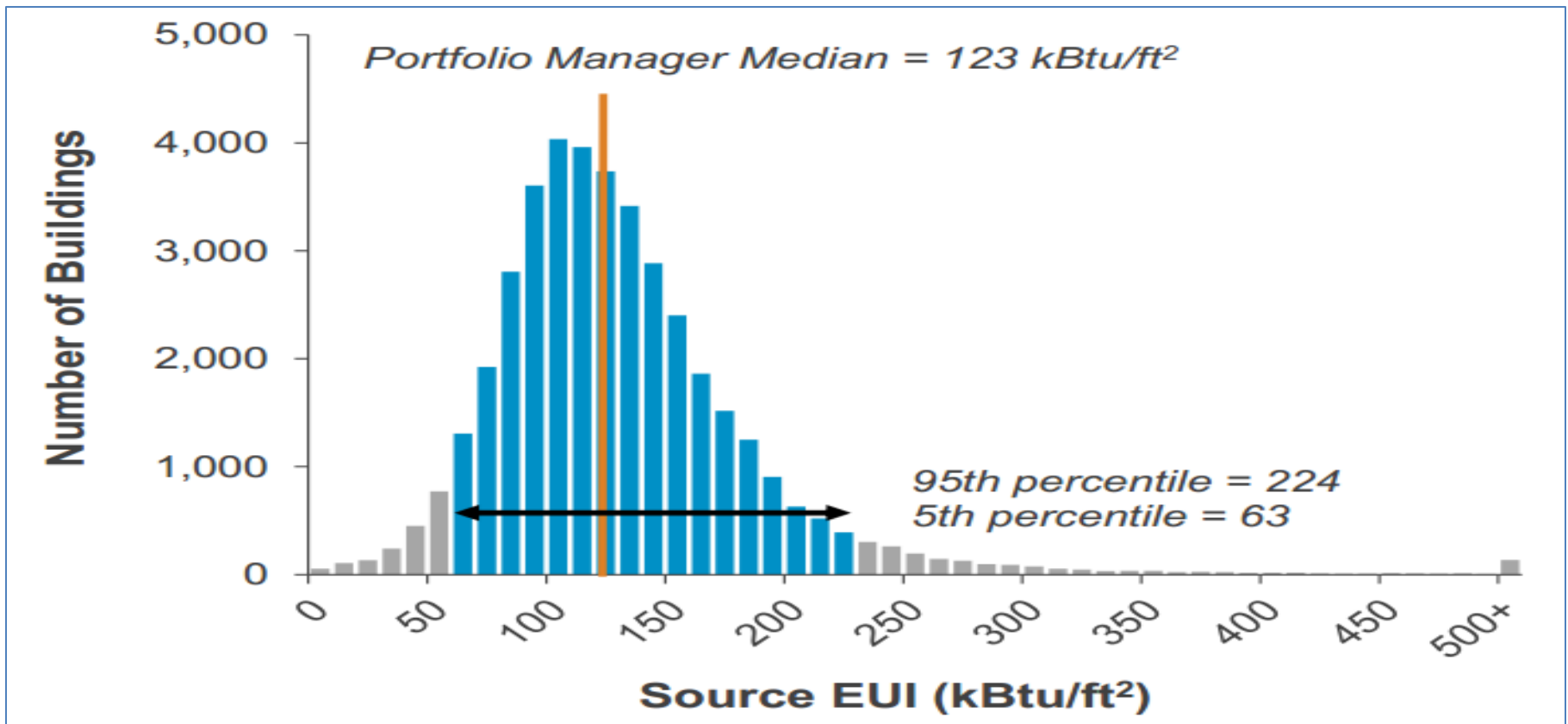


# POWERING DOWN ■ A TOOLKIT FOR BEHAVIOR-BASED ENERGY CONSERVATION IN K-12 SCHOOLS

Kate Crosby, Energy Manager  
Acton-Boxborough Regional School District

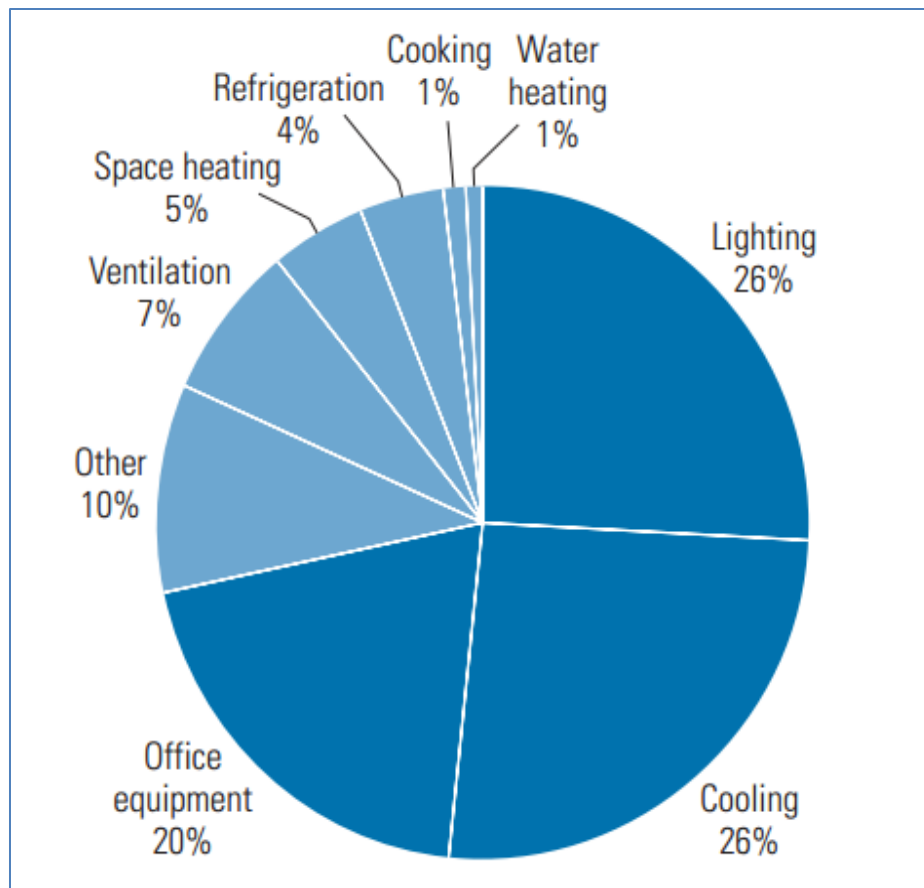


The least efficient school buildings use **four times** more energy per square foot than the most efficient ones. Older schools can sometimes be very energy efficient – the way in which a school building is managed has a big influence on how it stacks up.

# ENERGY USE IN SCHOOLS:

- HVAC
- Lighting (25-50% of electricity)
- Plug load (25% of electricity?)

