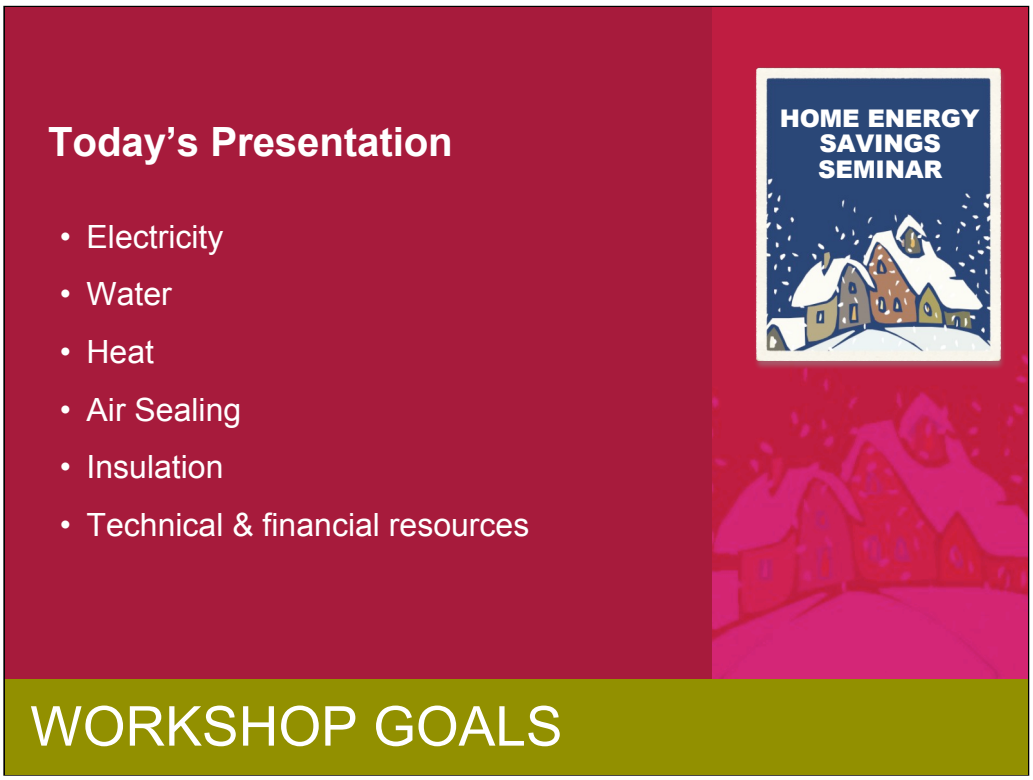
Comments:
-Thank participants for coming
-Thank local organizers and sponsors for making this possible
-Recognize all public officials (selectmen, mayor, committee members) and organizations present
-Ask: can everyone hear me? Please let me know as we go if you have trouble hearing or seeing
-Time allocation: This seminar takes approximately two hours to get through, it's a short time for all the material we have and I'll try to make the time move as quickly as possible.
-FIND OUT WHO IS IN THE AUDIENCE: Homeowners vs renters, done any improvements, some, lots



Comments:

- These are the topics we will be covering tonight.
- We will try not to overwhelm you with technical jargon. If you don't understand something, please ask.

Goals

- Help you take the next step
- Help you prioritize what to do
- Help you connect to resources and funding
- Have fun while learning how to save energy and money!

WORKSHOP GOALS

Comments:
- Get familiar with your audience. Ask a few questions:
- How many homeowners?
- How many renters?
- How many people here have taken some type of efficiency improvements on their home? (Try to get feel for needing intro or more advanced material.)
-G reat. I can assure you that in most cases – there are still significant opportunities for more savings.
- Don't forget that if you teach your children young, they won't have to un-learn bad habits!

Self Home Energy Audit

- Look at your bills, compare current month to same month last year
- Does usage over the year vary? Why?
- On-line tool from MassSAVE provides list of rebates and programs available to your area.
- On-line tool from Energy Star
- NStar has appliance operating cost calculator

RESOURCES

Notes:
Comparing this month to the same month last year helps people have a sense of improvement, suggest that they do this now, and then again after they have made changes.

It's not necessary to understand kilowatt hours and therms, just notice if the numbers are going up or down and by how much.

Record your bottom line!

MassSAVE Home Energy Audit

1-866-527-7283

www.masssave.com

- 1 - 4 unit buildings are eligible for this program sponsored by most major MA utilities
- MassSAVE audit will determine what rebates your house is eligible for.
- Provide zipcode and heating source on website for full listing of eligible programs and rebates

RESOURCES

The program targets customers interested in having efficiency work done so it maximizes savings and cost effectiveness to the program and utilities. If a customer is interested in upgrading the efficiency of their house they can always get an audit. If a customer is interested only in whether their existing refrig. is eligible for a rebate they can obtain a shorter visit called a Special home visit where the field staff evaluates the usage of the refrig., gives them an rebate form if eligible and installs CFLs. T-stats are a little different customers can access some rebate forms at places like Home Depo then mail them in or they can also obtain them at the audits.

•MassSave Audits are free, blower door test done only if air sealing is recommended and purchased.

• Contact information: Direct audience to contact information about Home Energy Solutions through MassSave.

• Please note MassSave program is NOT available in : Ashburnham, Ipswich, Shrewsbury, Boylston, Marblehead, South Hadley, Chicopee, Middleton, Sterling, Groton, Paxton, Templeton, Holyoke, Princeton, Westfield, Hull

Electricity & Appliances

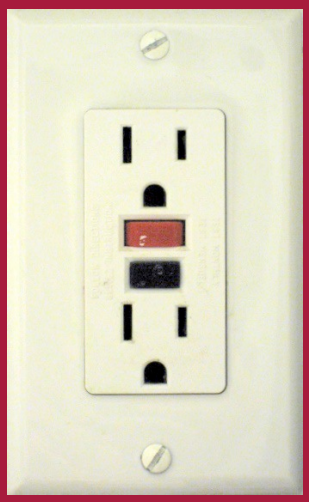


Photo b Jonathan Hunt

Electricity and appliances account for 40% of home energy use

ENERGY EFFICIENCY

From Energy Savers
http://www1.eere.energy.gov/consumer/tips/
11% lighting
9% Computers & electronics
9% Appliances
9% Refrigeration

8% Other
12% Water Heating
12% Space cooling
31% Space Heating

Lighting:

- 10-25% of average home electrical usage. Turn them off!
- Replace incandescent light bulbs with compact fluorescent light bulbs (CFLs).
  - Replacing five 60-watt bulbs used for 5 hours a day can **save $72/year** in MA
  - Uses **75% less** energy
  - Lasts **6-10 times longer** than incandescent light bulbs

ENERGY EFFICIENCY

Notes:

•CFLs: CFLs today come in warm colors, do not flicker, and come on instantly. They are also available in 3-ways, dimmables, and various shapes, including globes, bulb-shaped and reflector floods.

•Environmental Working Group does ratings of CFLs based on amount of mercury: http://www.ewg.org/files/EWGguide_lightbulb.pdf (URL on handout?)

•http://www.masssave.com/downloads/cfl_fact_sheet.pdf

Lighting:

Special bulbs needed for recessed lights, dimmable fixtures and outdoors

•CFLs vary greatly - try a few first to find personal preference

• Energy Star discount available: 60 watt equivalent mini-spiral CFL for $1 through http://efi.org/estarlights/ or 1-800-379-4121

ENERGY EFFICIENCY

http://www.efi.org/consumer/consumer.html

Lighting:

- Motion detectors or timer.
- **Holiday lights operating costs:**
  - **$1/season LEDs**
  - **$5/season regular mini lights**
  - **up to $75/season large lights!**
- Replace halogen torchieres:
  - Dangerously hot
  - Dramatically more electricity
- **Return dead CFLs for mercury recycling**

Efi.com catalog

ENERGY EFFICIENCY

Notes:

•Mercury in CFLs: CFLs have a small amount of mercury in them. When the bulbs burn out, they should be brought back to a local hardware store for eventual reuse of the mercury. Home Depot, and many True Value and Ace hardware stores take the bulbs back free of charge.

•Light Emitting Diode lights (LED's) are coming onto the market and will even be even more efficient.

Does the "OFF" button really turn things off?

Fact:

- Many products consume energy (called "phantom load") after being turned off
- Major culprits - home entertainment systems and computer work stations
- If the little box that plugs into the outlet is warm, it is using electricity

!!!! MYTH BUSTER !!!!

