



COMMONWEALTH OF MASSACHUSETTS

*Deval L. Patrick, Governor
Richard K. Sullivan, Jr., Secretary
Mark Sylvia, Commissioner*

*DOER Green Communities
Webinar*

January 13, 2014

Behavioral Energy Efficiency Programs

Green Communities Division

Serves as the hub for all Massachusetts cities and towns on energy matters

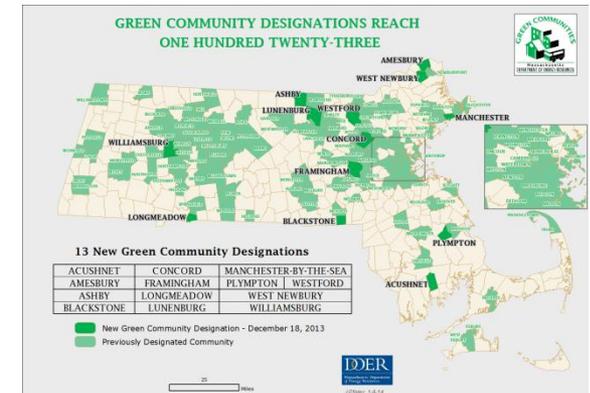


Helping Massachusetts Municipalities Create A Cleaner Energy Future

Green Communities Division

Programs & Resources for Municipalities

- Green Communities Designation and Grant Program
- **MassEnergyInsight**  energy tracking tool
- Municipal Energy Efficiency Program
- Energy Management Services Technical Assistance (EMS)
- Mass Municipal Energy Group (MMEG)
- Website filled with tools & resources - www.mass.gov/doer
- Email updates via listserv – Sign up by sending an email to: join-ene-greencommunities@listserv.state.ma.us

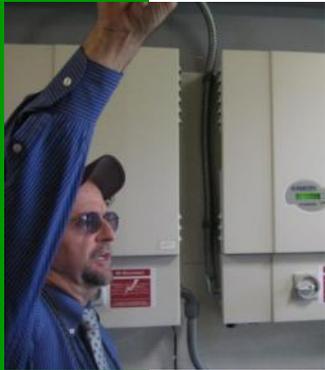


Helping Massachusetts Municipalities Create A Cleaner Energy Future



Outreach - Regional Coordinators

- Regional Coordinators act as direct liaisons with cities and towns on energy efficiency and renewable energy activities
- Located at each of the DEP Regional Offices:



SERO – LAKEVILLE: Seth Pickering
Seth.Pickering@state.ma.us

NERO – WILMINGTON: Joanne Bissetta
Joanne.Bissetta@state.ma.us



CERO – WORCESTER: Kelly Brown
Kelly.Brown@state.ma.us



WERO – SPRINGFIELD: Jim Barry
Jim.Barry@state.ma.us



Helping Massachusetts Municipalities Create A Cleaner Energy Future

Recording & Presentation

- The webinar is being recorded and will be available on our website in approximately 48 hours at:
www.mass.gov/energy/greencommunities
- The slide presentation will also be posted at:
www.mass.gov/energy/greencommunities
- Website and contact information is listed at end of presentation





COMMONWEALTH OF MASSACHUSETTS

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Considerations on Behavioral Energy Efficiency Programs

Aimee Powelka

*Municipal Efficiency Coordinator
Green Communities Division, DOER*

*DOER Green Communities
Webinar*

January 13, 2014

Behavior ≠ Education & Awareness

- Energy education has been ongoing since 1970s energy crisis, yet there are still lots of efficiency opportunities (i.e., energy waste)
- Why not efficiency?
 - Awareness
 - Barriers
 - Benefits

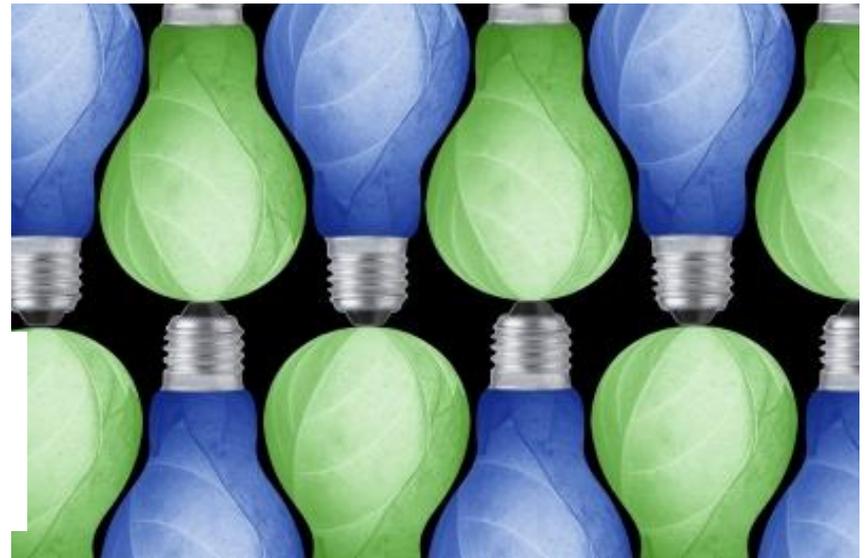


Image courtesy of koratmember/FreeDigitalPhotos.net

Reference:

Fostering Sustainable Behavior: An Introduction to Community-Based Social Marketing
Doug McKenzie-Mohr & William Smith



Helping Massachusetts Municipalities Create A Cleaner Energy Future



Tools and Resources: Community-Based Social Marketing

Fostering Sustainable Behavior
COMMUNITY-BASED SOCIAL MARKETING

HOME BOOK ARTICLES CASES STRATEGIES FORUMS MY ACCOUNT TRAINING CONTACT

Site Resources
This site consists of five resources for those working to foster sustainable behaviors, such as those involved in conservation, energy efficiency, transportation, waste reduction, and water efficiency. The site includes the complete contents of the book, Fostering Sustainable Behavior, as well as searchable databases of **articles**, **case studies**, and turnkey **strategies**. Further, it includes, **discussion forums** for sharing information and asking questions of others. If you take a moment to complete the free registration for this site, resources added since your last visit will be highlighted in the table below, and you will be able to post to the discussion forums and receive the daily discussion forum digest by email.

Please note: To gain the full functionality of this site please login or create an account.

Welcome, Guest
 Login
 Create Account
 Help & Terms of Use

Search the Site

Training & Services
 Receive short or long-term assistance with your programs through **consultations**.

Note
 Place your cursor over the above icons to reveal which behaviors have been **assigned to each category**. Clicking on a behavior will **display all of the content** on this site related to that behavior. Enjoy!