A sample profile of electricity use within a school - the distribution will differ depending on location & climate.



Source: US EPA, Energy Star Building Upgrade Manual (2008)

# THREE COMPLEMENTARY AVENUES TO ENERGY SAVINGS IN SCHOOLS:

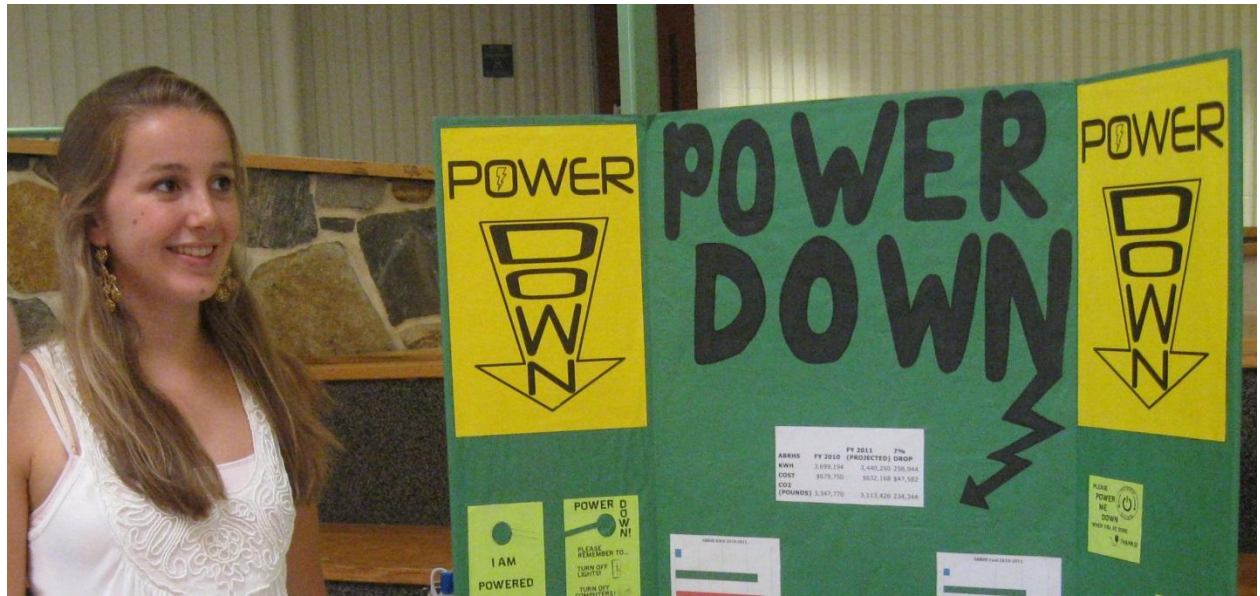
- Raising awareness among faculty, staff, students
- Managing school building operations
- Upgrading mechanical equipment and controls



www.scottwoodworking.com

Multiple sources, incl. Cross, *Shifting Organizational Culture - Innovation for Energy Conservation*; Foraker interview; Pierce interview.

