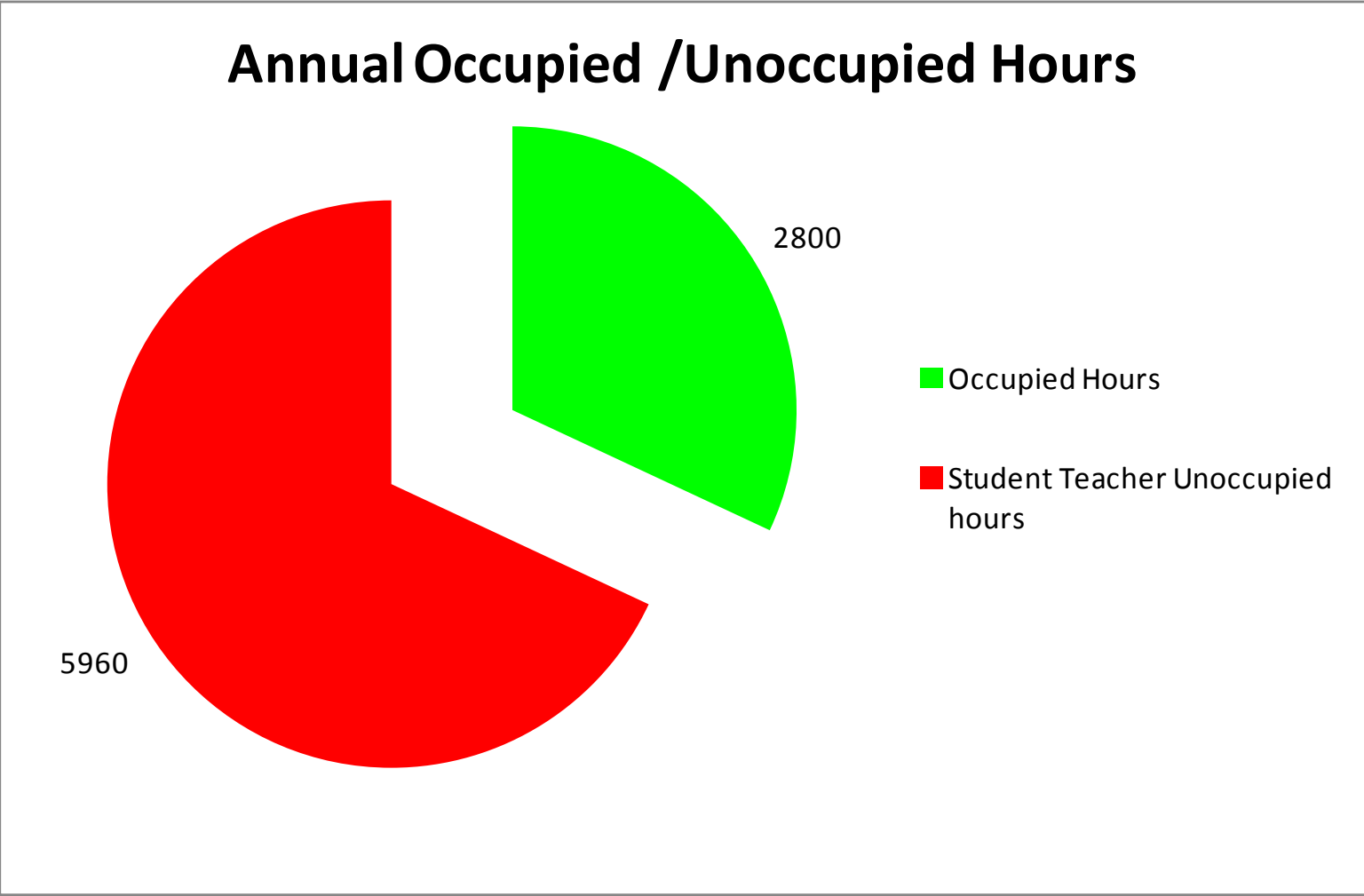
- Do our daily operations match our policy?
- Do we audit our buildings for energy opportunities?
- What is our prioritized list of energy projects?
- Do we use what we have?
- Are we happy or sad that our operations reflect our policies?



