



COMMONWEALTH OF MASSACHUSETTS

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

Behavioral Energy Efficiency Programs

DOER Green Communities Webinar

January 13, 2014

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
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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



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Considerations on Behavioral Energy Efficiency Programs

Aimee Powelka
Municipal Efficiency Coordinator
Green Communities Division, DOER

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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

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



Image courtesy of koratmember/FreeDigitalPhotos.net



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Tools and Resources: Community-Based Social Marketing



Source: www.cbsm.com



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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	CS	Report-Passive	Electric
WMECO	CS	Report-Active	Electric
WMECO	CS	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 keerat/FreeDigitalPhotos.net



Source: <http://www.aecse.org/sites/default/files/publications/researchreports/h121.pdf>

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Behavioral Program Steps

FIGURE 2. OVERVIEW OF ENERGY STAR GUIDELINES FOR ENERGY MANAGEMENT



- 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

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



Source: http://epa.gov/statelocalclimate/documents/pdf/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

January 13, 2014



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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
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January 13, 2014

Thank You

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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.cbasm.com
- www.opower.com/beepotential
- http://opower.com/uploads/library/file/19/MA_Three_Year_Cross-Cutting_Behavioral_Program_Evaluation_Integrated_Report_0725_12.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

Cambridge GreenSense Use Less. Gain More.

The Case for Energy Awareness

5 to 15% energy use is under occupant control

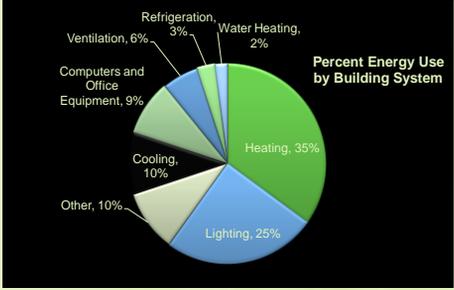


Chart: EERE Advanced Energy Retrofit Design Guide for Office Buildings, 2011

Cambridge GreenSense Use Less. Gain More.

Planning Stage

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

Cambridge GreenSense Use Less. Gain More.

Branding



Use Less. Gain More.

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




Cambridge GreenSense Use Less. Gain More.

Findings

Lights on after-hours:



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

Computers on after hours:

- 53% computers on
- 46% monitors on



Cambridge GreenSense

Use Less. Gain More.

First tip



Cambridge GreenSense

Use Less. Gain More.

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.



Cambridge GreenSense

Use Less. Gain More.

Report Results

Area/Station	04/05/12	07/03/12	04/04/13	12/05/13	%
Fire Station 1	17,172	17,564	14,517	-3,047	-17%
Engine 2	22,640	30,560	25,600	-4,960	-16%
Engine 3	9,680	11,080	9,160	-1,920	-17%
Engine 4	10,440	11,002	13,601	2,509	23%
Engine 5	7,538	6,907	6,764	-1,303	-16%
Engine 6	21,300	22,800	18,840	-3,960	-17%
Engine 7	5,707	6,179	6,002	-177	-3%
Engine 8	13,000	12,110	11,210	-790	-6%
Engine 9	135,840	126,440	127,643	1,203	1%
E. Cambridge Parking Garage	7,631	10,503	8,017	-2,486	-24%
Electrical Dept. Garage	36,800	38,400	37,000	-1,400	-4%
Green Street Garage	5,691	5,473	5,224	-249	-5%
Police Maintenance Garage	4,170	3,720	3,750	30	1%
City	14,640	16,060	14,640	-1,440	0%
Central Sq. Branch	4,447	4,245	3,650	-595	-14%
Heritage Branch	3,552	3,296	2,601	-697	-21%
Mr. Auburn Branch	6,634	2,436	7,316	4,680	200%
No. Camb. Branch	6,345	4,699	4,400	-299	-6%
Observatory Branch	9,784	9,002	8,482	-520	-6%
Valente Branch	4,000	3,000	3,000	0	0%
City Hall	190,080	192,732	167,352	-25,380	-13%
City Hall Annex (McCaskey Bldg)	123,640	148,920	122,520	-26,400	-18%
Clifton Building	72,960	69,520	65,120	-4,400	-6%
Danahy 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	20,002	22,747	17,686	-4,761	-21%
Lombardi Building	63,150	78,960	66,070	-10,920	-14%

Cambridge GreenSense

Use Less. Gain More.