# BENEFITS of Behavior-Based Programs



- **COST SAVINGS**
- **REDUCED ENVIRONMENTAL IMPACT**
- **LEARNING & LEADERSHIP OPPORTUNITIES FOR STUDENTS**
- **BEYOND THE SCHOOL COMMUNITY**

# FIVE EXEMPLAR PROGRAMS INCLUDED IN STUDY TO DOCUMENT STRATEGIES AND SAVINGS

School	Grades served	School enrollment	Date of construction or renovation of school bldg	District	District enrollment
Holston MS Knoxville, TN	6 through 8	833	1956 construction 2006 renovation & addition	Knox County Schools	56,000
Rosa Parks ES Lexington, KY	K-5	765	1997	Fayette County Public Schools	38,000
Laguna Creek HS Elk Grove, CA	9 through 12	1,640	1994	Elk Grove Unified School District	62,000
Henderson HS West Chester, PA	9 through 12	1,260	1954 construction 2006 addition	West Chester Area School District	11,800
John Jacobs ES Phoenix, AZ	PK-6	613	1980	Washington Elementary School District	22,335

School	Drop in Electricity Use Due to Behavior-based Energy Conservation Strategies					
	Annual reduction in electricity usage (vs. baseline year)		Annual cost savings (vs. baseline year)		Length of time covered by energy data	Baseline year
	%	kilowatt-hour (kWh)	%	\$		
Holston MS Knoxville, TN	<b>-37%</b>	<b>-848,929</b>	-12%	-\$19,816	<b>6 years</b>	FY2007
Rosa Parks ES Lexington, KY	<b>-36%</b>	<b>-645,900</b>	-20%	-\$24,500	<b>4 years</b>	FY2009
Laguna Creek HS Elk Grove, CA	<b>-30%</b>	<b>-663,232</b>	-19%	-\$47,704	<b>4 years</b>	FY2009
Henderson HS West Chester, PA	<b>-30%</b>	<b>-1,359,672</b>	-27%	-\$119,491	<b>5 years</b>	CY2008
John Jacobs ES Phoenix, AZ	<b>-20%</b>	<b>-250,797</b>	-10%	-\$12,463	<b>5 years</b>	Mar, 2007 - Feb, 2008

# TRAITS OF EFFECTIVE PROGRAMS



Credit: Fayette County Public Schools

## SCHOOL DYNAMICS

- Committed faculty/staff leader(s)
- Principal: essential support & endorsement
- Student engagement: energy, creativity, positive focus
- Custodial staff included

## DISTRICT SUPPORT

- Essential support: Tracking energy use → sharing feedback
- Additional support variable: recognition program, assistance with identifying priorities, signage, equipment loans, educational resources
- Can be homegrown or incorporate 3<sup>rd</sup> party assistance (emphasis on capacity-building and savings retained in district)

## MOMENTUM

- Energy data cited by faculty/staff as compelling and strongly motivating
- Cost savings highly valued → educational resources
- Recognition highly valued



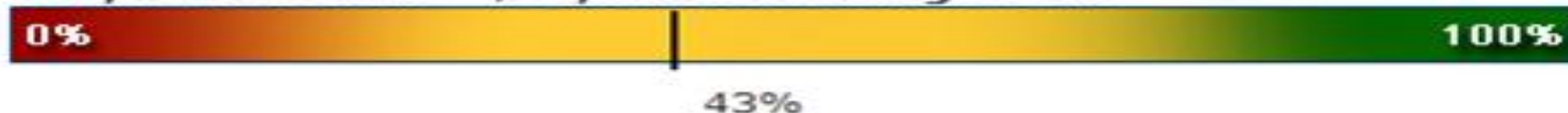
Carroll Elementary School

122,684.75 kWh = \$16,288.79 Savings Goal



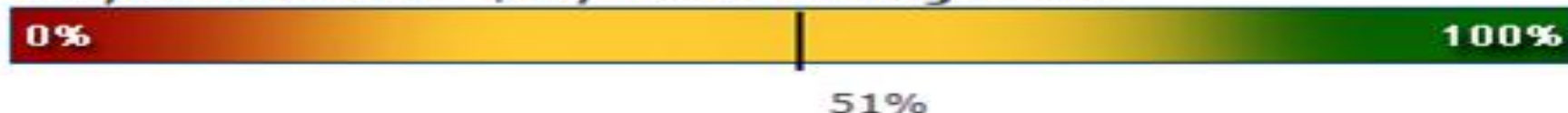
Raymond Case Elementary School

111,825.96 kWh = \$14,847.07 Savings Goal



Helen Carr Castello Elementary School

108,075.84 kWh = \$14,349.17 Savings Goal



Cosumnes River Elementary School

61,809.26 kWh = \$8,206.38 Savings Goal




Energy data & progress toward goals in web-based format

Elk Grove Unified School District: [www.egusd.net/energy/savings.html](http://www.egusd.net/energy/savings.html)


“Once [Facilities] was putting out the graphs showing how much we were saving each month, I think that was really key. People could see that last month we went down \$12,000 from the previous year, and all that we’re doing is turning our lights out when we leave the room. So it made a big difference that people could see the changes.”

-Faculty member, Laguna Creek High School



**Oops.**

**Please remember to save energy.**



Elk Grove Unified School District Energy Conservation Program



**GOOD JOB!**











**You are energy super stars!**

Thanks for an awesome energy shutdown!





Elk Grove Unified School District Energy Conservation Program

**Oops! Did you forget?**

		Lights off
		Computer monitors/printers off
		Windows & door closed
		Unused appliances unplugged
		Other:

**Thank you for E=USING Energy Wisely!**

- Your E=USE<sup>2</sup> Patrol Team

Please recycle me.

“The students leave notes as they check in the morning, like ‘Thank you for turning your lights out.’ It’s just a reminder to teachers, and the teachers think it’s fun and the kids get a kick out of it because they get to bust their teacher if they find the lights on with the room empty. When you come back and you get the note that you’ve been busted, you laugh about it but it does kind of put a little nugget in your head that says, ‘Okay, I really need to start doing this.’”