Notes:

•Other culprits of phantom load: While home entertainment electronics and computers are a major culprit, the trend extends into seemingly innocuous appliances like coffee makers and window fans. Any device that feels warm or has a glowing light when turned off is still drawing power.

•Products that use transformer include phones, speakers, or chargers.

Electronics:

- Many electronic devices when **turned off** use **20-40 watts**
  - **Unplug** any battery chargers or power adapters when not in use
  - Attach entertainment centers and home office equipment to a **power strip, and turn off the strip when not in use.**
- 20-watt device (cable TV box) **$30/year**
- 40-watt device (stereo) **$60/year**

ENERGY EFFICIENCY

Notes:

• Smartstrips are even better for computers as they will "power down" equipment associated with the computer (printer, scanner, etc.) when the computer goes into sleep mode.

• Computer: using Standby mode vs screen saver for 15 hours/day can save $45-$80

• Savings calculated using MA average electricity rate of $0.18/kWh in September 2008.

Electronics:

- Kill-a-watt meter
- Whole house power monitor

Find your electricity hogs!

ENERGY EFFICIENCY

Notes:

•Explain basics around how to use kill-a-watt meter, while they're inexpensive, everyone doesn't need their own. Towns are being encouraged to start a lending program through their library.

•Discuss finding hidden power hogs, check stereo components, UPS, printers, televisions, monitors

• Discuss whole house power monitors to find lights left on, base lines, reducing base lines, make it a game with children to see how low you can get the house usage to be, then can you keep it there?

•Kill-A-Watt meter typically needs to be purchased online, basic version is ~$20, EFI carries them: http://www.efi.org/consumer/consumer.html

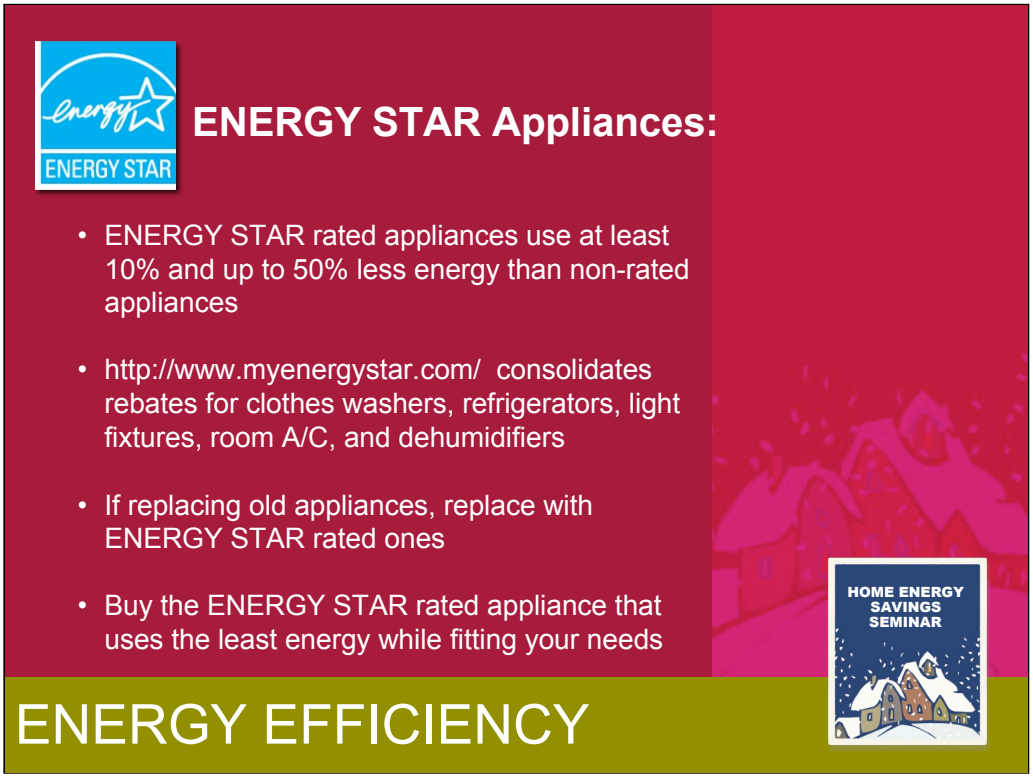
Appliances: Air Conditioners

- Use sparingly, turn off when leave room
- Use fans and ceiling fans
- Remove in the winter!
- Fit tightly into the window, seal edges well
- Get the correct strength unit for the space
- Look for Energy Star when replacing unit

ENERGY EFFICIENCY

Notes:

•Remind people that A/Cs that are too strong or too weak for the space use excessive amounts of energy. Some people think that "size the unit" means "make it fit in the window", not "get the correct strength for the space you are cooling"

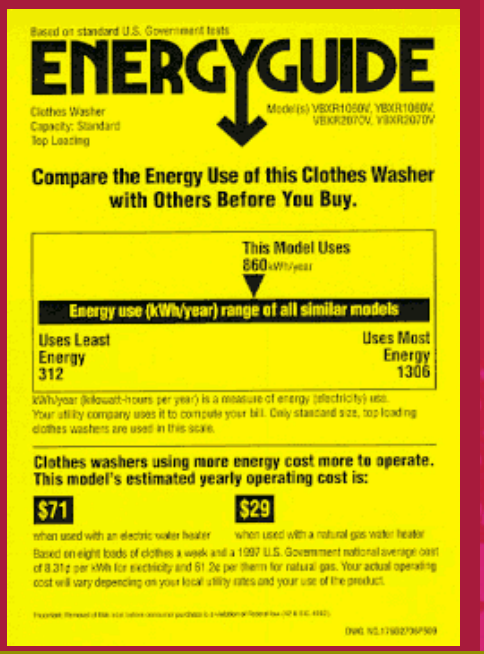


Notes:

•ENERGY STAR appliances (with a blue label as above) use less energy overall. See energy efficiency ratings of various appliances at: www.energystar.gov.

•Remove old inefficient refrigerators and freezers: Consider the 30 yr old, inefficient refrigerator that can be of the biggest electricity guzzlers.

Energy Guide Labels:



ENERGY EFFICIENCY

Notes:

•The Energy Guide label (which is yellow and on every appliance) allows for a comparison of energy usage of similar appliances against one another (note kWh costs is typically very low).

•ENERGY STAR appliances (with a blue label) use less energy overall. See energy efficiency ratings of various appliances at: www.energystar.gov.

Appliances: Kitchen

- Microwaves use less energy than the stove or oven
- Cover food tightly, moisture makes refrigerators work harder
- Turn off heated dry on dishwashers
- Re-assess need for 2nd refrigerators and freezers. Unplug when not needed. They often cost upwards of $75-$150/year to run.

ENERGY EFFICIENCY

Note:

•Microwave: it only heats the water, and not the container and surrounding air as well, the way stoves and ovens do. It uses a large amount of electricity for a short amount of time, resulting in less energy use.

•Try heated dry, if you are don't like the result, or don't have time for some air-drying, then don't use it again. Many find no difference with it on or off.

•Many people keep old refrigerators and freezers in the basement or garage for ice cream or soda. Is it really worth the cost? If you only need it during the holidays, unplug it the rest of the year.

Appliances: Clothes Washer & Dryer

- Use cold water
- Wash full loads
- Air dry your clothes outside, whenever possible – clothes will dry outside, even in freezing weather
- Consider purchasing a front loading washer:
  - Uses less water
  - Better extracting water, reducing drying time
  - Gentler on clothes

ENERGY EFFICIENCY

Note:
• (Source: US D.O.E. E.I.A.) 5.8% of residential electricity goes toward drying clothes.
Note: Some MA towns do not allow drying laundry outside.
• Top loader washing machines: if you run two or more loads per day with a top loader washing machine - its worthwhile investigating replacing this with an energy efficient front loader.

Don't forget to smile! - Slide is of St Lucia, courtesy of Jonathan Hunt.

Water:

- Install low-flow showerheads and faucet aerators
- Keep an eye out for leaks!
- Limit your hot water tank temperature to no more than 120° (setting may be "warm", "between A & B" or 120°, depending on heater)
- Each 10° reduction will save 3-5% on water heating costs

Water

Comments:

• Today's Low flow showerheads pull in air to give the same feeling of force as the high water pressure gives.

• Hot water can consume about 10% of your overall heating fuel. These tips for reducing hot water usage and heat loss will help you save energy.

• Homeowners pay for water and sewage, so reducing your water usage will save you money.

• Try turning the water down some, every few days turn it down a little more until you find a good setting for your family. If it is scalding, it is too hot. It not only wastes money, it's dangerous.