# Energy Efficiency Triangle



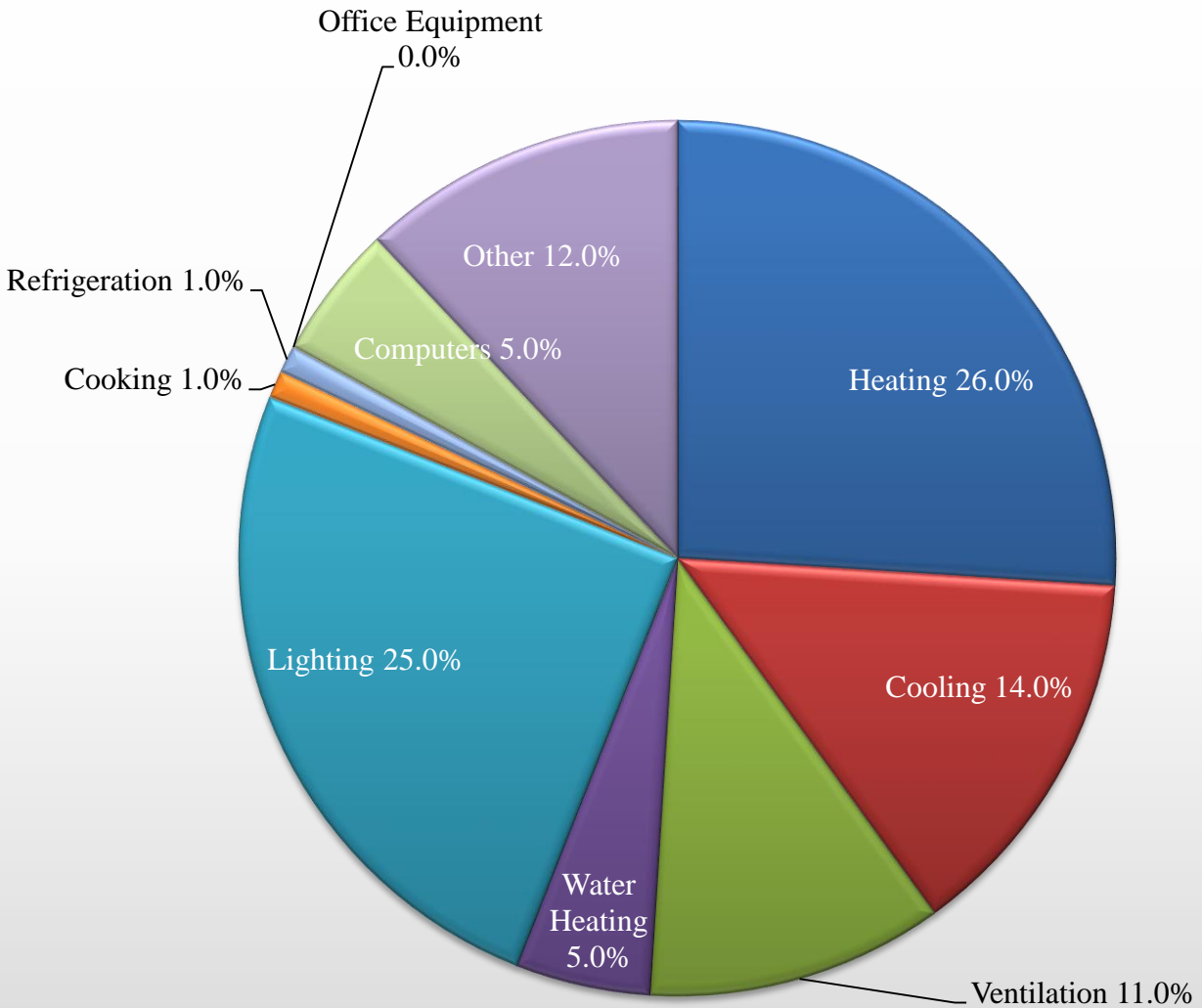
# Why Have Setbacks in a School?



# Where do those BTUs Go?

- Note HVAC
- Note Lighting
- Other = Things Plugged In
  - ✓ Space heaters
  - ✓ Coffee Makers
  - ✓ Microwaves
  - ✓ Mini Fridge

• Commercial Building Energy Consumption Survey



CBECS High School Energy Use Profile (2003)



# District Energy Manager

- Coordinates Requirements of Board Policy
- Develops & Implements Energy Management Plan
- Commits to Performance Goals
- Analyzes and Implements ECMs
- Accumulates and Provides Data
- Saves Districts Energy and Dollars

# Behavior Opportunities



Mini Fridge

Coffee Pot

Power Strip



DVD Player

Microwave

Lamp

Thermostat



# Student Energy Teams





## 2. Board Efficient Operations





# Outreach and Communication





# Outreach and Communication

- How do we compare Month to Month and YTY? Who knows?
- How does our energy cost/square foot compare with statewide and national data?
- What messages are on our website concerning energy policy?
- Are we communicating our energy efforts and savings?

# Goals of District Communication

- Keep all stakeholders up to date on progress of Energy Management Program
- Each school to constantly find ways to improve
- Allow each school to compare to last year
- Keeps everyone engaged in saving energy and money



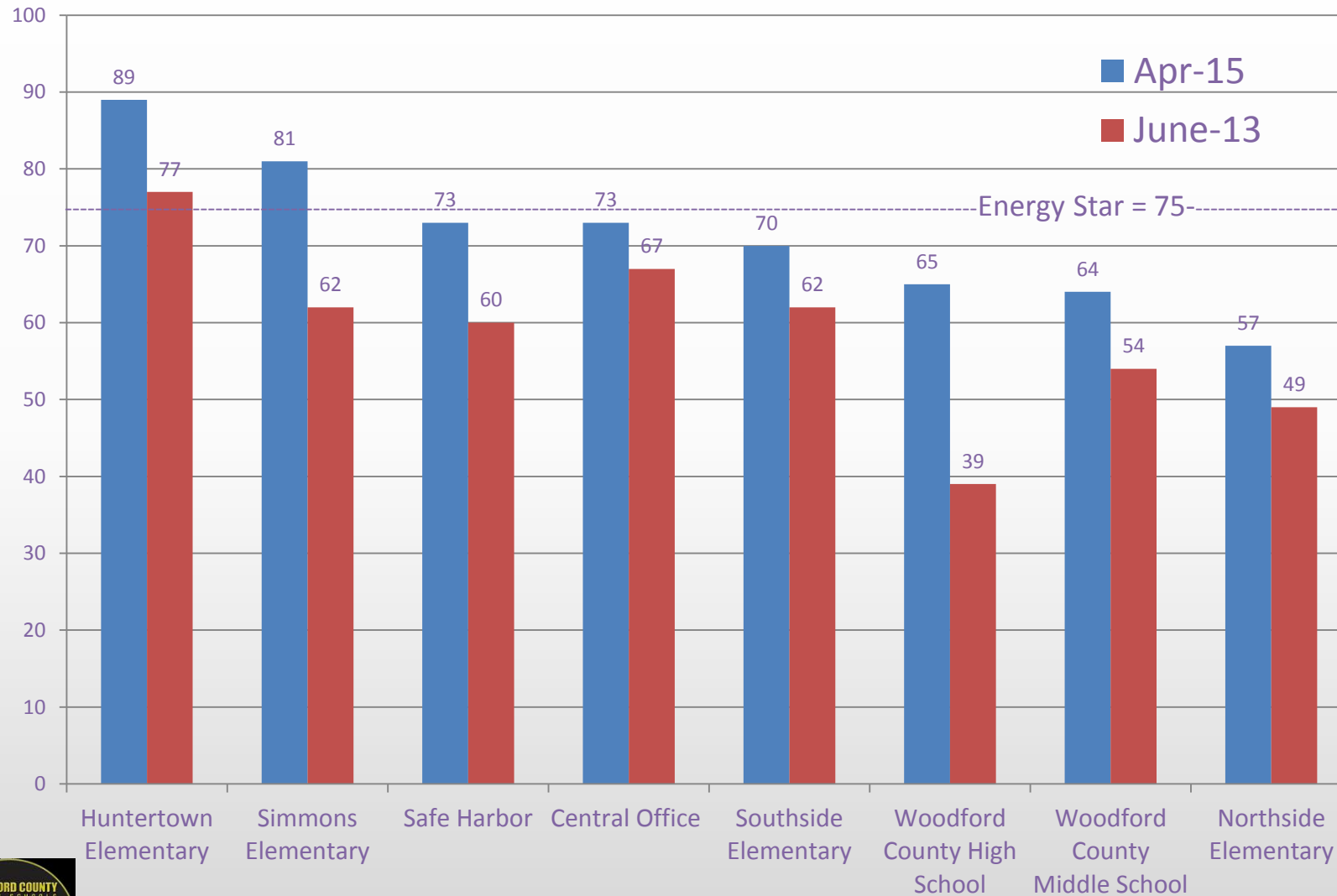
# Scott County Schools Energy Management Report June 2015