-Principal, Rosa Parks Elementary School

# E=USE<sup>2</sup> Classroom Checklist



## Lights out

- Before school
- After school
- Recess
- Lunch



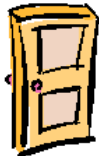
## Computer monitors & printers off

- when not in use



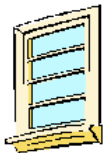
## Personal appliances off

- when not in use



## Doors closed

- During class
- When room is unoccupied



## Windows closed

When heat or cooling on



## WATTY says . . .

- **Lights off** when sun provides enough light
- **Blinds closed** to reduce heat from sun on warmer days
- **Blinds open** to admit heat from sun on cooler days
- **Thermostat** No electronic equipment within five feet

Credit:  
Fayette County  
Public Schools

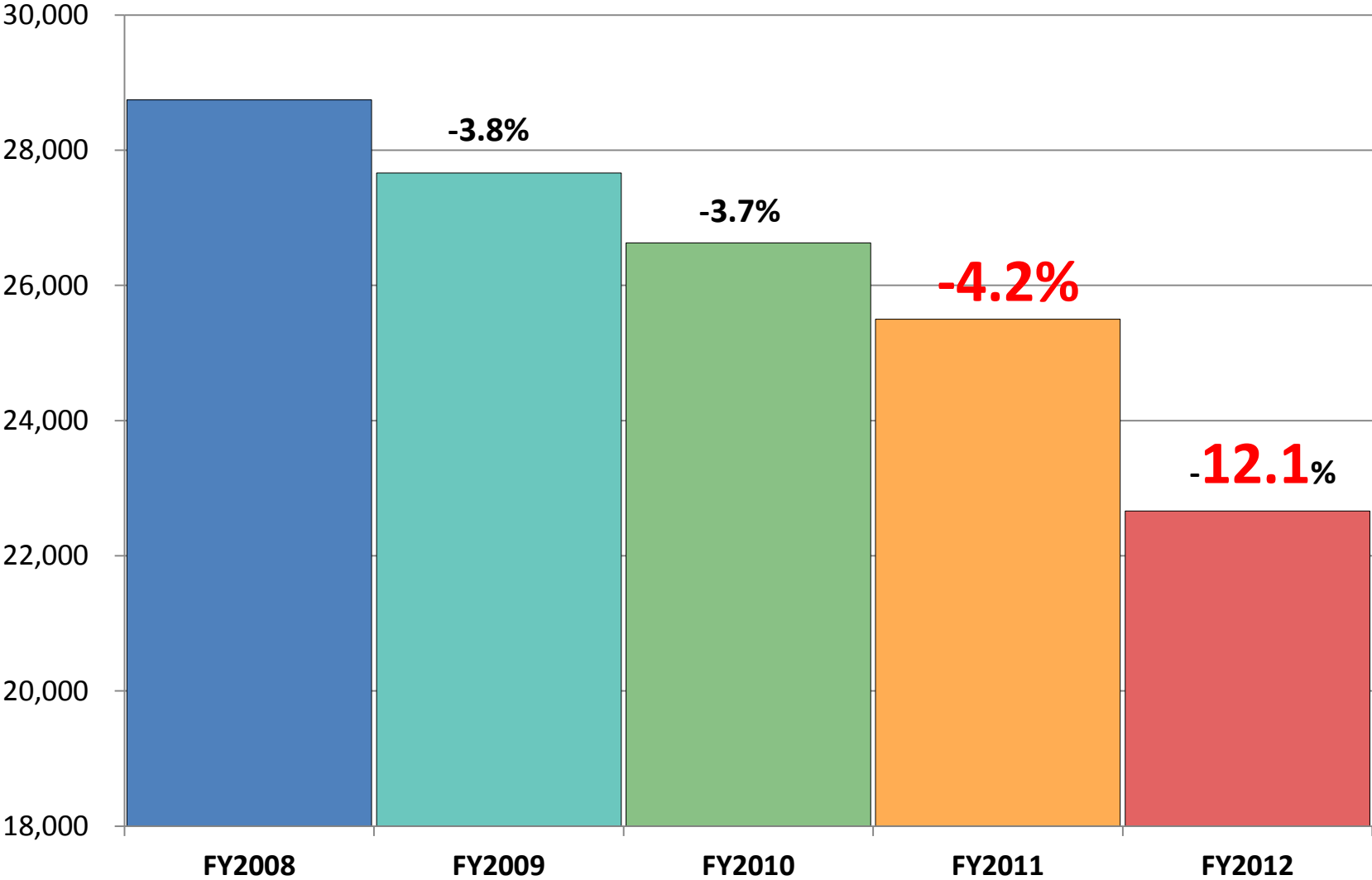
“To really get a successful conservation program in place, you have to engage with the children directly because they drive it every day—they practice it continuously.”