Acknowledge

- GoGreen Awards
- PIO Updates
- Intranet Site



Cambridge GreenSense

Use Less. Gain More.

GreenSense 2.0: Waste

What's your paper trail?



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

Cambridge GreenSense

Use Less. Gain More.



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



Cambridge GreenSense

Use Less. Gain More.

Thank you for your time!

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Cambridge GreenSense

Use Less. Gain More.

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

http://www.centerforgreenschools.org/Libraries/Resources_Documents/Behavior-based_Efficiency.sfb.ashx

School	Drop in Electricity Use Due to Behavior-based Energy Conservation Strategies					Baseline year
	Annual reduction in electricity usage [vs. baseline year]		Annual cost savings [vs. baseline year]		Length of time covered by energy data	
	%	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:

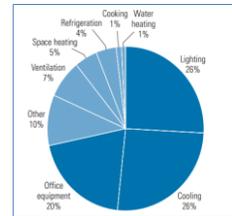
- Raising awareness among faculty, staff, students
- Managing school building operations
- Upgrading mechanical equipment and controls



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

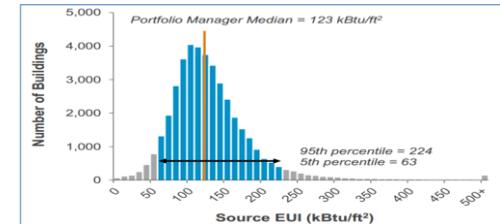
ENERGY USE IN SCHOOLS (and other "commercial" buildings):

- 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.

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



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.

(Sources: US EPA, Energy Use in K-12 Schools; US DOE, Benchmarking Your Building's Energy Using EPA's ENERGY STAR Portfolio Manager)

BENEFITS OF BEHAVIOR-BASED PROGRAMS



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

TRAITS OF EFFECTIVE PROGRAMS



SCHOOL DYNAMICS

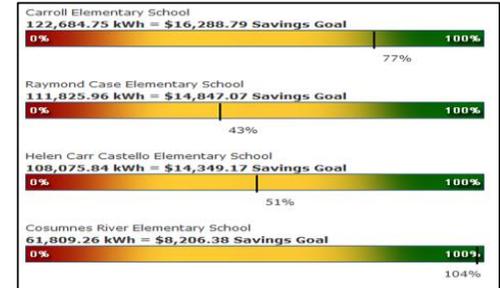
- Committed faculty/staff leader(s)
- Principal/administrator: essential support & endorsement
- Student engagement: energy, creativity, positive focus
- Custodial staff included

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



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



Credit: Elk Grove Unified School District, Fayette county Public Schools

“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=USE ² Classroom Checklist	
	Lights out <ul style="list-style-type: none"> • Before school • After school • Recess • Lunch
	Computer monitors & printers off <ul style="list-style-type: none"> • when not in use
	Personal appliances off <ul style="list-style-type: none"> • when not in use
	Doors closed <ul style="list-style-type: none"> • During class • When room is unoccupied
	Windows closed When heat or cooling on
	WATTY says . . . <ul style="list-style-type: none"> • 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.”