Hot Water:

- Install an insulating wrap on electric hot water tank – unless labeled otherwise
- Wrap first 9ft of hot and cold water pipes with pipe insulation
- Consider upgrading to newer, more efficient hot water heater.

Water

Comments:

• Insulate the first 9 ft of cold and hot water pipe running off the dhw heater. This is because heat is transferred up both pipes from the dhw heater. This 9ft min. for both was the finding of an evaluation years ago.

•Wrapping water heaters: for safety reasons, homeowners should not insulate gas or oil hot water heaters. Also, new electric water heaters should not be wrapped. Look for signage on the tank itself.

•Massachusetts law states that the temperature must be between 110F and 130F. [from flyer distributed by MA FD in 2007]

Water Heater Replacements

- Water heaters fail spectacularly, if older than 10 years, consider replacing now.
- Purchase most efficient available, but only buy needed capacity
- Most efficient 234 therms/year
- "On-demand" or "tankless" systems only heat water as needed but plumbing costs are higher
- **Discounts**
  - Rebates range from **$100-$300** depending on model and heating source

Water

-Mention that on-demand systems are a great option for seasonal and weekend houses. Much more convenient than turning off the system when you leave and saves significant money over leaving the system on all the time.
-Discounts:

- Gas Networks customers can get $100-$1300 depending on model
- MassSave eligible customers who heat with oil, propane or electric can access rebates from $300-$500 on some types of upgrades. See MassSAVE site for details.

Should I turn down the thermostat?

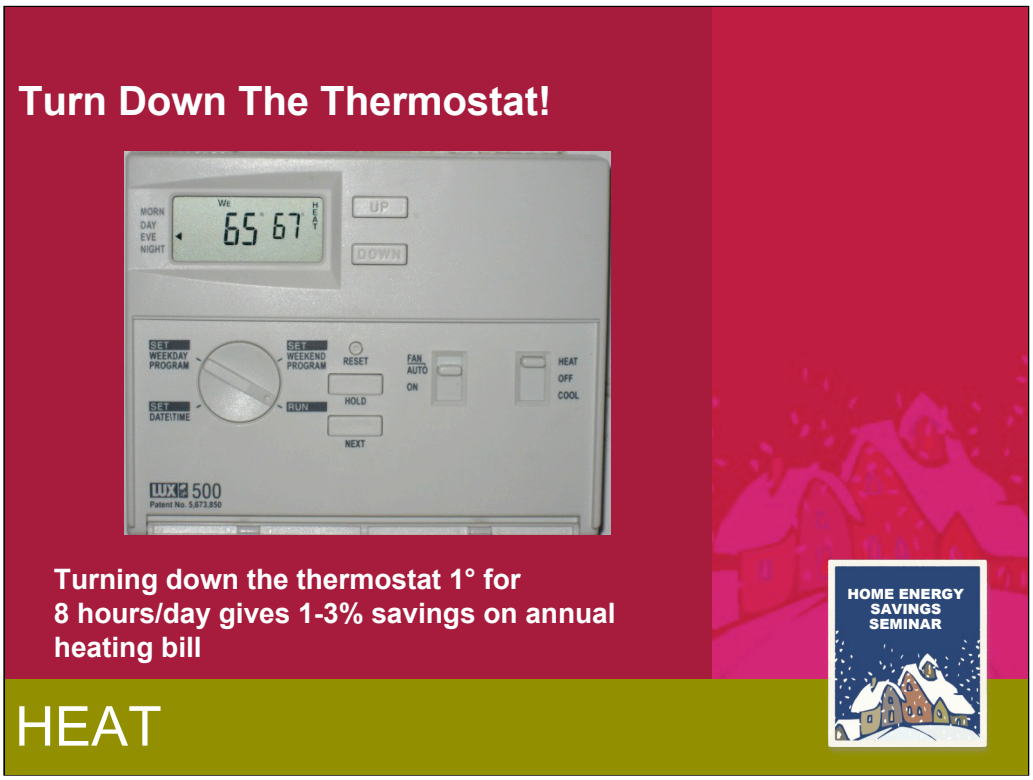
YES!

Fact:

- Heat loss increases with temperature difference. Reducing indoor air temperatures will result in savings.
- Bringing the home back up to temperature DOES **NOT** consume as much fuel as would be used to maintain the higher temperature.

!!!! MYTH BUSTER !!!!

Note:



Comments:

•Try turning down the thermostat by 1° every few days until people start to complain, then turn it back up 1° and use as your awake setting.

•Set your thermostat as low as 55° when you're out of the house for 8 hours or more

•58° night while you're sleeping.

•It's more efficient to run the furnace at full strength to bring your house back up to temperature than to have it cycle on and off during the day when you're not home.

•Use a programmable thermostat to have the house warm when you arrive home or wake up.

•Cost $30-$90

•ES rebate $25/per thermostat

Comments:
•Steps identified here can greatly increase the overall efficiency of home heating.
Notes:
•Cleaning furnaces: some question about how often to clean a furnace: more frequently for oil force-air furnaces, less frequently for other fuels
•Upgrading furnaces: In general, if people have older furnaces and burn a lot of oil – it is worthwhile considering upgrading the burner/furnace. It is often best to first reduce the heating load of a house through weatherization measures before investing in a new heating system. This may allow people to buy a smaller system and for that system to run more efficiently than a larger system which would be oversized if the weatherization measures were done after the furnace upgrade. If buying a new system, buy one that is ENERGY STAR rated and buy one that is sealed combustion vented.
•Filters: This is more about protecting the bearings on the fan and keeping the dust from circulating than about saving energy – replace several times over the winter.
•Balanced supply & return – Important to have sufficient quantity of cold air return. Important not to force warm air out of the upstairs bedroom with the door closed - -which will cause depressurization elsewhere (especially the CAZ). If your basement door is pulled open when the air handler comes on, call a Home Performance contractor
•Fuel switching: beyond the scope of this workshop
•Rebates:

- Gas networks from $100-$1300

Boilers

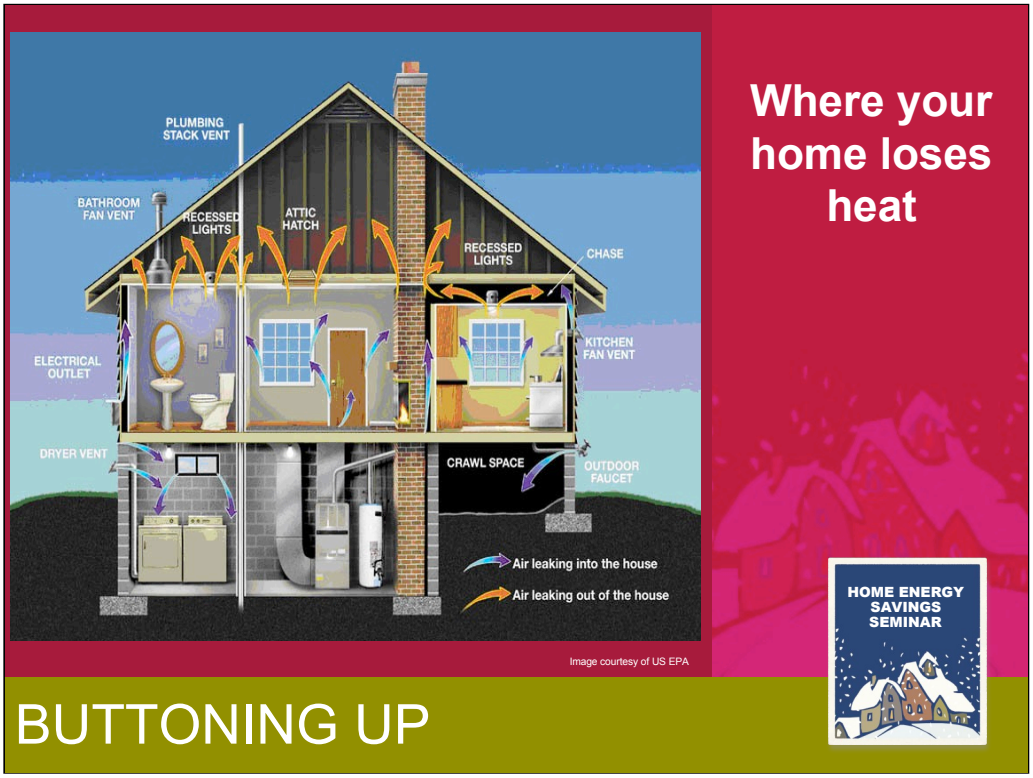
- **Clear space** around radiators to allow air and heat to circulate freely
- Have unit **serviced regularly** according to recommended schedule; about once per year for older systems
- **Insulate water or steam pipes**, particularly in unheated areas; be sure to use insulation appropriate for high temps if steam
- If you have outdated equipment, consider investing in a more efficient heating system
- **Rebates** available from **$100-$1,300**.