- Energy Manager, Knox County Schools



**POWER DOWN PROJECT  
ACTON-BOXBOROUGH REGIONAL SCHOOL DISTRICT**

**ABRSD/APS ELECTRICITY CONSUMPTION  
(mmBtu)**

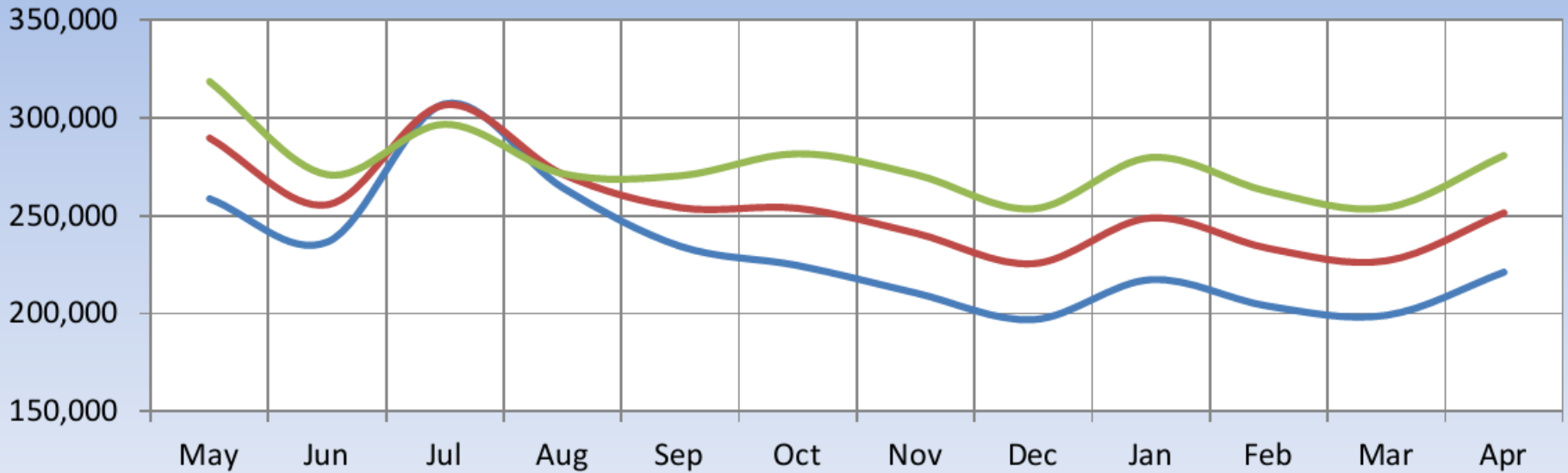




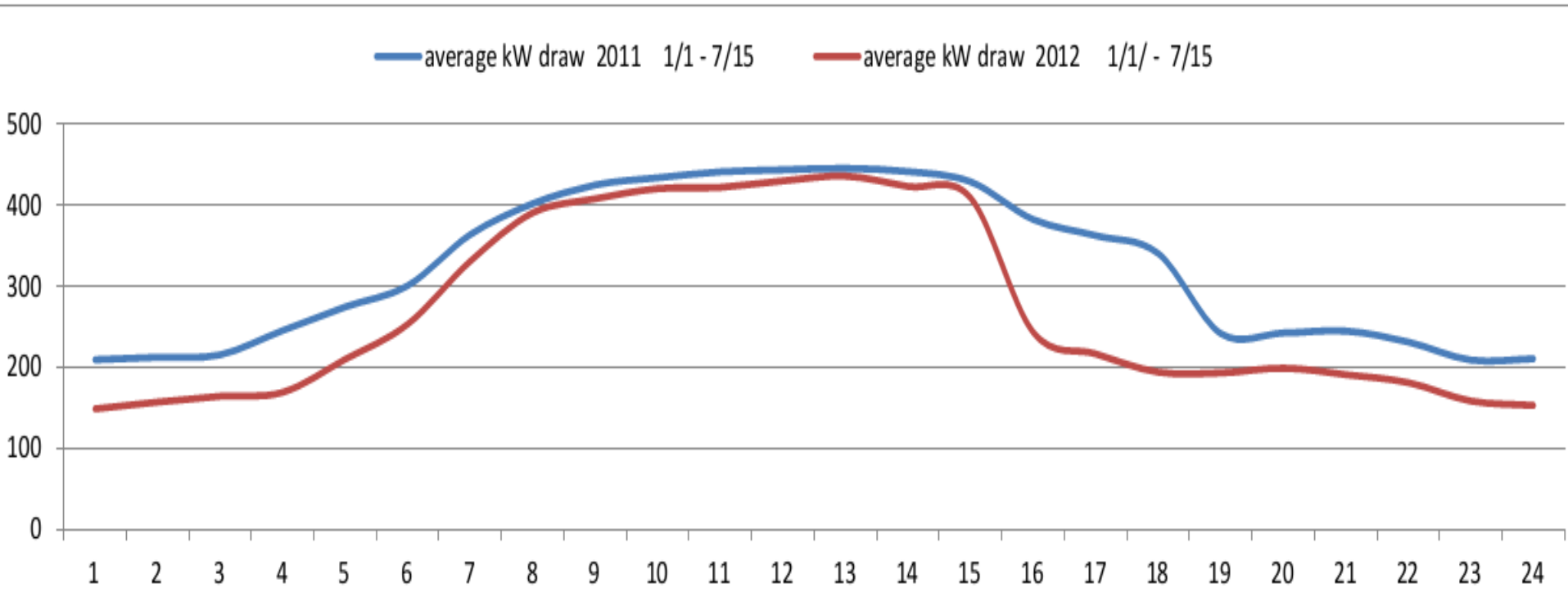
# REDUCTION IN USAGE (kWh)