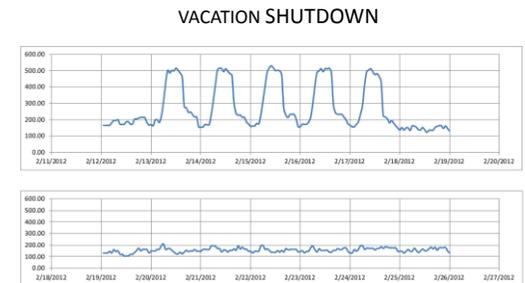
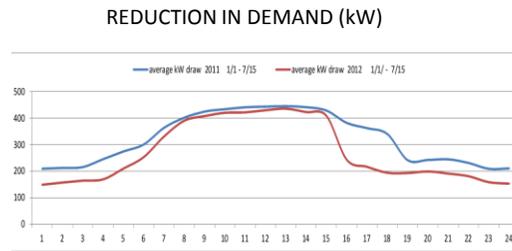
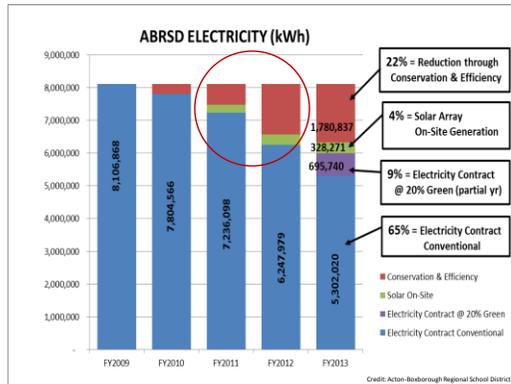
- Energy Manager, Knox County Schools

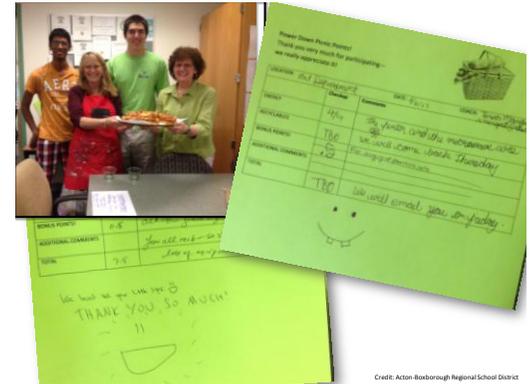
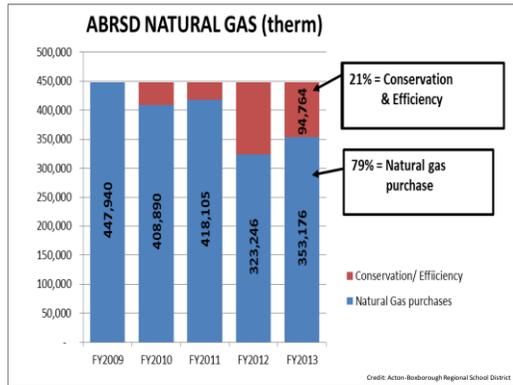


Credit: Acton-Boxborough Regional School District

POWER DOWN PROJECT

ACTON-BOXBOROUGH REGIONAL SCHOOL DISTRICT







Credit: Acton-Bosborough Regional School District



Credit: Acton-Bosborough Regional School District



Credit: Acton-Bosborough Regional School District



Credit: Acton-Bosborough Regional School District



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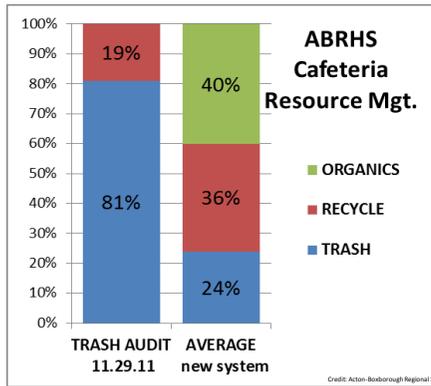
Credit: Acton-Boxborough Regional School District



Credit: Acton-Boxborough Regional School District



Credit: Acton-Boxborough Regional School District



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-Buxborough Regional School District



DISTRICT SUSTAINABILITY AWARD



US Dep't of Education
2013



Credit: Acton-Buxborough 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*