HOME ENERGY SAVINGS SEMINAR

HEAT

Comments:
• Steps identified here can greatly increase the overall efficiency of home heating.
• Take a comprehensive look at shell and furnace/boiler efficiency improvements; generally recommended to do shell improvements before efficiency upgrades

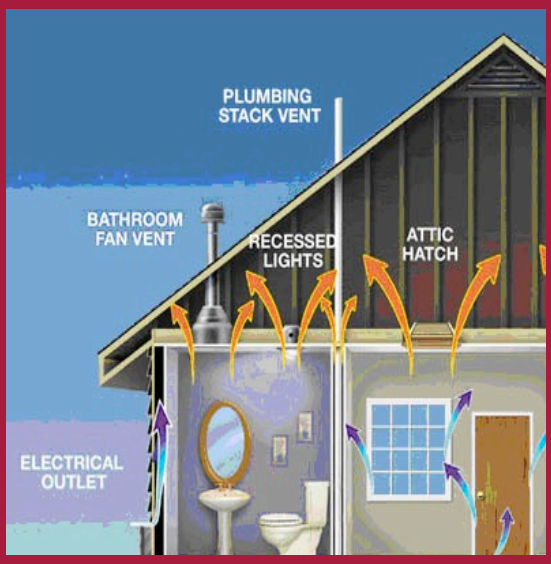
Notes:
• Upgrading boilers: Get an assessment of how efficient it is. 90% and higher efficiencies are currently available. Do air sealing and insulating first, this may allow people to buy a smaller system and for that system to run more efficiently than a larger system which would be oversized if the weatherization measures were done after the furnace upgrade. If buying a new system, buy one that is ENERGY STAR rated and buy one that is sealed combustion vented.
• MA 0% Heat loans are available, more info at end of presentation.
• Fuel switching: defer all questions about fuel switching as beyond the scope of this workshop
• Rebates: Gas networks from $100-$1300, MassSAVE for rebates through electric companies for oil & propane heat



Comment:

- Conduction – Heat flows through a solid object
- Convection – Heat is carried by a moving current of air or fluid
- Radiation – Heat flows through empty space as infrared light waves
- Good analogy for air and thermal barrier: Think about the warmth a heavy wool sweater gives you on a cold day. However, if a cold wind comes up -- the sweater isn't much good without something to stop the wind such as putting on a shell over the sweater. The shell keeps you warm because it is stops the air flow. Thus, *sweater = thermal barrier* while the *shell = air barrier*.

Where Your Home Loses Heat



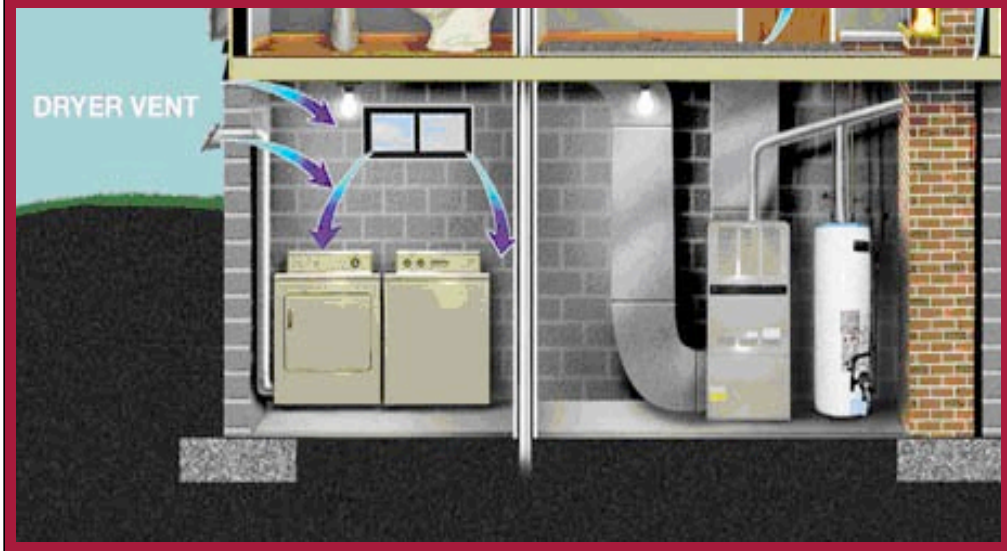
HOME ENERGY SAVINGS SEMINAR

BUTTONING UP

Comment:

•Good analogy for air and thermal barrier: Think about the warmth a heavy wool sweater gives you on a cold day. However, if a cold wind comes up -- the sweater isn't much good without something to stop the wind such as putting on a shell over the sweater. The shell keeps you warm because it is stops the air flow. Thus, *sweater* = *thermal barrier* while the *shell* = *air barrier*.

Where Your Home Loses Heat

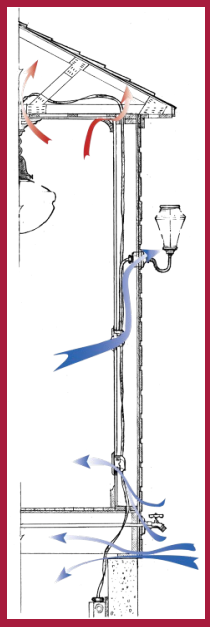


BUTTONING UP

Good reminder that cold air coming in is just as bad as hot air going out.

Where Your Home Loses Heat

Air leakage also occurs within walls



HOME ENERGY SAVINGS SEMINAR

BUTTONING UP

Comment:

Air Sealing and Insulation

BUTTONING UP

What is the most cost-effective way to stop heat loss?

Fact:

- **Air sealing** is typically the most cost-effective way to stop heat loss in New England homes, and should always be done **before** (or as part of) adding additional insulation
- Air Sealing the attic and basement is most important
- Many air sealing steps can be accomplished by the average homeowner for minimal cost

!!!! MYTH BUSTER !!!!

Comments:

-Explanation of how loose insulation doesn't stop air leakage: High pressure from warm air pushing at the top of the thermal envelope will allow warm air to move out leaks in thermal barrier and through fiberglass and loose fill insulation. Additional insulation may not stop convective heat loss. Need to pull back existing insulation and seal leaks before adding new insulation

Is adding attic insulation an effective way to stop heat loss?

Fact:

- Not by itself. Fiberglass and loose-fill cellulose do not stop air leakage.
- Attic insulation is an essential, highly cost-effective means of saving on heat, **but only** if air-sealing is done first.

!!!! MYTH BUSTER !!!!

Where Your Home Loses Heat

Building Depressurization Test using a blower door with calibrated fan

HOME ENERGY SAVINGS SEMINAR

BUTTONING UP

Notes:

• If an insulation contractor doesn't use a blower door, find another contractor – "if you're not testing, you're guessing!"

• Explanation of blower door (building depressurization) test: is a more sophisticated and accurate method of finding the leaks used by Home Performance and Weatherization specialists as part of an energy audit to:

-quantify the amount of air leakage

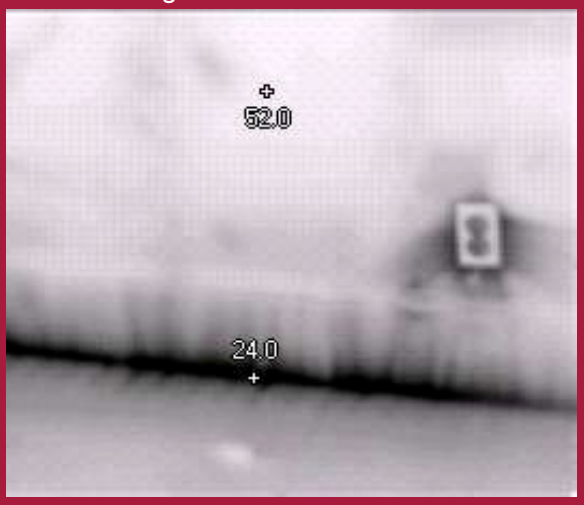
-identify the sources of leakage

-generate data for recommending most cost effective retrofits

-can be used after retrofits to verify that leaks have been sealed as prescribed

Where Your Home Loses Heat

Air Leaking at Baseboards



Images Courtesy of Brad Cook

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BUTTONING UP

Notes:
-- Shows air leakage at baseboard, could be caulked, and air leakage around outlet. Slide with outlet insulators in a few slides.