Category	Articles	Cases	Strategies	Forums
Agriculture & Conservation	0 50	0 6	0 0	0 148
Energy	0 254	0 18	0 0	0 353
Transportation	0 108	0 9	0 0	0 183
Waste & Pollution	0 345	0 46	0 0	0 420
Water	0 73	0 11	0 0	0 214

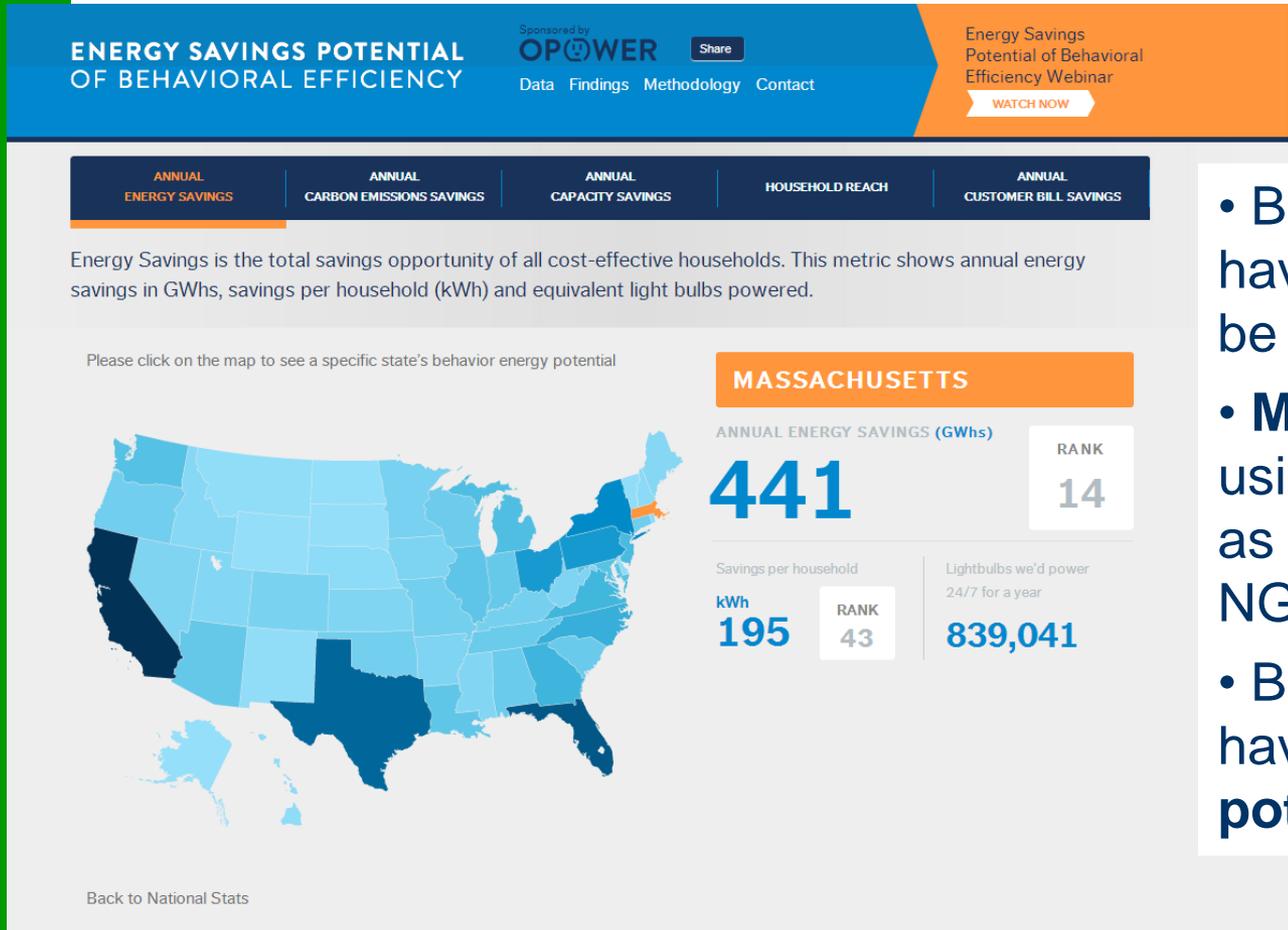
Source: www.cbsm.com



Helping Massachusetts Municipalities Create A Cleaner Energy Future



Residential Behavioral Programs Look Promising



- Behavioral programs have been shown to be **cost-effective**
- **MA utilities** are using programs such as OPower (CLC and NGrid)
- Behavioral programs have **significant potential**



Source: www.opower.com/beepotential

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MA Utilities Are Using Residential Behavioral Programs

Program Administrator	Implementer	Cohort	Fuel Type
National Grid	OPOWER	2009	Electric
National Grid	OPOWER	2009	Electric
National Grid	OPOWER	2010	Electric
National Grid	OPOWER	2010	Electric
National Grid	OPOWER	2010 Add	Electric
National Grid	OPOWER	2011	Electric
National Grid	OPOWER	2009	Gas
National Grid	OPOWER	2009	Gas
National Grid	OPOWER	2010	Gas
National Grid	OPOWER	2011	Gas
NSTAR	OPOWER	Wave I	Gas
NSTAR	OPOWER	Wave II	Gas
WMECO	C3	Report-Passive	Electric
WMECO	C3	Report-Active	Electric
WMECO	C3	No Report - Active	Electric

- **National Grid, NSTAR and WMECO** have piloted and/or are using residential behavioral programs
- Evaluation report published July 2012
- Key findings:
 - Opt-in programs generate higher relative savings per household
 - Opt-out programs save more overall due to greater reach
 - Electric programs generate more savings, on average, than gas programs using the same model
 - **Energy savings persist and GROW with continued treatment into 2nd year**



Source: http://opower.com/uploads/library/file/19/MA_Three_Year_Cross-Cutting_Behavioral_Program_Evaluation_Integrated_Report_072512.pdf

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Key Strategies for Commercial Behavioral Programs

- Strong support from upper management
- Program branding
- Building a team with stakeholders
- Peer champions from building occupants
- Many and varied communication tools
- Engagement techniques such as feedback, benign peer pressure, competition, rewards and reference to social norms



Image courtesy of
keerati/FreeDigitalPhotos.net



Source:

<http://www.aceee.org/sites/default/files/publications/researchreports/b121.pdf>

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Behavioral Program Steps

FIGURE 2 OVERVIEW OF ENERGY STAR GUIDELINES FOR ENERGY MANAGEMENT



The ENERGY STAR Guidelines for Energy Management presents a seven-step approach to achieving superior energy management and savings across a portfolio of buildings.