School Facility	June					2014 - 2015 YTD Results				
	2014 Actual Kwh	2015 Actual Kwh	% Reduction	Position	\$ Cost Change	2013-14 Actual Kwh	2014-15 Actual Kwh	% Reduction	Overall Position	YTD \$ Cost Change
GMS	58,400	54,040	7.5%	5	-\$401	1,057,200	1,055,080	0.2%	14	-\$182
RSMS	77,080	74,160	3.8%	9	-\$268	1,215,840	1,271,200	-4.6%	17	\$4,753
AME	73,316	58,060	20.8%	1	-\$1,403	982,539	931,666	5.2%	6	-\$4,367
Eastern	27,181	22,402	17.6%	2	-\$439	517,031	462,757	10.5%	3	-\$4,659
Garth	68,331	59,542	12.9%	4	-\$808	702,431	649,422	7.5%	4	-\$4,551
Northern	41,200	34,000	17.5%	3	-\$662	622,800	513,200	17.6%	1	-\$9,409
Southern	48,480	45,440	6.3%	7	-\$279	789,440	776,960	1.6%	11	-\$1,071
Stamping Ground	42,960	43,120	-0.4%	11	\$15	577,040	556,270	3.6%	8	-\$1,783
Western	55,200	66,800	-21.0%	17	\$1,066	971,600	924,400	4.9%	7	-\$4,052
Central Office/Misc	54,912	58,975	-7.4%	13	\$374	777,328	751,434	3.3%	9	-\$2,223
Preschool	15,941	15,627	2.0%	10	-\$29	274,827	266,633	3.0%	10	-\$703
SCHS	183,274	170,053	7.2%	6	-\$1,215	3,065,514	2,674,873	12.7%	2	-\$33,537
SCMS	55,920	62,400	-11.6%	15	\$596	1,087,680	1,080,000	0.7%	12	-\$659
ATC	4,248	4,022	5.3%	8	-\$21	147,306	146,641	0.5%	13	-\$57
9th Grade/Cardinal Acad.	36,000	40,800	-13.3%	16	\$441	566,400	590,160	-4.2%	16	\$2,040
ECS	39,200	40,800	-4.1%	12	\$147	560,400	568,400	-1.4%	15	\$687
Lemons Mill	43,615	47,616	-9.2%	14	\$368	1,000,531	929,711	7.1%	5	-\$6,080
Total	925,258	897,857	3.0%		-\$2,519	14,915,907	14,148,807	5.1%		-\$65,856



# Woodford County Schools

## Energy Star Portfolio Manager Rating



# Additional types of District Communication

- **Monthly Report** to the School Board
- **Monthly Report** to Superintendent, District Energy Team Members, Principals and Energy Team Leaders
- **Weekly Report** to Principals and all Interested Team Members
- **School District Web Site** Monthly Updates
- **News in Local Newspaper** to let Taxpayers know how much money is being saved by the program

# Weekly Energy Usage Report

(done by weekly meter readings)

School	Date/ Reading	Date/ Reading	Delta	Mult.	kwh	Days	kwh/ day	Projected Aug 2015	Aug 2014	Delta	% Delta
WCCO 30	8/4/2015 63250	7/7/2015 63181	69	180	12420	29	428	12420	15840	-3420	-21.6%
WCMS 28	8/4/2015 1225	7/6/2015 758	467	240	112080	29	3865	112080	108240	3840	3.5%
Safe Harbor 28	8/5/2015 858	7/7/2015 799	59	80	4720	29	163	4720	4800	-80	-1.7%
Southside 29	8/10/2015 41766	7/14/2015 41336	430	150	64500	27	2389	69278	63300	5978	9.4%
Huntertown 29	8/10/2015 330	7/15/2015 184	146	200	29200	25	1168	33872	40400	-6528	-16.2%
WCHS 29	8/10/2015 15297	7/22/2015 14994	303	300	90900	18	5050	146450	185100	-38650	-20.9%
Northside 28	8/10/2015 44017	7/23/2015 43810	207	200	41400	17	2435	68188	63200	4988	7.9%
Simmons 28	8/10/2015 4335	7/27/2015 4150	185	120	22200	14	1586	44400	53520	-9120	-17.0%
Total						24		491408	534400	-42992	-8.0%



# ENERGY STAR's Portfolio Manager

- An excellent way to benchmark schools and communicate how each is doing
- Initial set-up requires the following items:
  - Area of School Building, Gym & Parking Lot
  - % of Area Heated and Cooled
  - # of workers and student capacity
  - Months in use and whether it is used on weekends
  - # of computers
  - Does it have cooking facilities?
  - # of walk-in Refrigeration/Freezer Units