AB - RHS- CDD Weather Adjusted kWh

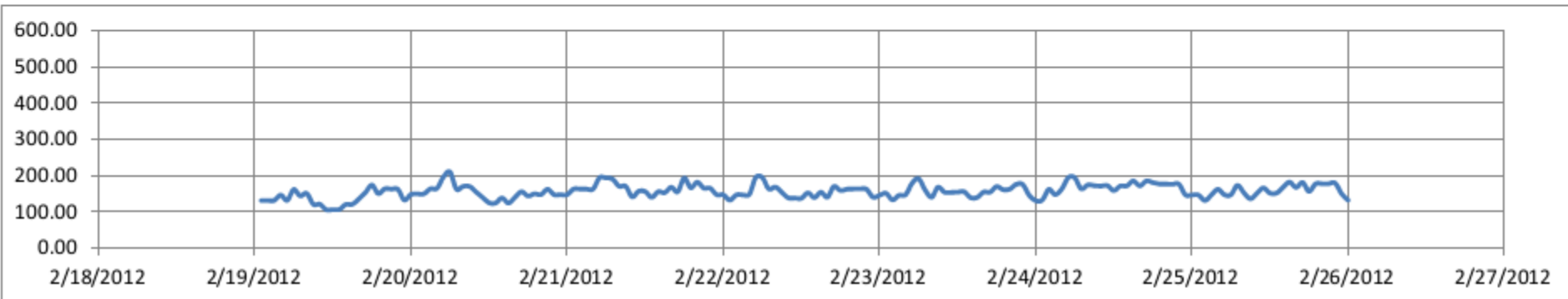
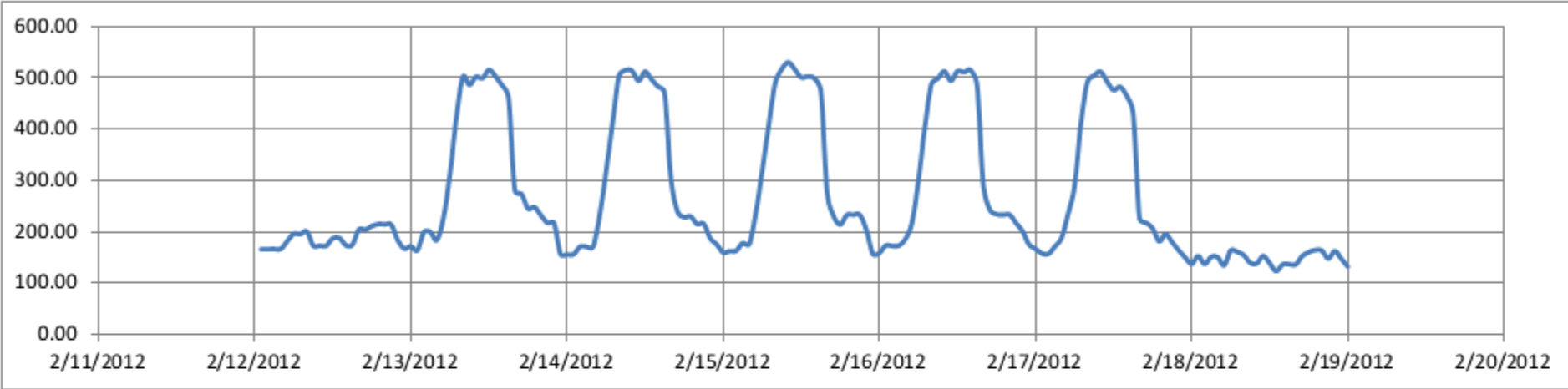
Weather Adj. 2011-2012      Weather Adj. 2010-2011      Weather Adj. 2009-2008