- Take the time to plan – *it takes a lot of time*
- Understand your stakeholders – *don't talk at people, have them help you create the program*
- Identify barriers – *ask "why" questions*
- Choose something you can *measure*
- Evaluate
- **Reward**
- Repeat



Source: http://epa.gov/statelocalclimate/documents/pdf/k-12_guide.pdf

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Cambridge GreenSense

*DOER Green Communities
Webinar*

January 13, 2014

Ellen Katz
*Fiscal Director
Cambridge Department of Public Works
Cambridge, MA*



COMMONWEALTH OF MASSACHUSETTS

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Powering Down and Behavioral EE in Schools

*DOER Green Communities
Webinar*

January 13, 2014

Kate Crosby
*Energy Manager
Acton-Boxborough Regional School District
Acton, MA*

Thank You

- Ellen Katz
 - Fiscal Director
 - Cambridge Department of Public Works
 - ekatz@cambridgema.gov
 - Tel: (617) 349-6956
- Kate Crosby
 - Energy Manager
 - Acton Public Schools/Acton-Boxborough Regional School District
 - C 978-580-0052
 - kcrosby@abschools.org
 - ab.mec.edu/departments/facilities/facilities.shtml
- Aimee Powelka
 - Municipal Efficiency Coordinator, Green Communities Division
 - Department of Energy Resources
 - Aimee.Powelka@state.ma.us
 - 617-626-7356



Helping Massachusetts Municipalities Create A Cleaner Energy Future



Resources

- **National Grid Customers:** See the Light behavioral program
- Fostering Sustainable Behavior: An Introduction to Community-Based Social Marketing by Doug McKenzie-Mohr & William Smith
- www.cbsm.com
- www.opower.com/beepotential
- [http://opower.com/uploads/library/file/19/MA Three Year Cross-Cutting Behavioral Program Evaluation Integrated Report 072512.pdf](http://opower.com/uploads/library/file/19/MA_Three_Year_Cross-Cutting_Behavioral_Program_Evaluation_Integrated_Report_072512.pdf)
- http://epa.gov/statelocalclimate/documents/pdf/k-12_guide.pdf
- <http://www.aceee.org/sites/default/files/publications/researchreports/b121.pdf>



Cambridge GreenSense

Ellen Katz
City of Cambridge
January 13, 2014



Goals

- ✿ Reduce energy consumption in City facilities
- ✿ Save money
- ✿ Minimize City's environmental footprint
- ✿ Advance City's role as a "green" leader

The Case for Energy Awareness

5 to 15% energy use is under occupant control

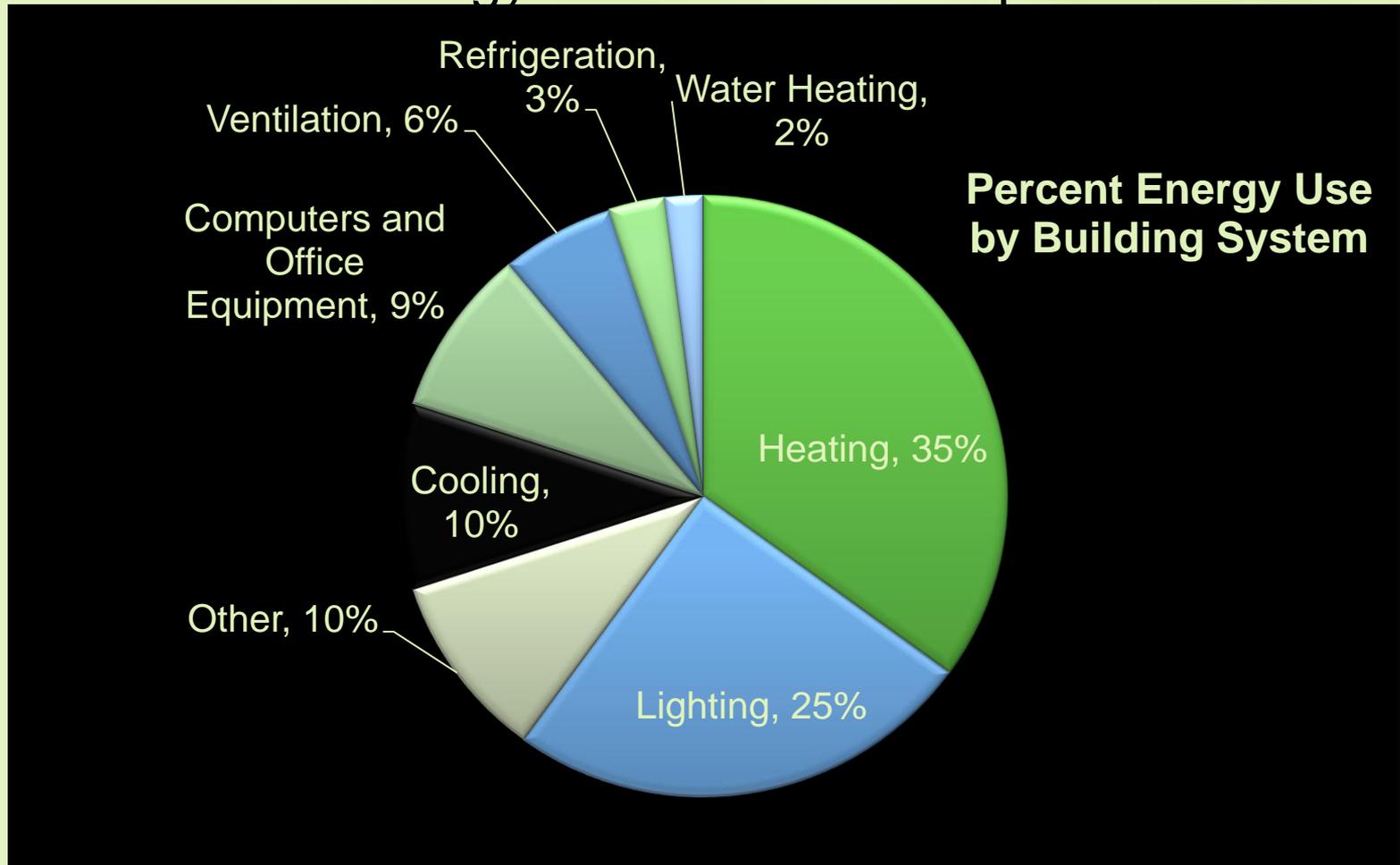


Chart: EERE Advanced Energy Retrofit Design Guide for Office Buildings, 2011

Planning Stage

- ✿ Planning group from several departments:
“Understand your stakeholders”
- ✿ Requires staffing! Led by DPW
- ✿ Takes time! Met regularly for several months.

Branding



Cambridge GreenSense

Use Less. Gain More.

Select Target Behavior

Measurable

Keep it Simple

Surveyed 10 buildings after hours:

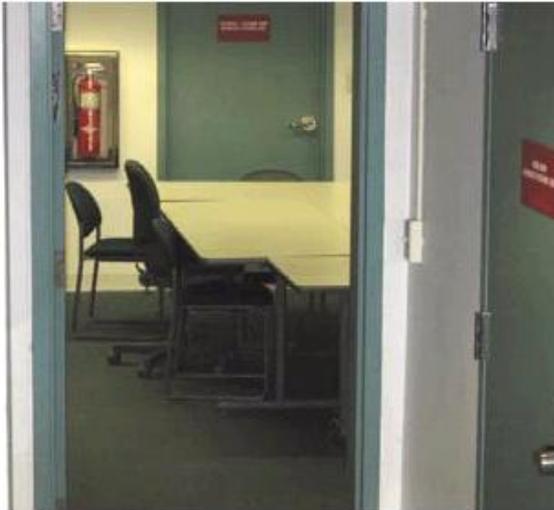
- 🌿 Fire HQ
- 🌿 Office building



- 🌿 Branch library
- 🌿 Public Works garage

Findings

☘ Lights on after-hours:



- ☛ Common areas
- ☛ Hallways
- ☛ Stairwells
- ☛ Restrooms
- ☛ Kitchen areas
- ☛ Offices

☘ Computers on after hours:

- ☛ 53% computers on
- ☛ 46% monitors on



First tip

PLEASE
TURN IT
OFF

IT'S AN EASY WAY TO
CONSERVE ENERGY
AND HELP PROTECT
THE ENVIRONMENT.