# Energy Construction and Renovation

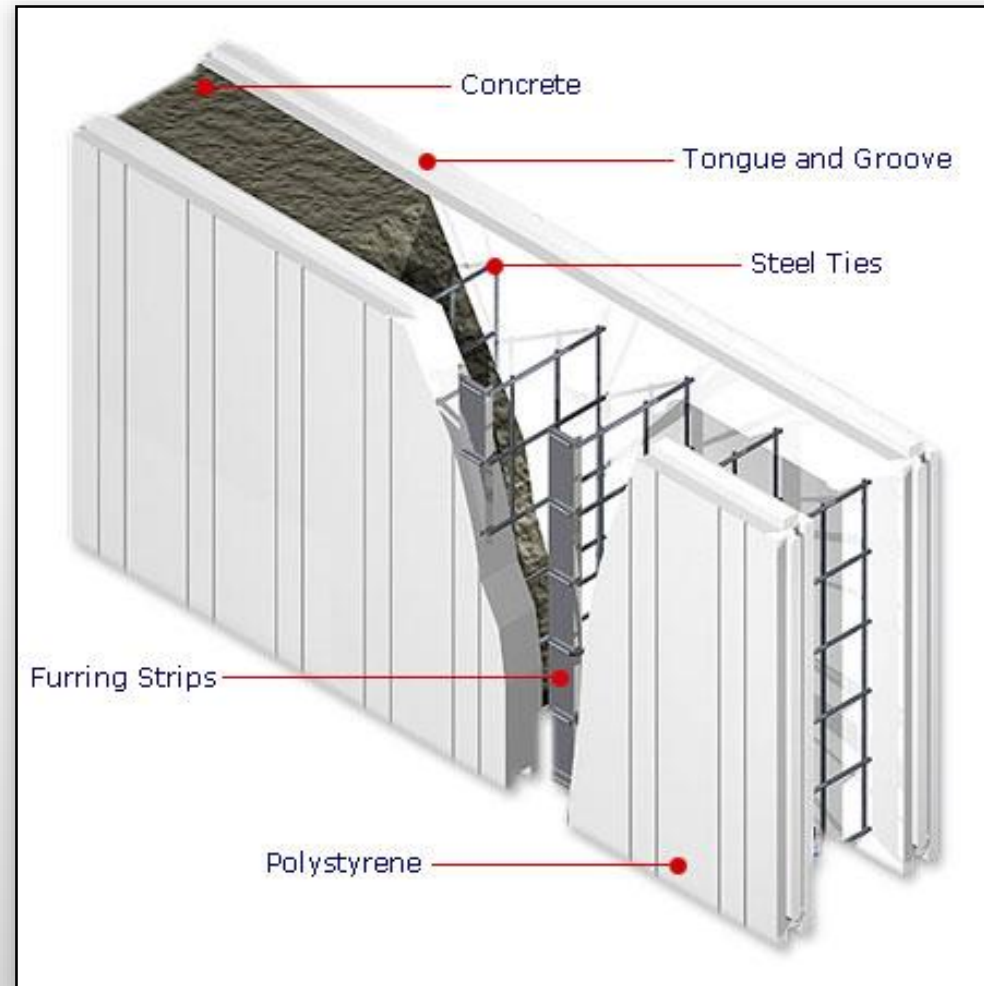


# Energy Construction and Renovation

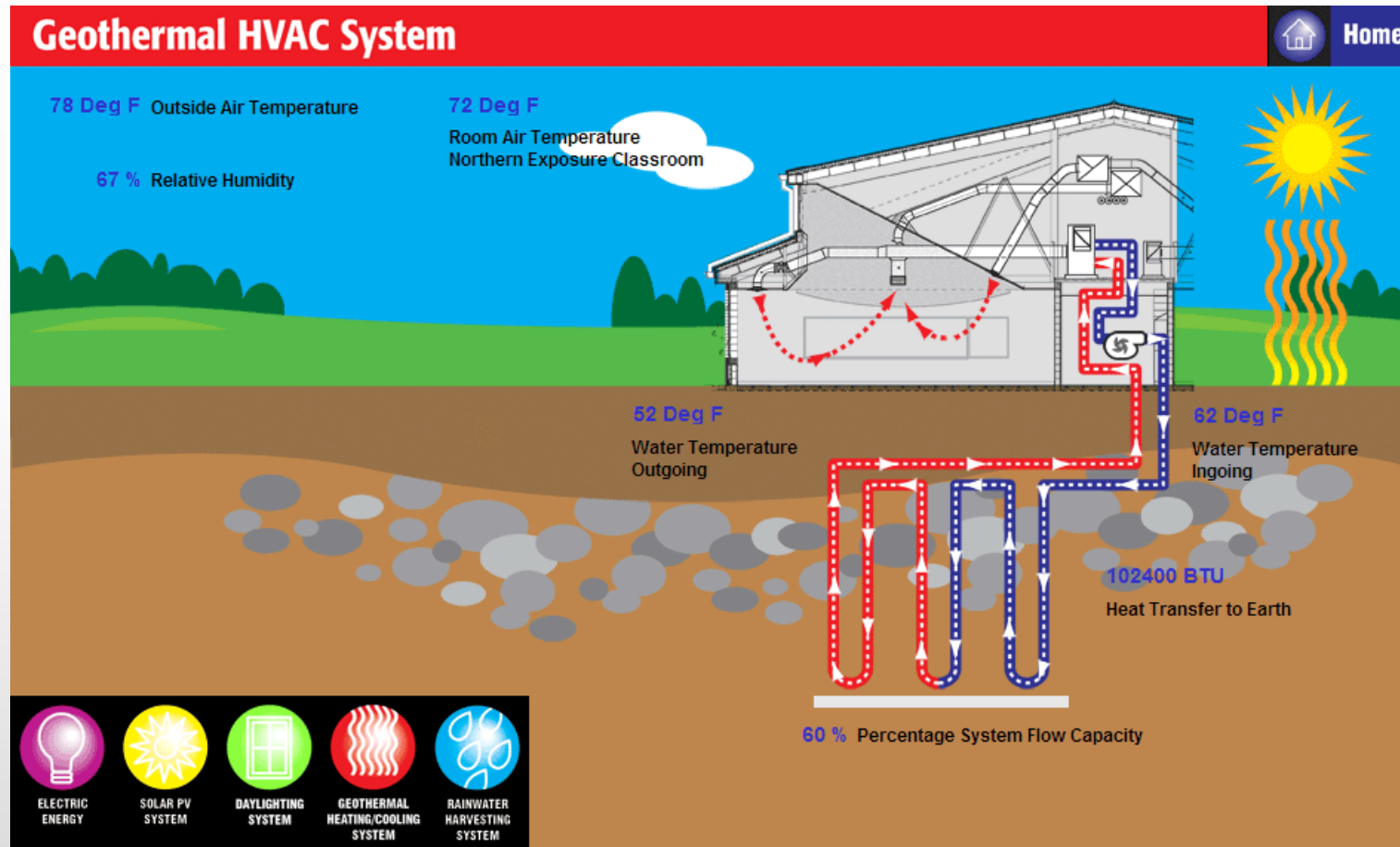


- Are we taking advantage of energy construction and renovation to reduce our long-term operating costs?
- Are we using life-cycle costing as a part of our initial decision-making process?
- Are we building and renovating in a manner that creates a healthy environment for students while saving energy and operational expense?