Air Sealing

Weatherizing Power Sockets & Switches

- Seal with foam cutouts (use on outside walls)

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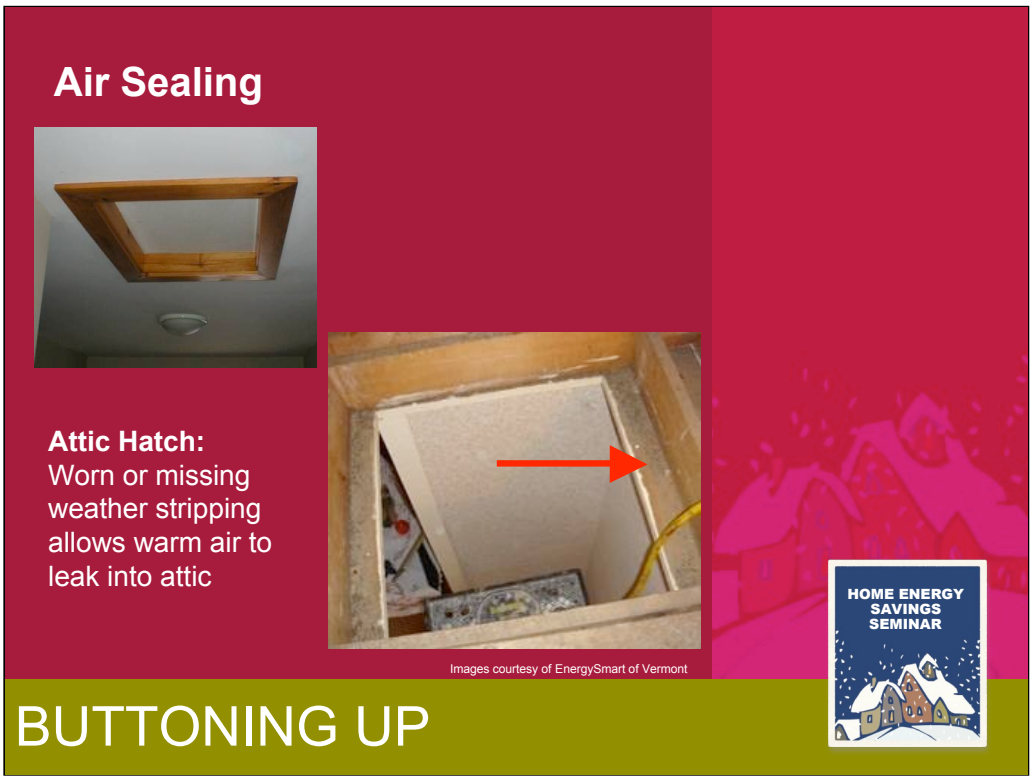
BUTTONING UP

These are both very simple to do. Equipment can be obtained very inexpensively at the hardware store. Simply unscrew outlet, insert insulation pad and screw outlet back on. Be careful not to touch any exposed wires!



Comment: Arrow points to missing weather stripping. Two hard surfaces do not make a seal. Hatch surface material must not warp!
Spending $40 to seal and insulate your attic hatch – will pay for itself and then some in one winter of heating bills

Note:
•Energy Star air sealing handout talks about how to do this.
•To seal attic hatch:
- -Measure, cut and apply weather strip to the top of the wooden ledge that hatch sits on so it compress down onto the weather strip when closed.
- -Glue with caulk adhesive, 3 layers of 2" poly-isoscyanruate foil-covered insulating foam board (Ther-max) to the top of the hatch cover
- -Foil tape the edges of insulation board.
- -Glue a couple of pieces of 2x lumber to top of hatch for additional weight to compress weatherstrip

Air Sealing

Pull Down Attic Stairs: A MAJOR leak - seal tight with an insulated cover above the stairs like the Therma-Dome Attic Stair Cover

HOME ENERGY SAVINGS SEMINAR

BUTTONING UP

Comment: This applies to pull down stairs and whole house fan assemblies in attics.
There are covers you can buy, such as the Thermadome from efi.org for $110.

Bulkhead Door
Air sealing the bulkhead door – a highly cost-effective action

HOME ENERGY SAVINGS SEMINAR

BUTTONING UP

INTRO - Mention as an item to do
WEATHERIZATION WORKSHOPS - Spend time explaining how

Explanation of how to seal a bulkhead door: The Bulkhead/Exterior door is often not weather stripped or insulated. To weather strip a bulkhead door:
-Close the door so it latches (fix so it does latch properly if it doesn't already).
-Cut top and side strips of Q-Lon door stop weather stripping
-Apply caulk to back of Q-Lon.
-Snug Q-Lon up to door, compressing the gasket about half way.
-Tack in place, but leave nail heads revealed.
-When all 3 pieces of Q-Lon are tacked in place, open the door and make sure that you can close and latch it again. If you cannot close and relatch the door, you may have installed the Q-Lon pushing too hard into the door. You would then have to pull the nails and move the Q-Lon slightly out. But make sure that the gasket stays in contact with the door all the way around.
-Once the door seals and latches properly, you can set the nails.

Air Sealing

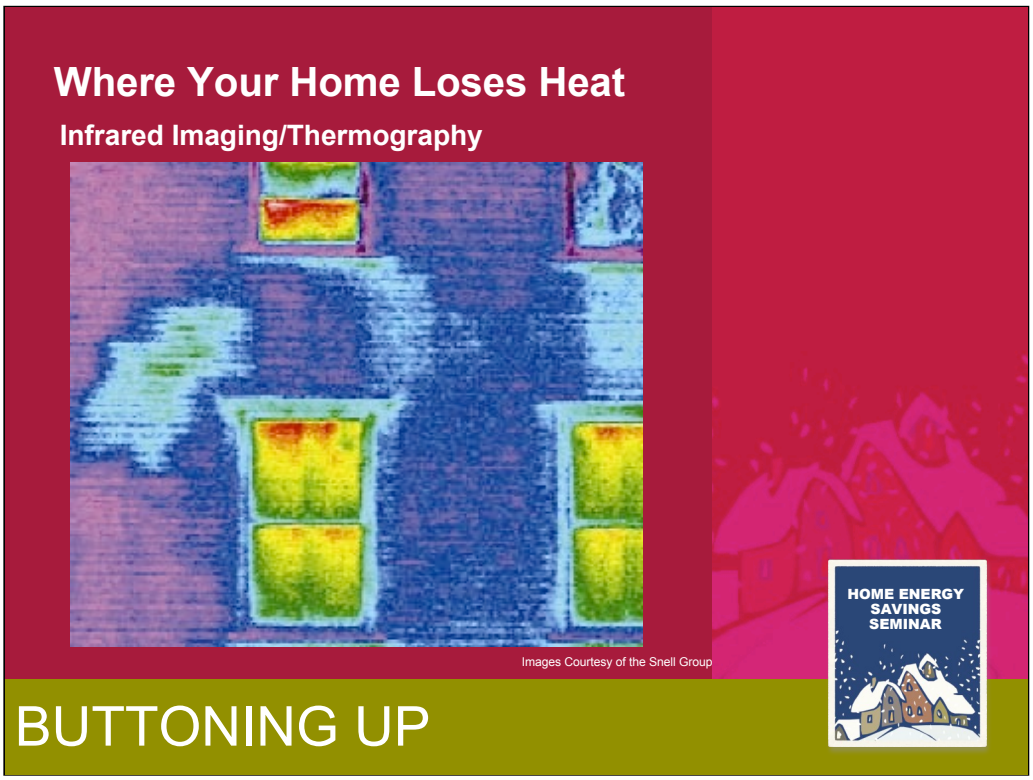
Exterior Doors

- Add or replace worn weather stripping and door sweeps
- Older doors and frames may benefit from adjusting jams and latch strike plates

Image courtesy of EnergySmart of Vermont

BUTTONING UP

Notes:
INTRO CLASS: Don't spend a lot of time on this slide: You can move quickly through this slide as it is basically covered under "bulkhead door".
• Replacing exterior doors with insulated an door would be a long term payback.
WEATHERIZING: Steps to retrofit an exterior door:
Retrofitting doors to make them air tight is cost effective.
-If doors rattle against door stops, adjust striker plate so the close snuggly against stop.
-If weatherstripping is missing or is cracked or torn, Add Q-Lon or peal and stick weatherstrip to door stop for tighter seal.
-If door is uninsulated, install storm door with replaceable screen panels for summer ventilation.
- Consider adding 2" of insulation foam board to exterior doors where aesthics are not a concern (basement, attic).



Comments:
- Infrared imaging (called "thermography") is a photographic technique that can depict visually heat loss.
- Understanding how to interpret an infrared scan is critical to correct analysis.
- Used alone, thermography can be misleading -- leading one to fix symptoms, not problems.
- Used in combination with blower test is most effective to understanding building heat loss.