DID YOU KNOW?

We can prevent the release of 6 tons of greenhouse gas emissions just by turning off unnecessary equipment and lights in just one City building.



CAMBRIDGE
GreenSense

Use Less. Gain More.

Cambridge GreenSense brings City of Cambridge employees together to cut energy use and minimize our impact on the environment. Learn more at www.cambridgema.gov/greensense.

Implemented

- ✿ Support from upper management
- ✿ Volunteer Energy Champions
- ✿ Kick off meeting – City Manager welcome
- ✿ Two options – AM/PM
- ✿ Supplies:

- ✿ T-shirts
- ✿ Posters
- ✿ Labels for light switches





Cambridge GreenSense

Use Less. Gain More.

Report Results

Fire Station	94,537	107,342	94,484	-12,858	-12%
Engine 2	17,172	17,564	14,517	-3,047	-17%
Engine 3	22,640	30,560	25,600	-4,960	-16%
Engine 4	9,680	11,080	9,160	-1,920	-17%
Engine 5	10,440	11,092	13,601	2,509	23%
Engine 6	7,538	8,067	6,764	-1,303	-16%
Engine 8	21,360	22,800	18,840	-3,960	-17%
Engine 9	5,707	6,179	6,002	-177	-3%
Garage	185,962	180,816	177,884	-2,932	-2%
E. Cambridge Parking Garage	135,840	126,440	127,643	1,203	1%
Electrical Dept. Garage	7,631	10,503	8,017	-2,486	-24%
Green Street Garage	36,800	38,400	37,000	-1,400	-4%
Police Maintenance Garage	5,691	5,473	5,224	-249	-5%
Library	47,402	39,760	41,089	1,329	3%
Central Sq. Branch	14,640	16,080	14,640	-1,440	-9%
Heritage Branch	4,447	4,245	3,650	-595	-14%
Mt. Auburn Branch	3,552	3,298	2,601	-697	-21%
No. Camb. Branch	8,634	2,436	7,316	4,880	200%
Observatory Branch	6,345	4,699	4,400	-299	-6%
Valente Branch	9,784	9,002	8,482	-520	-6%
Office Building	546,059	638,024	555,735	-82,289	-13%
City Hall	190,080	192,732	167,352	-25,380	-13%
City Hall Annex (McCusker Bldg)	123,640	148,920	122,520	-26,400	-18%
Coffon Building	72,960	69,520	65,120	-4,400	-6%
Danehy Park Comfort Station	10,139	17,242	15,404	-1,838	-11%
Emergency 911	57,416	95,950	92,827	-3,123	-3%
Fire Headquarters	20,602	22,747	17,986	-4,761	-21%
Lombardi Building	63,150	78,990	68,070	-10,920	-14%

Acknowledge

- ✿ GoGreen Awards
- ✿ PIO Updates
- ✿ Intranet Site



GreenSense 2.0: Waste

What's your paper trail?



**Reduce paper use 10%:
*Just 9 pieces per week!***



**OFFICE SUPPLY
TRADING POST**



Opt out of junk mail

Cambridge GreenSense

Use Less. Gain More.

Lessons Learned

- ✿ Changing the culture
- ✿ Leaders emerge:
 - ✿ Fire Department,
Assessor's, City Clerk's office
- ✿ Don't worry about reaching everyone
- ✿ Include custodians





Thank you for your time!

Ellen Katz

Fiscal Director

Department of Public Works

City of Cambridge

Phone: 617-349-6956

ekatz@cambridgema.gov

POWERING DOWN

- A TOOLKIT FOR BEHAVIOR-BASED ENERGY CONSERVATION IN K-12
- SCHOOLS

Kate Crosby, Energy Manager
Acton-Boxborough Regional School District

POWERING DOWN:



A TOOLKIT FOR BEHAVIOR-BASED
ENERGY CONSERVATION IN
K-12 SCHOOLS

THE CENTER
FOR GREEN SCHOOLS



Drop in Electricity Use

Due to Behavior-based Energy Conservation Strategies

School	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	-37%	-848,929	-12%	-\$19,816	6 years	FY2007
Rosa Parks ES Lexington, KY	-36%	-645,900	-20%	-\$24,500	4 years	FY2009
Laguna Creek HS Elk Grove, CA	-30%	-663,232	-19%	-\$47,704	4 years	FY2009
Henderson HS West Chester, PA	-30%	-1,359,672	-27%	-\$119,491	5 years	CY2008
John Jacobs ES Phoenix, AZ	-20%	-250,797	-10%	-\$12,463	5 years	Mar, 2007 - Feb, 2008

THREE COMPLEMENTARY AVENUES TO ENERGY SAVINGS IN SCHOOLS:

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



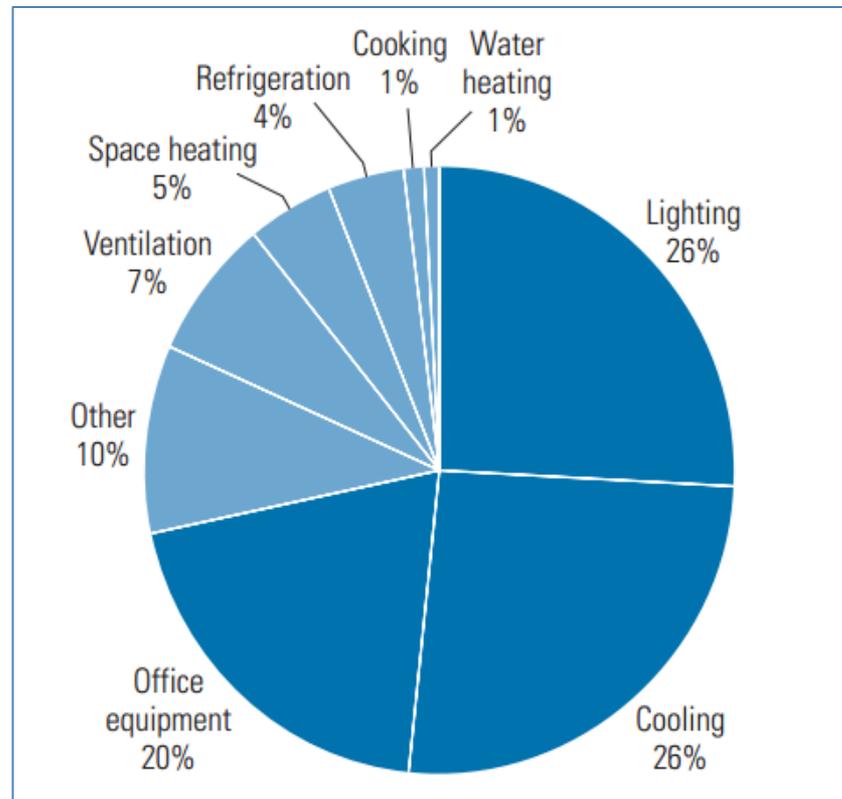
Multiple sources, incl. Cross, *Shifting Organizational Culture - Innovation for Energy Conservation*; Foraker interview; Pierce interview.