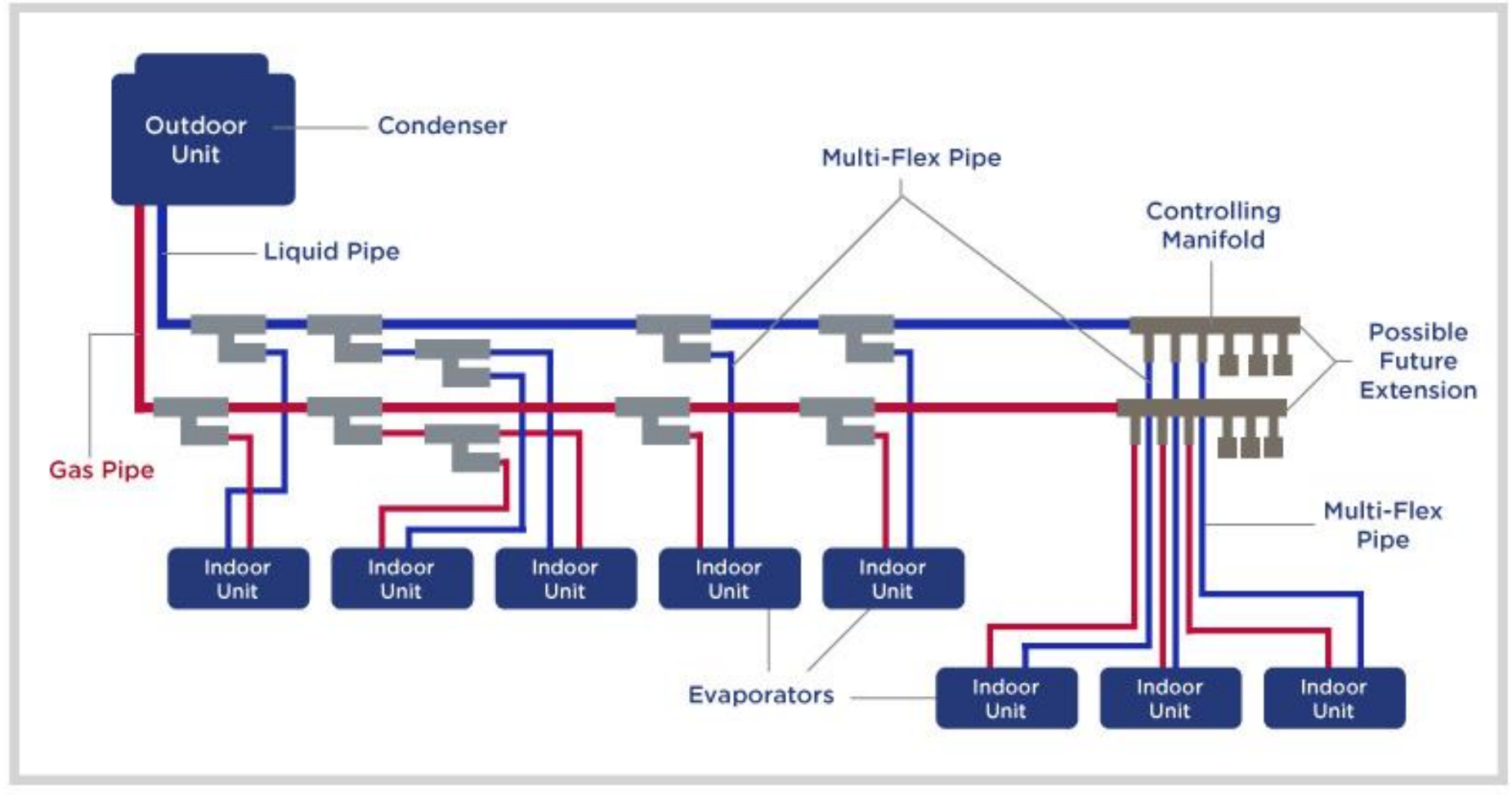
# Insulated Concrete Walls



# Geothermal HVAC

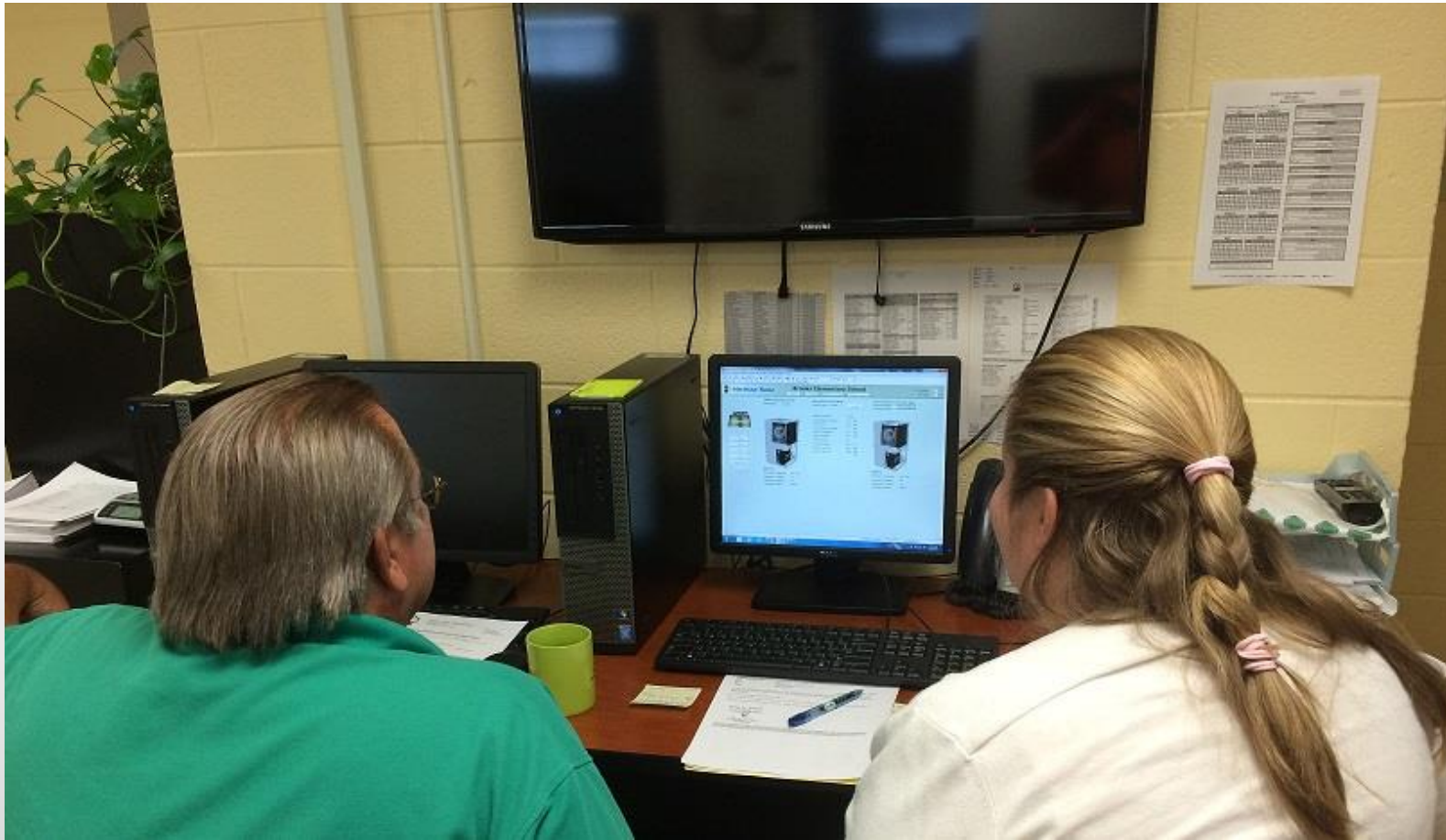


# Variable Refrigerant Flow





# Control Systems





# Envelope Improvement



# Orientation

## 4. Energy Construction and Renovation



- The school was designed to face the sunrise in the east
- The classrooms feature clerestory windows (a row just below the