# REDUCTION IN DEMAND (kW)

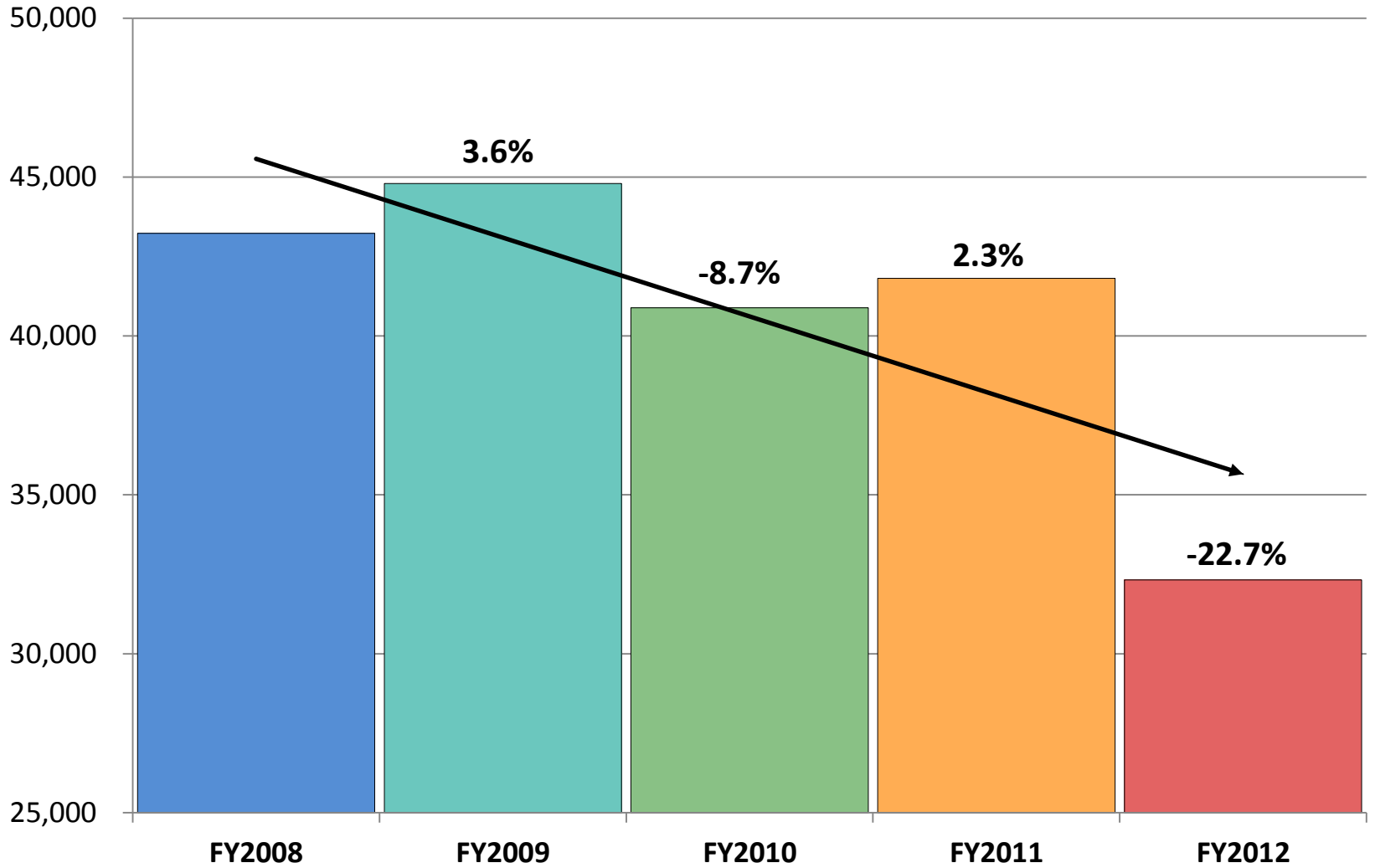


# VACATION SHUTDOWN



# ABRSD-APS NATURAL GAS

mmBtu



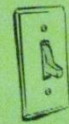




**POWER DOWN!**

PLEASE  
REMEMBER TO...

TURN OFF  
LIGHTS!



TURN OFF  
COMPUTERS!



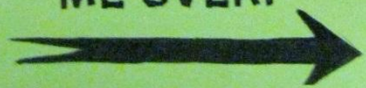
UNPLUG AV UNITS!



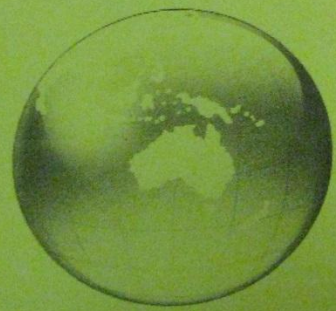
TURN OFF  
PRINTERS!



AND TURN  
ME OVER!



**I AM  
POWERED  
DOWN!**



**THANK YOU!**

Hi! The Power Down  
Team stopped by and  
we loved how everything  
was turned off in your  
room!! The extra effort  
you put in helps save the  
school energy and money,  
which is GREAT! Thank  
you so much for AWESOME  
work! 😊 Your room has been  
put into the mix to win a  
PRIZE! Thank you!!!

- The  
Power  
Down Team

title

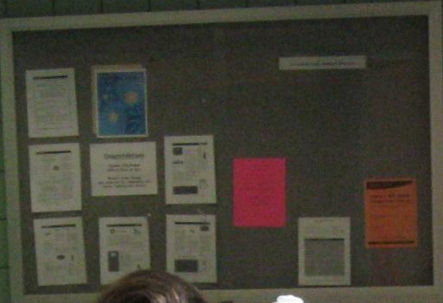


A three-switch light switch plate is mounted on a wall. The plate is silver and has three white toggle switches. The plate is surrounded by a hand-painted border in shades of green and blue. Below the plate, a white sign with the text "POWER DOWN" is attached to the wall.

**POWER DOWN**

POWER  
DOWN

LIGHT BULB  
EXCHANGE!



POWER  
DOWN









**Energy Detectives**  
DATE: 1-11-12  
 MOONLIGHTS  
 BATHROOMS  
 DYN : BATHROOMS  
 Pod - 1<sup>st</sup> GRADE  
 SPEECH ROOM  
 HALLWAY IN ART ROOM - LIGHTS  
 HALLWAY TO ART ROOM - BASEBOARD HEATER  
 THERMOSTAT-TEMP!  
 Pod - 2<sup>nd</sup> / 3<sup>rd</sup> GRADE  
 Pod - 4<sup>th</sup> GRADE  
 Pod - 6<sup>th</sup> GRADE  
NOTES & OTHER OBSERVATIONS:

**Energy Detectives**  
DATE: 1-11-12  
 MOONLIGHTS  
 BATHROOMS  
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 Pod - 4<sup>th</sup> GRADE  
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 HALLWAY IN ART ROOM - LIGHTS  
 HALLWAY TO ART ROOM - BASEBOARD HEATER  
 THERMOSTAT-TEMP!  
 Pod - 2<sup>nd</sup> / 3<sup>rd</sup> GRADE  
 Pod - 4<sup>th</sup> GRADE  
 Pod - 6<sup>th</sup> GRADE  
NOTES & OTHER OBSERVATIONS:

RECYCLE COMPOST TRASH TRAYS COMPOST RECYCLE

HELP  
AB  
GO  
GREEN!