Notes:
Don't spend too much time on these slides. These are here mostly as interesting visuals.

Air Sealing - Windows

Image courtesy of Efficiency Vermont

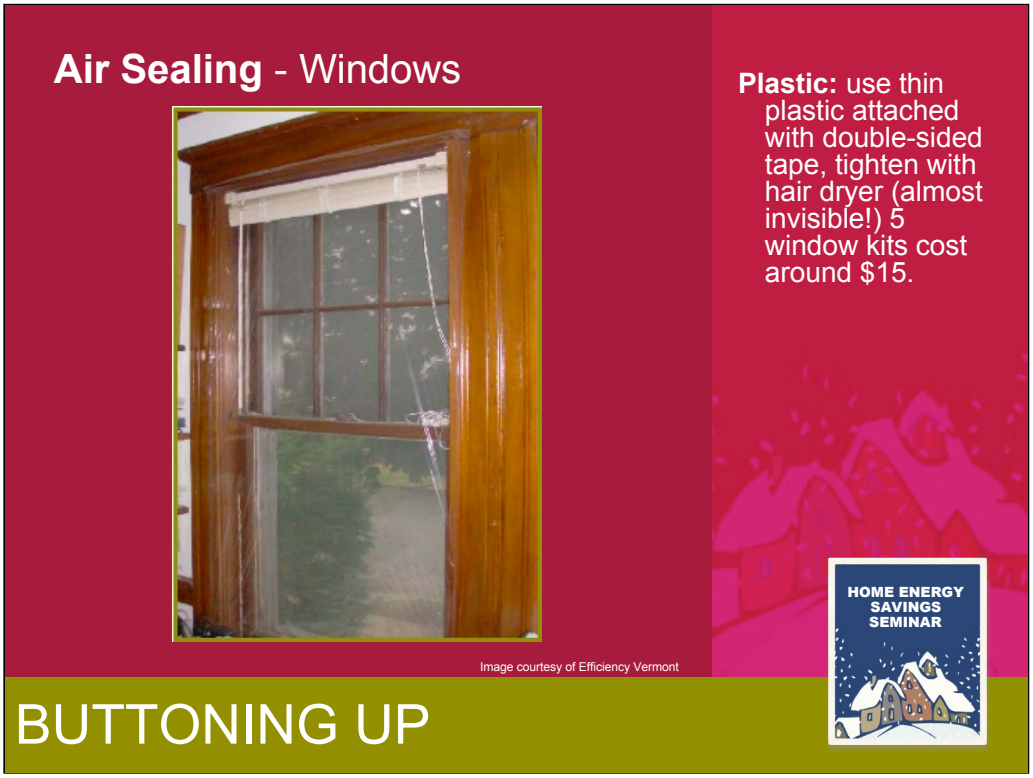
Rope caulk: Use on seams along window frames inside home (not on outside as shown in picture)

HOME ENERGY SAVINGS SEMINAR

BUTTONING UP

Notes:These are for windows you won't be opening during the heating season. Typically this is removed during the warmer months. These are very simple than any resident can do.

If the plastic is done carefully, it is hard to notice from just a few feet away.



- RETIREES: Suggest neighbor or teenager can do for you
- ALL OTHERS: Easy to do!
- MENTION STORM WINDOWS TOO! Make sure they are installed properly and closed!
- Notes:These are for windows you won't be opening during the heating season. Typically this is removed during the warmer months. These are very simple than any resident can do.
- Put on rope caulk before putting up the plastic.
- If the plastic is done carefully, it is hard to notice from just a few feet away.

Air Sealing - Windows

Window-Blockers, Insulating Blinds, & Drapes

- Use when not at home, at night, when rooms not in use

Rolling Quilt

Honeycomb or Cellular Blinds

HOME ENERGY SAVINGS SEMINAR

BUTTONING UP

Notes:

- These are a more expensive option, they are not better than previously mentioned options, but they don't have to be reinstalled each year and they allow the window to be opened.
- Mention that these can be used to keep heat out in the summer as well.

Is replacing windows a good investment for saving energy?

Fact:

- There are many good reasons to replace windows, but energy savings is rarely one of them
- Most windows can be effectively sealed for far less than the cost of new replacement window installations

!!!! MYTH BUSTER !!!!

Comments:

- Replacing windows is expensive and usually not cost effective from an energy-saving perspective.
- Many of the actions in replacing a window are the same as would be done a proper rehabilitation of a window: e.g. sealing the rough opening.
- Rehabilitating windows is time consuming and requires a certain amount of patience and skill, but within the capability of "handy homeowners".
- Consider storm windows and "indoor storm" windows instead of replacements.

Air Sealing - Windows

Replacing windows

- Good installation is important
- Fill cavities in wall with loose insulation or foam
- Cost vs. Quality
- Get double or triple panes
- Save energy, but payback is 30-40 years

Rebate

- Gas Networks **$10 per window** up to **$500** for home window replacement

BUTTONING UP

Notes: Some vinyl is quality, but some are not worth the price paid. Do a little research before replacing windows. One source of information is the discussion board on http://www.vinyl-replacement-windows.com/

Additional perk is getting rid of lead paint

WEATHERIZATION: good opportunity hear to discuss U-factor vs R-factor. (Later slide talks about R-factor)

Air Sealing - When to Hire A Professional

- A history of ice dams in the winter (an indication of serious air leaks)
- Kitchen, bathroom, and clothes dryer vents that exhaust moist air directly into the attic space instead of outdoors
- To test house with Blower door to check for adequate ventilation and combustion draft is adequate after air sealing.

BUTTONING UP

Source: "A Do-It-Yourself Guide To Sealing And Insulating With ENERGY STAR"

Note: There are 3 separate reasons here to hire a professional, only the picture and first bullet are about ice dams.

Air Sealing - When to Hire A Professional (continued)

- Wet or damp insulation or Moldy or rotted attic rafters or floor joists indicating a moisture problem
- Knob and tube wiring (pre-1930), which can be a fire hazard when in contact with insulation
- If you have many unsealed and uninsulated recessed "can" lights, special care must be taken when insulating around these fixtures
- Little or no attic ventilation
- If you have vermiculite insulation in your attic.

BUTTONING UP

Source: "A Do-It-Yourself Guide To Sealing And Insulating With ENERGY STAR"

•What does vermiculite look like: Vermiculite usually looks like small gray flaky chunks - less than 1" in diameter - was used as loose fill insulation in old houses. Some vermiculite might have asbestos in it - others might not - so sampling is difficult. Needs to be done in a manner sufficient to sample entire contents of attic. Treat it as hazardous, asbestos containing material and contact a licensed abatement consultants and contractors – get list at USEPA http://www.epa/asbestos/

•http://www.epa.gov/asbestos/pubs/insulation.html

Do I have to be careful not to make a house too tight? What about indoor air pollution?

Fact:

- All buildings need ventilation to have healthy air
- Blower door and combustion safety tests necessary to insure adequate ventilation
- In homes with air ducts, build or renovate as tightly as possible; then, if necessary add an Energy Recover Ventilator (ERV)
- With radiators and baseboards a quality exhaust fan should be sufficient
- Ensure adequate supply of combustion air for heating system & hot water heaters through professional testing.

http://efi.org

!!!! MYTH BUSTER !!!!

Comment:
•Build tight and ventilate right.
•Air coming in from leaky houses is unreliable and can actually build up moisture and indoor pollutants from the soil, attached garage, or wet crawl space.
•The best investment is to build or renovate as tight as possible, and then control ventilation with highly efficiency exhaust fans or an Energy Recover Ventilator (ERV).

Note:
•This myth results from a failure to understand ventilation dynamics when builders first started building tight houses in the 1970s and the importance of moisture control was not well understood. Off-gassing chemicals and other pollutants caused "sick buildings". New energy tight buildings have to be approached with a whole systems understanding that includes ventilation strategies appropriate for the location, use and occupants.

Carbon Monoxide

Health effect: ranges from fatigue and chest pain to impaired vision and nausea to death – depending on concentrations

Remedies:

- Do NOT use unvented combustion appliances, such as kerosene heaters
- Have trained professional inspect and tune up combustion appliances
- Install a carbon monoxide detector on each floor
- **MA law requires at least one CO detector in each house**.

http://efi.org

HEALTH & SAFETY

Notes:
• Sources: all combustion devices – unvented kerosene and gas space heaters, leaking chimneys, furnaces, boilers and woodstoves/fireplaces, gas stoves, dryers and other gas-powered equipment, Automobile exhaust from attached garages, Tobacco smoke
• The MA law requiring CO detector's is called "Nicole's Law". It became law in 2005.
• Carbon Monoxide (CO) is an odorless, colorless and toxic gas; CO can kill you before you are aware it is in your home. Again, move relatively quickly through this slide.
• Other health effects:
•At low concentrations, fatigue in healthy people and chest pain in people with heart disease.