ceiling) that use light shelves to bounce light onto a specially designed ceiling

# Richardsville Elementary



The Nation's First Net Zero School





## 4. Energy Construction and Renovation



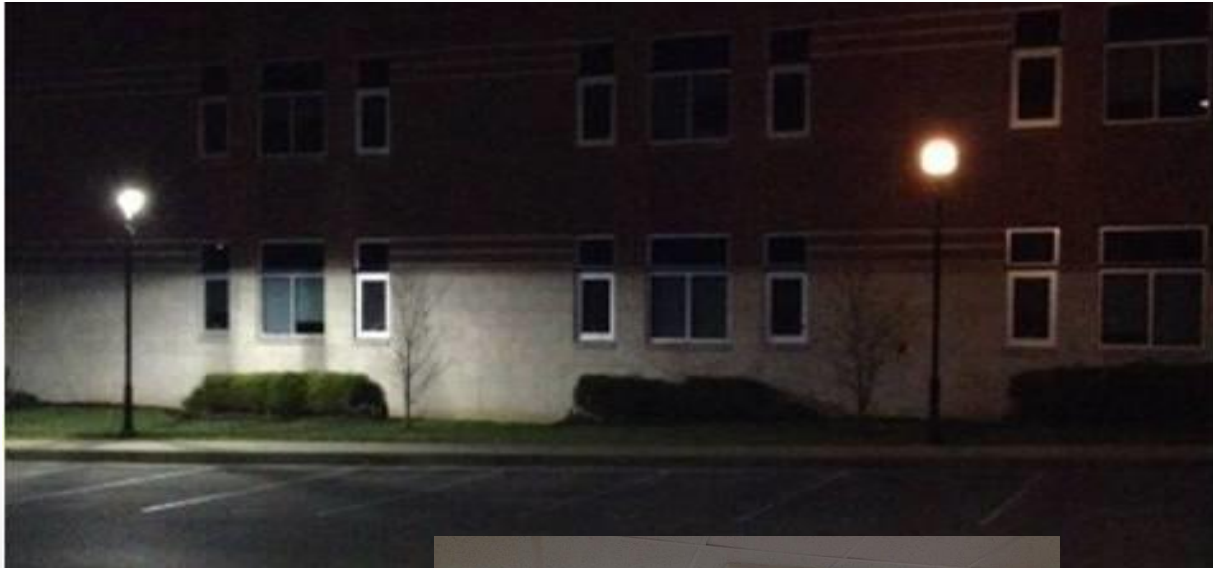
Solar Tubes exterior

Solar tubes have been placed in the second-story classrooms to provide sunlight—natural lighting directly into the building - classrooms.