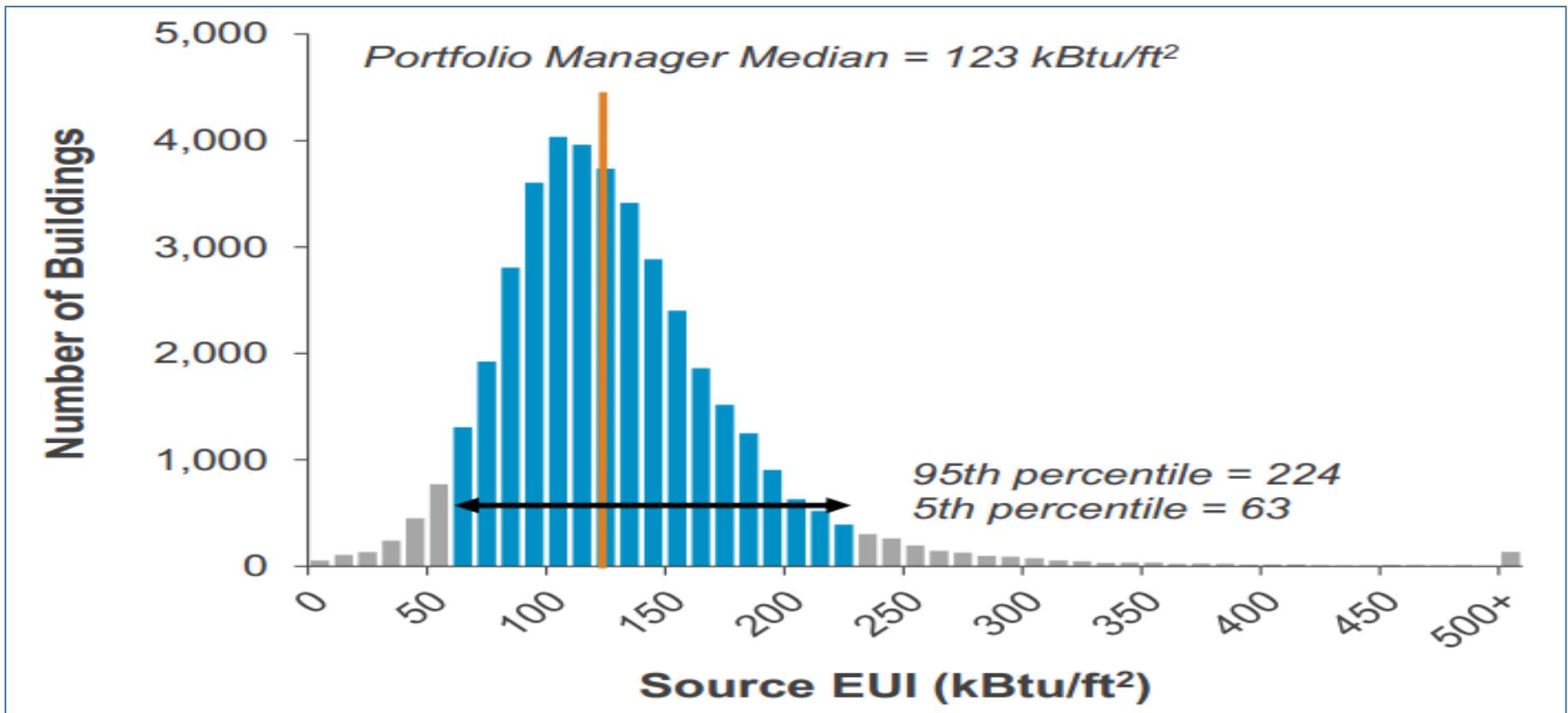
ENERGY USE IN SCHOOLS

(and other “commercial” buildings):

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

The chart shows a sample profile of electricity use within a school. Actual data will differ depending on location & climate.





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.

BENEFITS OF BEHAVIOR-BASED PROGRAMS



Credit: Acton-Boxborough Regional School District

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

TRAITS OF EFFECTIVE PROGRAMS



Credit: Fayette County Public Schools

SCHOOL DYNAMICS

- Committed faculty/staff leader(s)
- Principal/administrator: 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 3rd 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

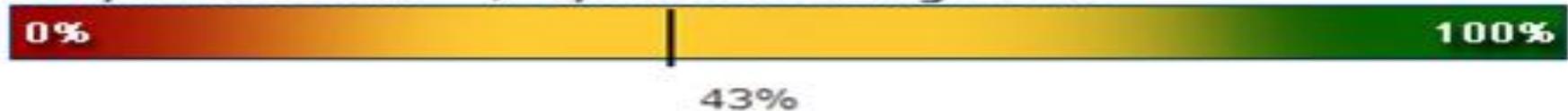
Carroll Elementary School

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



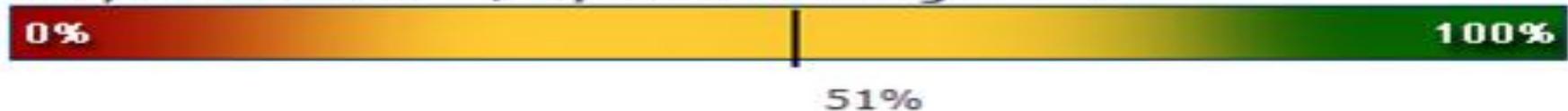
Raymond Case Elementary School

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

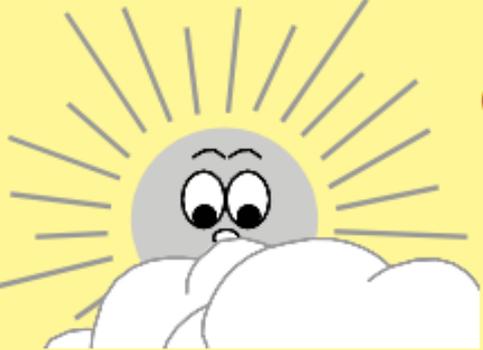


Energy data & progress toward goals in web-based format

Elk Grove Unified School District: www.egusd.net/energy/savings.html

“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

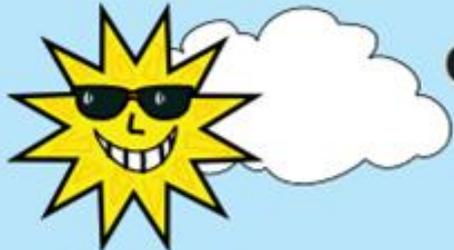


Oops.