Landfill

Single Stream

BRUTE  
SINGLE-STREAM RECYCLE!  
PLASTIC  
GLASS  
METAL  
PAPER

BRUTE  
RECYCLE

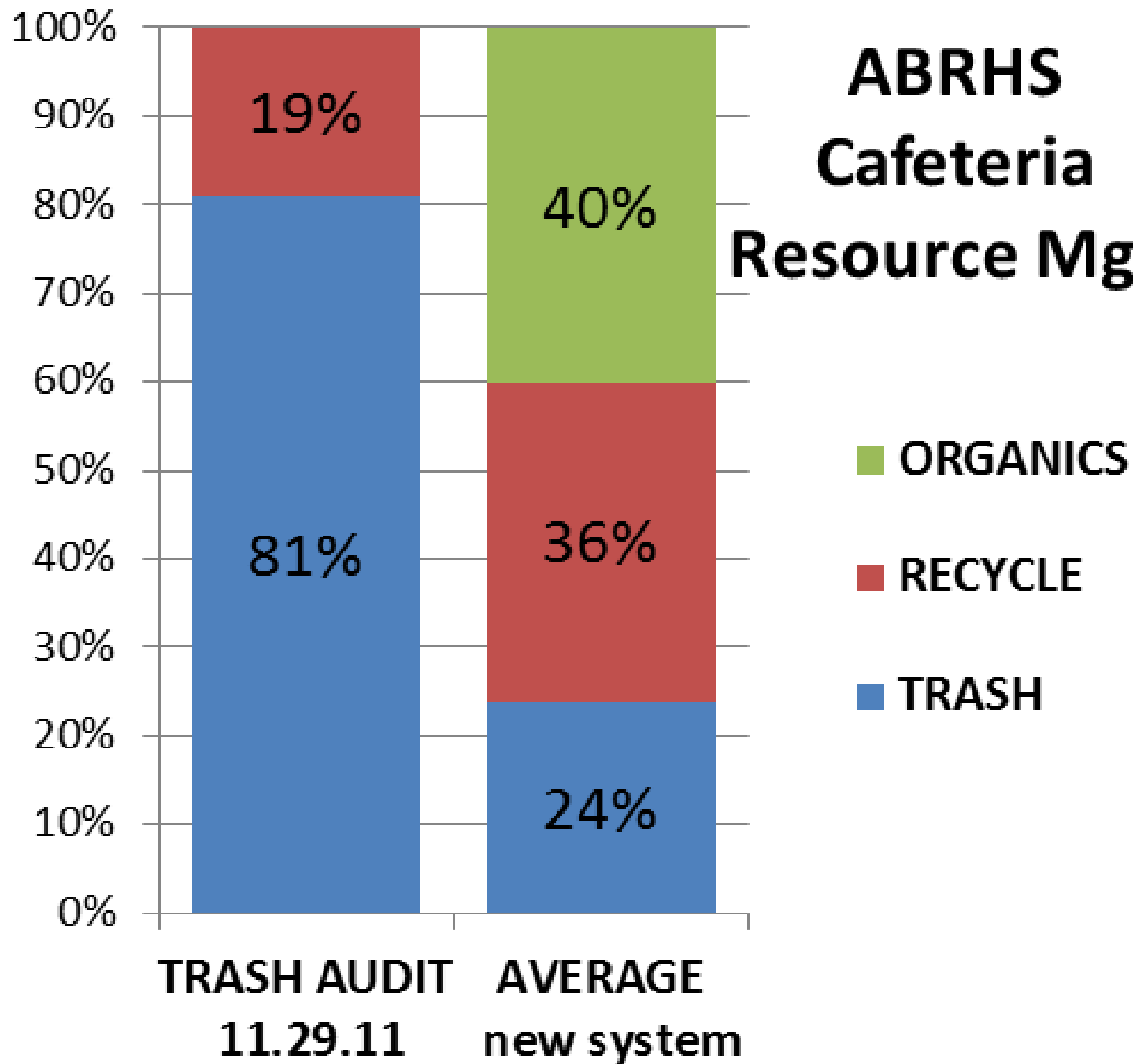
BRUTE  
RECYCLE

QUESTIONS?

Start Up & Start



# ABRHS Cafeteria Resource Mgt.











1966  
C. DOUGLAS  
ELEM. SCHOOL

DOUGLAS  
ELEM. SCHOOL

U.S. DEPARTMENT OF EDUCATION

GreenRibbonSchools



US-ED  
DISTRICT  
SUSTAINABILITY  
AWARD  
2013



Buildings have their own hidden curriculum that teaches as effectively as any course taught in them.



What lessons are taught by the way we design, build, and operate academic buildings?

-David Orr, *Earth in Mind*