They look like regular ceiling lights but give students the benefit of natural daylight



# LED Lighting





# Solar Energy



# Energy Financing





# Energy Financing

- Do I know the cost of energy for my district?
- Do I understand how my district's operational savings can be used to finance other projects?
- Are we leveraging our operational savings?



# Operational Savings for Equipment Retrofits

Example:

- Your energy manager has identified an air infiltration problem in one of your buildings and estimates the savings will be \$15,000 per year but will cost \$45,000 to repair.
- You say, "No way, I've got to find \$130,000 to repair a roof in another building."
- ??????

# Operational Savings for Equipment Retrofits

Example:

- Assume the repaired building will last 20 years
- Assume 5% discount rate
- By understanding the Life Cycle Cost and the Time Value of Money, you can determine the Present Value of the \$15,000 per year annuity over the next 20 years

# Operational Savings for Equipment Retrofits

## Example:

- $\$15,000 \times 12.4622^* = \$186,933$  (Present Value)
- $\$186,933 - \$45,000 = \$141,933$  (Net Present Value)



❖ *The Net Present Value of the Energy Savings will fund the Roof Repair!!*

## Energy Savings are an Annuity

- Used to secure *Guaranteed Bond with Board Resolution*

Or

- Used to establish a *Performance Contract*

Or

- Used to buy books and teachers

Cost Inputs			Savings Inputs		
Construction Cost		\$ 302,000	First Year Energy Savings		\$ 37,700
Bond Issuance Cost	3.00%	\$ 9,060	Energy Escalation Rate		2.50%
Total Bond Issue		\$ 311,060	First Year Additional Maintenance/M&V		\$ -
Interest Rate		3.50%	M&V Escalation Rate		1.00%
Years		15	1st Year Maintenance/Operational Savings		\$ 7,000
			Maintenance Escalation Rate		1.00%

Year	Bond Payment	Total Cost	Energy Savings	Operational Savings	Total Savings	Yearly Cashflow	Cumulative Cashflow
1	\$ 26,685	\$ 26,685	\$ 37,700	\$ 7,000	\$ 44,700	\$ 18,015	\$ 18,015
2	\$ 26,685	\$ 26,685	\$ 38,831	\$ 7,070	\$ 45,901	\$ 19,216	\$ 37,232
3	\$ 26,685	\$ 26,685	\$ 39,996	\$ 7,141	\$ 47,137	\$ 20,452	\$ 57,684
4	\$ 26,685	\$ 26,685	\$ 41,196	\$ 7,212	\$ 48,408	\$ 21,723	\$ 79,407
5	\$ 26,685	\$ 26,685	\$ 42,432	\$ 7,284	\$ 49,716	\$ 23,031	\$ 102,439
6	\$ 26,685	\$ 26,685	\$ 43,705	\$ 7,357	\$ 51,062	\$ 24,377	\$ 126,816
7	\$ 26,685	\$ 26,685	\$ 45,016	\$ 7,431	\$ 52,446	\$ 25,762	\$ 152,578
8	\$ 26,685	\$ 26,685	\$ 46,366	\$ 7,505	\$ 53,871	\$ 27,187	\$ 179,764
9	\$ 26,685	\$ 26,685	\$ 47,757	\$ 7,580	\$ 55,337	\$ 28,653	\$ 208,417
10	\$ 26,685	\$ 26,685	\$ 49,190	\$ 7,656	\$ 56,846	\$ 30,161	\$ 238,578
11	\$ 26,685	\$ 26,685	\$ 50,666	\$ 7,732	\$ 58,398	\$ 31,713	\$ 270,292
12	\$ 26,685	\$ 26,685	\$ 52,186	\$ 7,810	\$ 59,995	\$ 33,311	\$ 303,602
13	\$ 26,685	\$ 26,685	\$ 53,751	\$ 7,888	\$ 61,639	\$ 34,954	\$ 338,557
14	\$ 26,685	\$ 26,685	\$ 55,364	\$ 7,967	\$ 63,330	\$ 36,646	\$ 375,202
15	\$ 26,685	\$ 26,685	\$ 57,025	\$ 8,046	\$ 65,071	\$ 38,386	\$ 413,589
	\$ 400,268	\$ 400,268			\$ 813,857	\$ 413,589	