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=USE² 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... 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=USE² Classroom Checklist



Lights out

- Before school
- After school
- Recess
- Lunch



Computer monitors & printers off

- when not in use



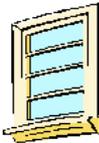
Personal appliances off

- 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

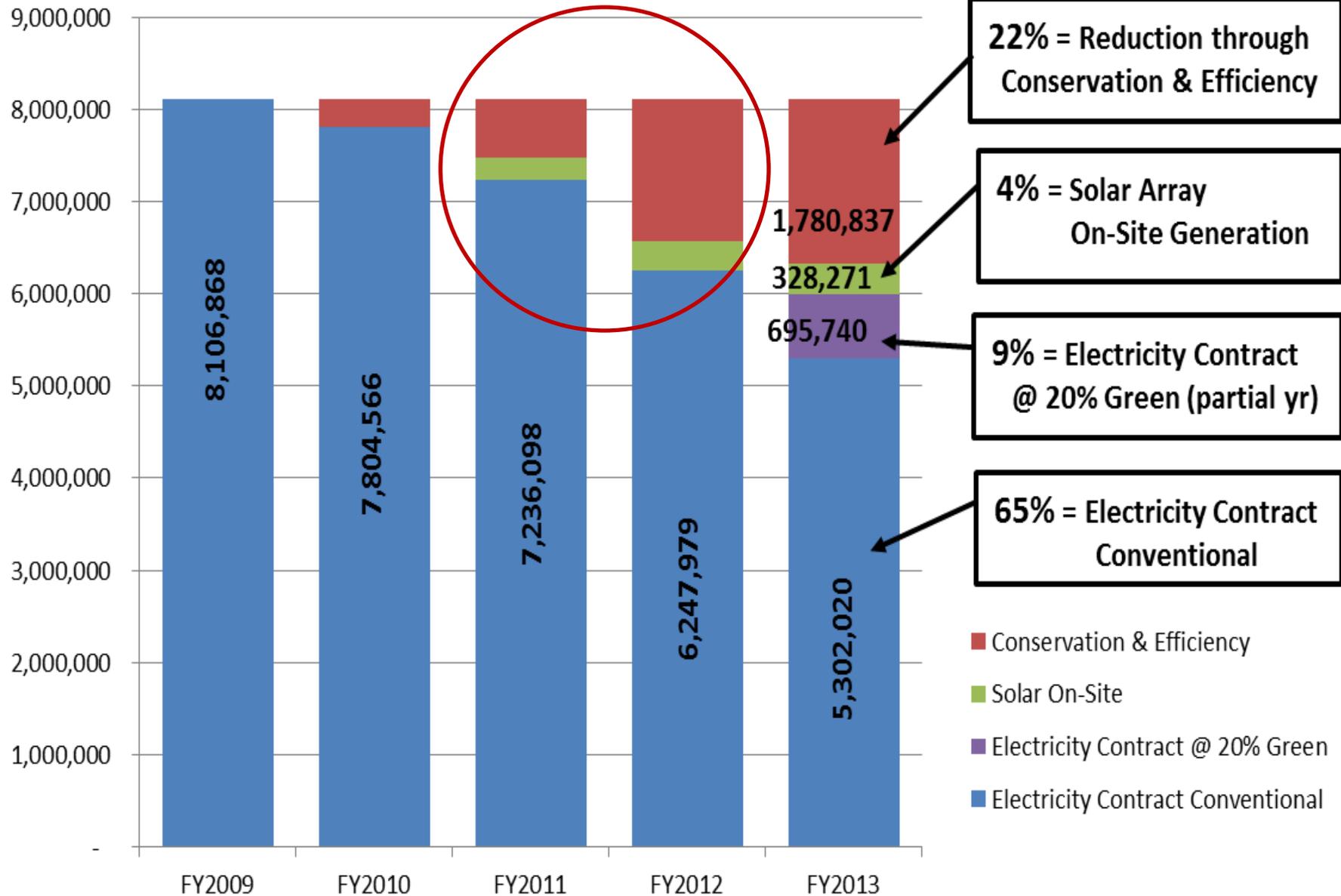


Credit: Acton-Boxborough Regional School District

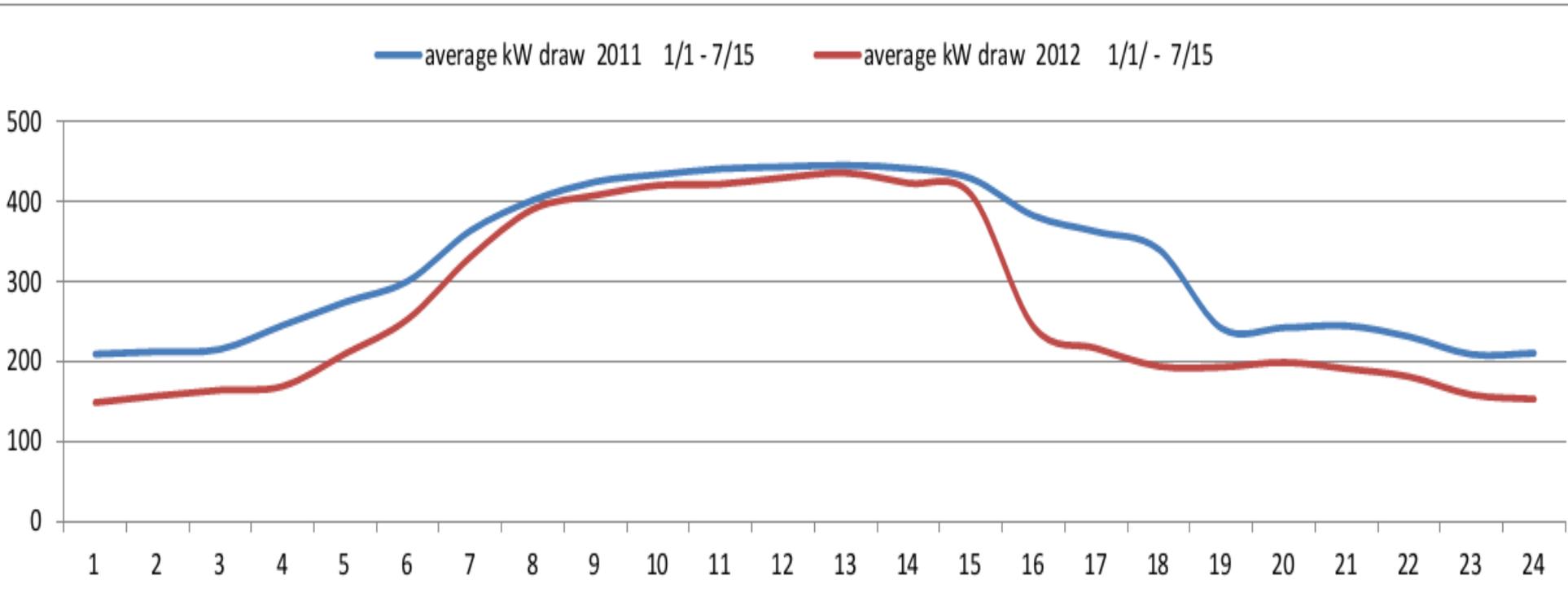
POWER DOWN PROJECT

ACTON-BOXBOROUGH REGIONAL SCHOOL DISTRICT

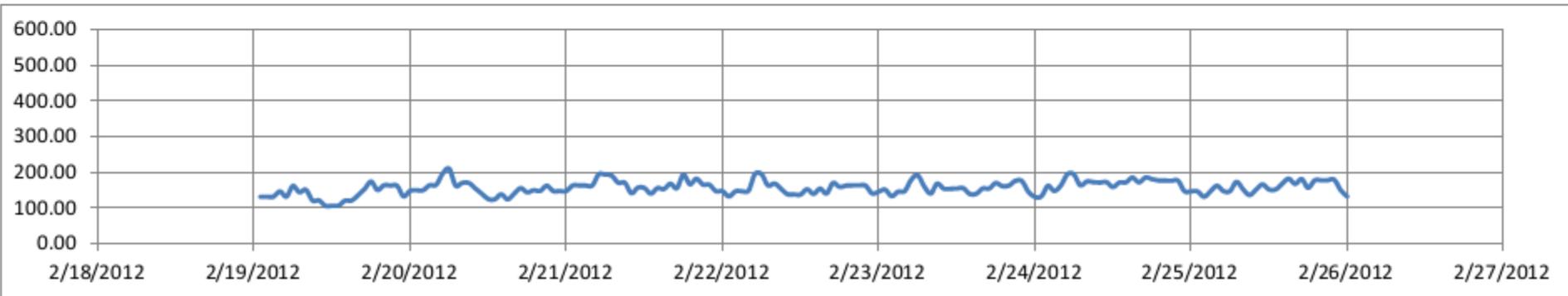
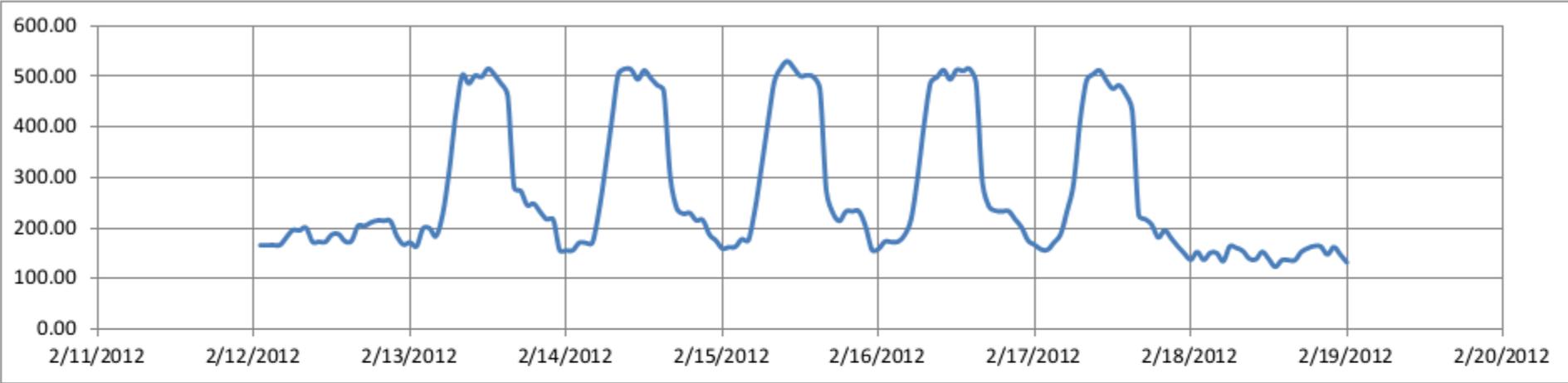
ABRSD ELECTRICITY (kWh)



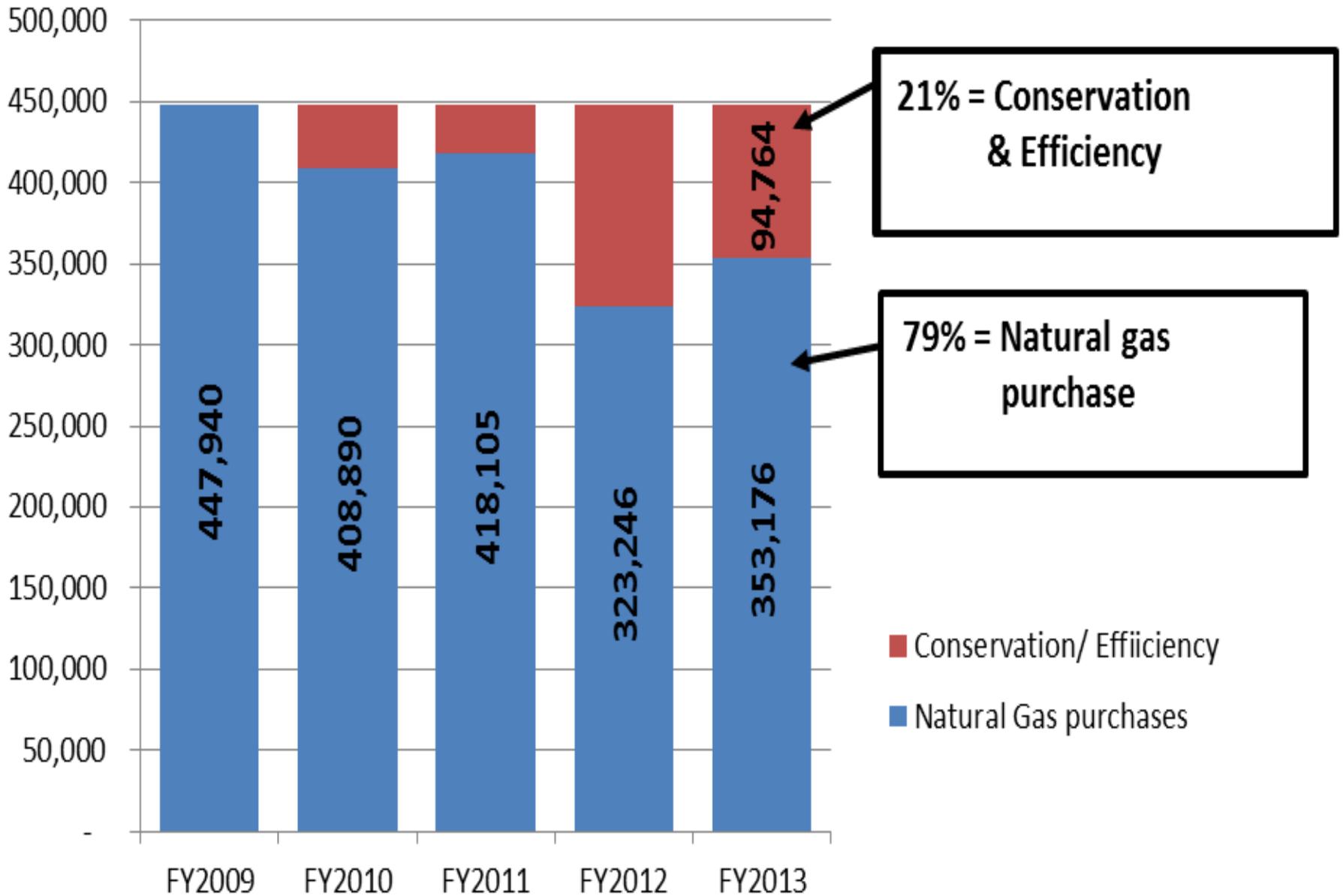
REDUCTION IN DEMAND (kW)



VACATION SHUTDOWN



ABRSD NATURAL GAS (therm)



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!