-At higher concentrations, impaired vision and coordination; headaches; dizziness; confusion; nausea.

-At moderate concentrations, angina, impaired vision, and reduced brain function may result.

- At higher concentrations, CO exposure can be fatal

Air Sealing - Plumbing, electrical, and phone/data penetrations

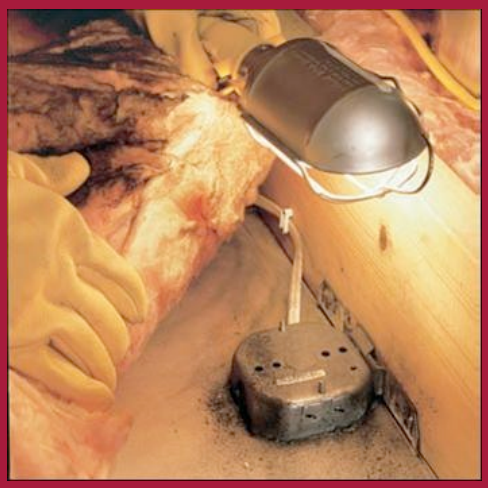
Images courtesy of Vermont Energy Investment Corp.

BUTTONING UP

Notes:

- Sealing these penetrations is something you can do yourself if you're comfortable with a caulk gun. (The larger hole needs insulating foam.)
- Plumbing penetrations often provide open air passage from basement to attic, and are easily sealed by pulling back foam and spraying opening with foam.
- Wiring penetrations are easily sealed from the attic by pulling back the insulation and spraying foam or caulking openings in and around electric boxes and wires.
- These penetrations can be found in the basement from outside as well, and should also be sealed

Air Sealing - Electrical penetrations



Source: "A Do-it-Yourself Guide to Sealing and Insulating with Energy Star®"

BUTTONING UP

INTRO: Just mention this should be done by a knowledgeable person.

WEATHERIZATION: Explain details

- Wiring penetrations are sealed from the attic by pulling back the insulation and spraying foam or caulking openings in and around electric boxes and wires.
- Check for gaps in attic that allow air movement by checking for dirty insulation. Seal gaps with caulk or expanding foam.
- Fill wiring and plumbing holes with expanding foam. Caulk around electrical junction boxes, and fill holes in box with caulk.

More details in "A Do-it-Yourself Guide to Sealing and Insulating with Energy Star®" ~~(Which is available online)~~

Air Sealing - Recessed Lighting & Chimney Chases

Image courtesy of Vermont Energy Investment Corp.

Image courtesy of EnergySmart of Vermont

BUTTONING UP

INTRO: If you're not already familiar with construction and insulation, this is something that you should hire a contactor to do, these are some areas he should seal.

WEATHERIZATION: Use heat-resistant materials (high-temp. caulk, aluminum flashing) around heat sources: chimney, exhaust pipes, electric fixtures. Building code: no combustibles within 3 inches of heat sources.

Do not seal or insulate over recessed light fixtures unless they are IC rated (can build a box around them if leave enough space to dissipate heat)
Notes:

•Recessed lights can be major sources of air leakage. If the recessed light fixtures are IC/Insulation Contact rated:

- -Pull back insulation away from fixture
- -Seal openings in fixture and around fixture to ceiling with spray foam
- -Replace insulation

-If recessed light fixtures are NOT IC/Insulation Contact rated:

- -Pull insulation away from fixture
- -Construct box with 4 side and top of sheet rock, sealed at the edges with foam, to fit over fixture. Sides of box must remain 1' away from fixture.
- -Seal insulated box to ceiling board with foam
- -Pull insulation back against insulated box.
- -Alternative is to replace the can light with an EnergyStar rated, Airtight, IC rated fixture

•Chimney's can be complicated and may represent a fire hazard if air sealed improperly. Please be cautious about providing specific DIY advice in the context of this workshop.

Air Sealing - Box Sill and Foundation

Images courtesy of EnergySmart of Vermont

- A major leak – the junction between the sill and foundation
- Seal gap by running a bead of caulk, or squirt foam around a piece of rigid insulation board

BUTTONING UP

Comments:
-A major leak in most basements is the junction between the sill and foundation. This can be easily sealed by running a bead of caulk or spray foam along this gap. Home owners can insulate the rim joist by cutting 2" foam blocks that fit loosely between the joist and spray foaming (single part) the edges for an air sealed fit.

Notes:
WEATHERIZATION:
-Display a foam gun. Mention that it is important to completely seal the gun after each use. Explain benefits of repeated usage equipment (versus individual, throw-away canisters) such as better control, replaceable canisters, less expensive per can, etc.
-Caution about using foam gun in living space – it can ruin things; proper ventilation

Is a fireplace a good way to add heat to my home?

Fact:

- Fireplaces lose more heat than they generate (in cold weather) because they suck in so much outside air for combustion
- Fireplaces can be a huge air leak when not in use; the damper is often poorly sealed
- **Recommendation:** close off a fireplace to create a tight seal during cold weather, or consider installing a closed-combustion insert to provide heat while preventing indoor air leaking up the chimney

!!!! MYTH BUSTER !!!!

Comment:
• Fireplaces can be a HUGE air leak in a house and are a net energy loss because they suck in so much outside air for combustion.

WEATHERIZATION:
"The Chimney Balloon, also know as a Chimney Pillow, is a removable & durable device that has been saving families home heat for more than 20 years. It stops airflow, odor, and debris from flowing through your chimney. This prevents chimney odor & cold drafts from entering your home, and prevents heat from escaping."
- Completely seal off inside flue with a foam plug, foamed to sides or an inflatable chimney pillow insert and capping off chimney top
- Don't use or limit use in cold season. If folks really need to use the fireplace during the cold season, make sure flue damper is tightly closed once fire is completely out.
- Install a tight-fitting glass fireplace screen on front that can be closed to limit house air from being pulled up chimney.
-Encourage people to consult with a home performance professional for their particular needs.
-Safety issues: let house guests, renters, and purchasers know that the fireplace is inoperable -- if it is blocked off!
-Might want to explain the term: closed-combustion

Back Drafts

Problem: Unbalanced forced hot air heating systems and/or insufficient "make-up" air can cause chimney or flue to "back draft" – spilling dangerous gases into the building

Tightening houses without dealing with combustion air supply can cause back draft problems

Remedies:

- Testing and maintenance by a professional air sealer to make sure drafts are adequate
- Install "sealed combustion" or "direct vented" appliances
- Install supplied air (burner boot) to non-sealed combustion appliances

HEALTH & SAFETY

Notes:
Signs of back drafting include:
- Back-puffing of the furnace -- indicated by soot or staining around the air intake
- Back-puffing of woodstoves -- indicated by visible puffs of smoke or odors of smoke
- Unusual odors from a combustion appliances
- Difficulty in starting or maintaining a fire

• Insufficient air is seldom the cause of back-drafting. More prevalent is mechanical depressurization from an imbalance in forced air distribution systems. Need to ensure that there is a sufficient source of combustion air – especially if doing air sealing.

• Installing new sealed combustion appliances or adding dedicated air boots to existing combustion appliances will relieve effects of negative house pressure on combustion air, eliminate back drafting and assure sufficient combustion air.

Insulation - Priorities

- Attic
- Walls
- Basement

BUTTONING UP

Introduction slide

Reiterate that air sealing needs to come first

Why?
* saves money and limited energy resources
* makes your house more comfortable by helping to maintain a uniform temperature throughout the house, and
* makes walls, ceilings, and floors warmer in the winter and cooler in the summer.

Insulation - How Much?