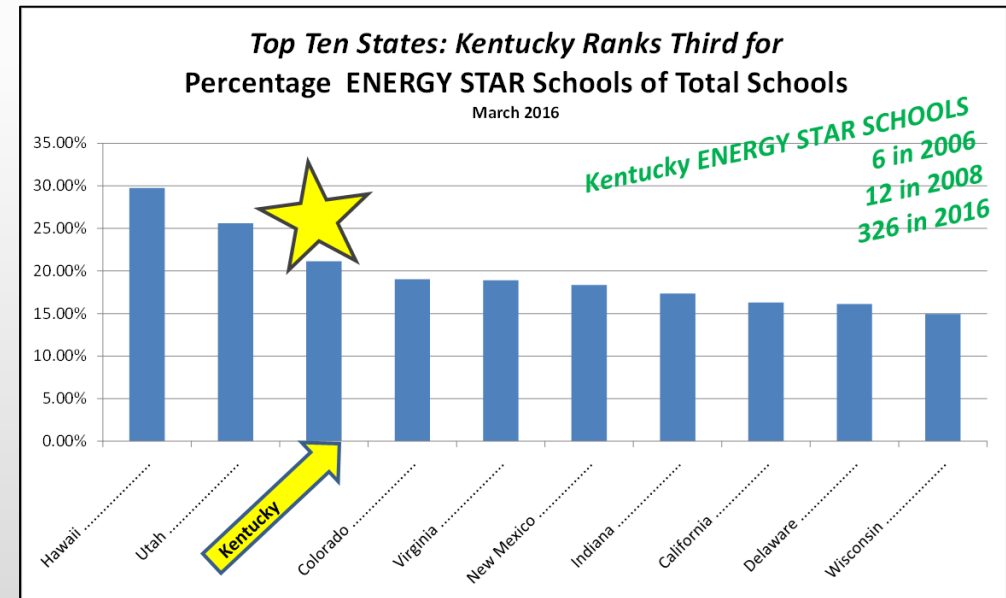
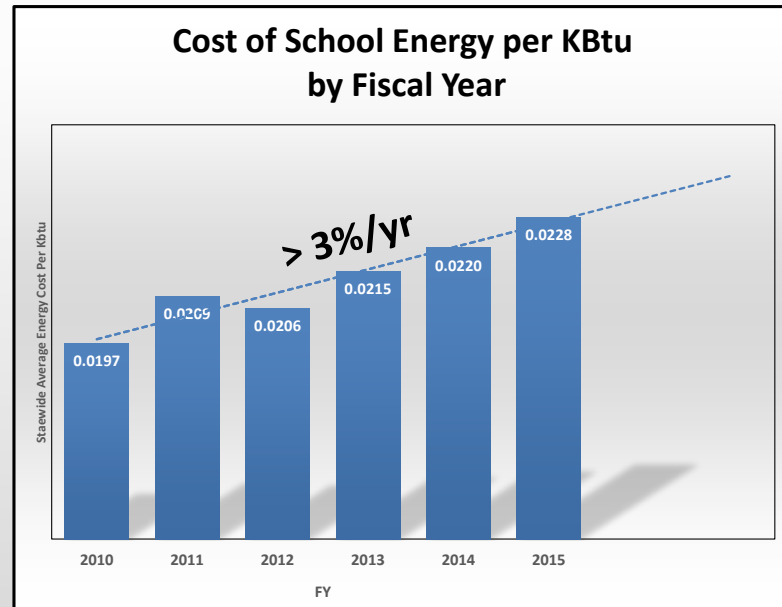
# Kentucky Public Schools Energy Facts

- Kentucky is Using Less Energy Today than in 2010!
  - Even though Conditioned Square Footage has increased 6M.
- 147 of Kentucky's 173 School Districts have improved.
  - Average Improvement of 16%
- 48 Districts are Operating Below 50 Kbtu/SF
  - In 2010 this number was 13.



# Kentucky School Energy Profile

- Energy Cost per Student = \$230
- Energy Cost per Square foot = \$1.31
- Statewide Efficiency
  - 2010 - 65.4 KBtu/sf
  - 2015 - 57.5 KBtu/sf



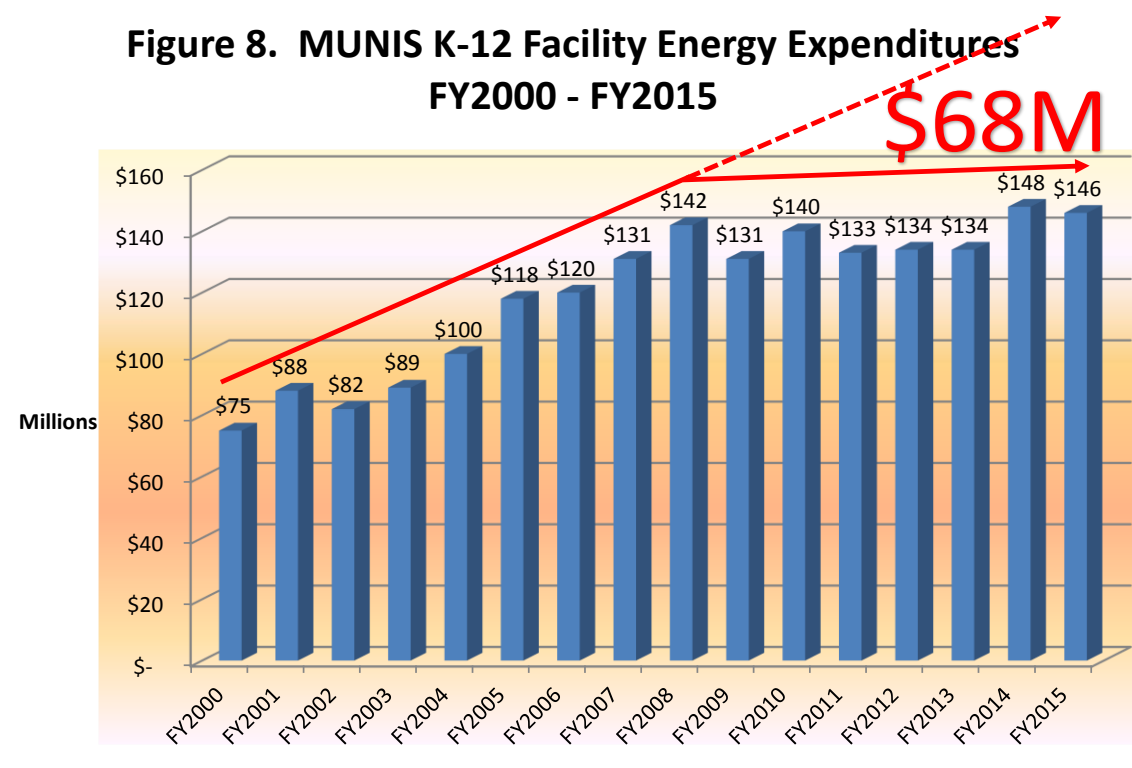


# Shameless Plug

## Get an Energy Manager

- Dedicated Resource
  - No priority shuffling
  - Significant ROI (This NON classroom position saves multiple classroom positions)
  - Knowledgeable connection to utility companies
- Skilled Resource
  - Evaluates and presents energy saving options
  - Facilitates policy compliance
  - Translates technical information

Figure 8. MUNIS K-12 Facility Energy Expenditures  
FY2000 - FY2015



# Questions ??????

## Ron Willhite

Director School Energy Managers Project  
Kentucky School Boards Association

[ron.wilhite@ksba.org](mailto:ron.wilhite@ksba.org)

502.783.0058