PLEASE
REMEMBER TO...

TURN OFF
LIGHTS!



TURN OFF
COMPUTERS!



UNPLUG AV UNITS!



TURN OFF
PRINTERS!



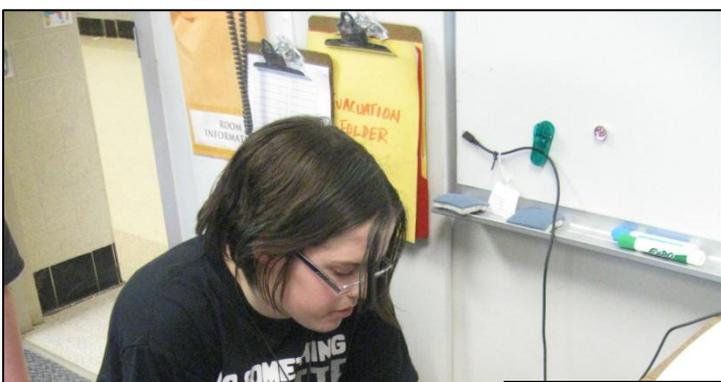
AND TURN
ME OVER!



**I AM
POWERED
DOWN!**



THANK YOU!





Power Down Picnic Points!
Thank you very much for participating –
we really appreciate it!



LOCATION: *out Department* DATE: *5/16/13* COACH: *Tamara Mangano*
13 Mangano

ENERGY	Checkup	Comments
RECYCLABLES	<i>4/4</i>	<i>The punter and the microwave are off</i>
BONUS POINTS!	<i>TBD</i>	<i>we will come back Thursday</i>
ADDITIONAL COMMENTS	<i>.5</i>	<i>For hanging up previous note</i>
TOTAL	<i>TBD</i>	<i>We will email you on Friday.</i>



BONUS POINTS!	<i>0.5</i>	<i>all the great sig</i>
ADDITIONAL COMMENTS		<i>You all rock - so s</i>
TOTAL	<i>7.5</i>	<i>lots of eq</i>

We loved all your little signs. ☺
THANK YOU, SO MUCH!
☺


POWER
DOWN

LIGHT BULB
EXCHANGE!



POWER
DOWN





Credit: Acton-Boxborough Regional School District





Credit: Acton-Boxborough Regional School District







Credit: Acton-Boxborough Regional School District

RECYCLE COMPOST TRASH TRAYS COMPOST RECYCLE

HELP
AB
GO
GREEN!

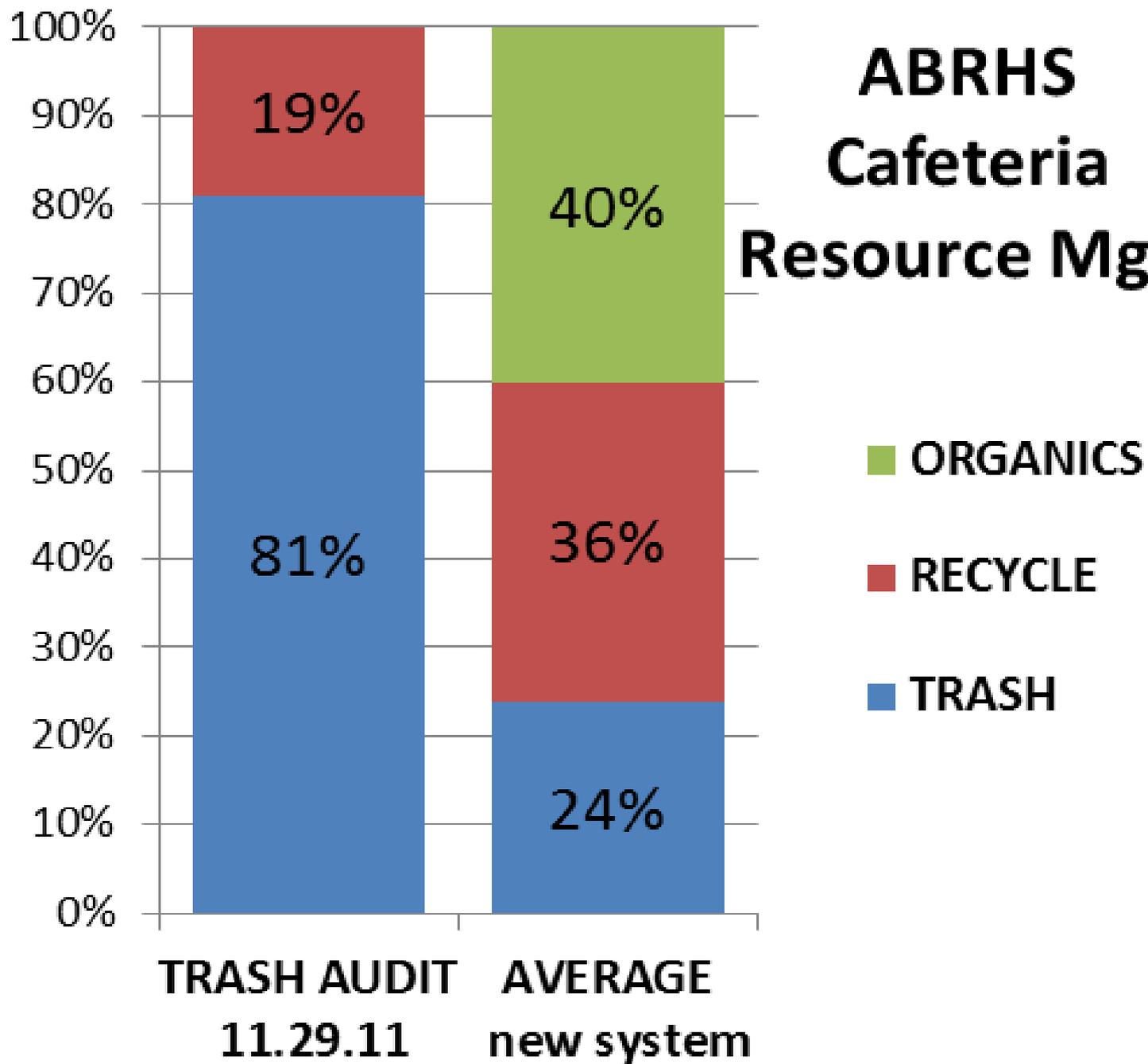
Landfill

Single Stream

BRUTE
SINGLE-STREAM RECYCLE!
PLASTIC
GLASS
METAL
PAPER

BRUTE
COMPOST

ABRHS Cafeteria Resource Mgt.





Credit: Acton-Boxborough Regional School District



International "Green Flag" award – Eco-Schools USA

Credit: Acton-Boxborough Regional School District



US EPA ENERGY STAR award to most of our schools...

the rest to follow soon!

Credit: Acton-Boxborough Regional School District

U.S. DEPARTMENT OF EDUCATION

GreenRibbonSchools



DISTRICT SUSTAINABILITY AWARD



US Dep't of Education
2013



Credit: Acton-Boxborough Regional School District

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*