Higher R-value, greater insulating effectiveness

- Ability to resist air-flow
- Depends on thickness
- Depends on installation quality
- Recommended amount depends on
  - Location
  - Price

BUTTONING UP

INTRO: When asking for bids, make sure you are comparing/asking for the same R-value

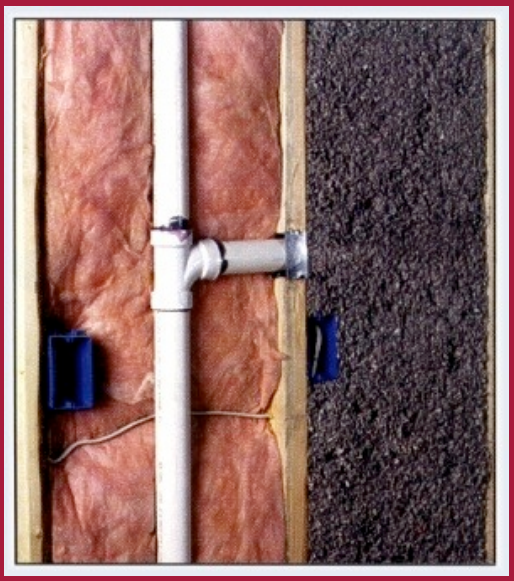
WEATHERIZATION: READ THE LABEL

No matter what kind of insulation you buy, check the information on the product label to make sure that the product is suitable for the intended application. To protect consumers, the Federal Trade Commission has very clear rules about the R-value label that must be placed on all residential insulation products, whether they are installed by professionals, or whether they are purchased at a local supply store. These labels include a clearly stated R-value and information about health, safety, and fire-hazard issues. Take time to read the label BEFORE installing the insulation. Insist that any contractor installing insulation provide the product labels from EACH package (which will also tell you how many packages were used). Many special products have been developed to give higher R-values with less thickness. On the other hand, some materials require a greater initial thickness to offset eventual settling or to ensure that you get the rated R-value under a range of temperature conditions.

http://www.ornl.gov/sci/roofs+walls/insulation/ins_02.html

Insulation - Types

- Spray foam
- Cellulose
- Fiberglass (batt and blown in forms)
- Rigid foam Board



BUTTONING UP

Fiberglass on left, cellulose on right

Insulation - Which Type is Best?

- How much insulation is needed
- Accessibility of the insulation location
- Space available for the insulation
- Local availability and price of insulation
- Other considerations unique to each purchaser

Images courtesy of Vermont Dept. of Children and Families

BUTTONING UP

From: Building Envelope Research, Oak Ridge National Laboratory, January 2008

http://www.ornl.gov/sci/roofs+walls/insulation/ins_02.html

Asbestos and Vermiculite

Some Vermiculate insulation has asbestos in it. If you have vermiculite, a professional should install any additional insulation.

Health effects: Asbestos is a known carcinogenic

Remedies:

- Wear respirator when near material
- Don't try to remove or deal with it yourself
- Can sometimes be covered with a rugged protective coating and left in place
- Often must be removed or remediated by trained and certified professionals

HEALTH & SAFETY

Note:

- Main message: if you find it in your house, don't touch it! Call in a professional to deal with it.
- Refer to sample of vermiculite so that people can see what it looks like.
- What does vermiculite look like: Vermiculite usually looks like small gray flaky chunks - less than 1" in diameter - was used as loose fill insulation in old houses. Some vermiculite might have asbestos in it - others might not - so sampling is difficult. Needs to be done in a manner sufficient to sample entire contents of attic. Treat it as hazardous, asbestos containing material and contact a licensed abatement consultants and contractors – get list at USEPA http://www.epa/asbestos/
- http://www.epa.gov/asbestos/pubs/insulation.html
- Same for asbestos pipe wrap commonly found on old steam distribution pipes - white tape surrounding asbestos insulation.

Moisture

Can become a problem after insulating and air sealing if moisture sources are not taken care of

Health effect: mold, mildew, and other biological growth can cause health problems

Building damage: damage to windows, walls, floors, and roof systems

Remedies: Important to remove moisture sources before or during air sealing. vapor barriers on floors, vent dryers to outside, install exhaust fans to the exterior, prevent water entrance, dehumidify with Energy Star appliance and keep warm moist indoor air from leaking into attics

HEALTH & SAFETY

Notes:

- Moisture is very important issue! Excessive moisture can lead to lots of problems. Control moisture at the source
- Place vapor barrier on earth floors in basements and crawl spaces – 6 mil poly sheets
- Vent dryers to the outside
- Install exhaust fans or Energy Recovery Ventilator
- Prevent water from entering the building or manage it when it does enter
- Seal indoor air from leaking into attics

Home Energy Audit & Improvements

- Whole-house diagnosis: detailed inspection of the building envelope, combustion efficiency and safety, and other tests as needed
- Written assessment of findings and priority list of improvements; some with costs for renovations
- Access to discounted financing
- **A comprehensive improvement project** involves air sealing, insulation, heating system improvements and tune-ups, moisture control, and ventilation

RESOURCES

Home energy audits and improvements – also referred to as Home Performance Services -- take a whole house, systems approach to improving home comfort, durability, health and safety and to reduce your energy costs

• Auditors follow a series of protocols

• Cost of an audit: MassSave Home Performance with Energy Star Audits are free because they are paid for by the Energy Conservation charge on customers utility bills. The blower door tests are included in the air sealing work if spec'd for the customer's house.udits are free. Point out that there is a cost for a home energy audit from a private company– usually $300 - $800 – but these costs are often repaid in the first year alone from energy saving improvements.

• Home energy audits do the following:

-assess amount and source of air leakage

- verify "building Tightness Limit" and adequate fresh air.

-identify areas of heat loss.

-measure efficiency and back drafting of combustion equipment

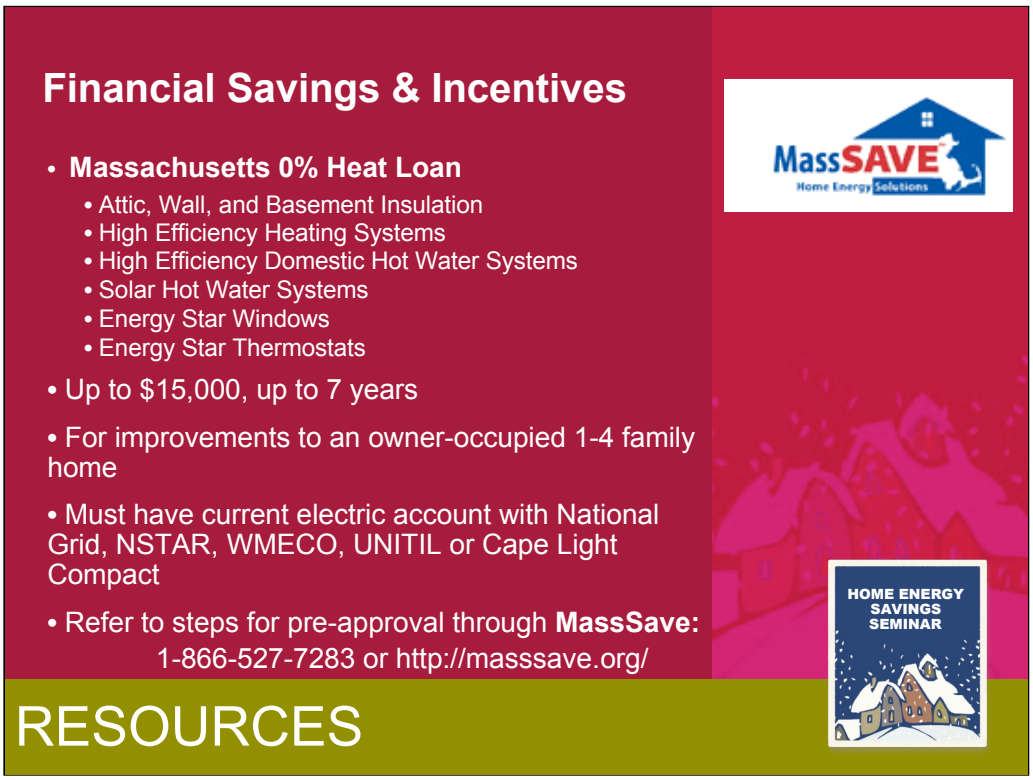
-identify presence and amount of carbon monoxide and gas leaks.

Financial Savings & Incentives

- **Efficiency saves money:** retrofits cost money up-front but provide long-term savings
- **Tax Incentives Initiatives Project:** 2009 Federal tax credit is available for many improvements, including air sealing and heating systems. 10% of qualified work, up to $500. To help navigate these: **http://www.energytaxincentives.org/consumers/**
- **MassSave** for links to incentives including for insulation and air sealing (75% up to $2,000 for eligible projects) http://masssave.org/

RESOURCES

Very important to go to MassSave website and put in your zipcode and what you heat with to get a list of all the programs available to you. Amounts and access points vary by heating and electric company across state.



The companies that are participating can change over time if they use up their funding.

Participating utilities:

- Bay State Gas,
- Nstar Gas
- National Grid
- Berkshire Gas
- Unitil
- New England Gas Company
- Northern Utilities Natural Gas

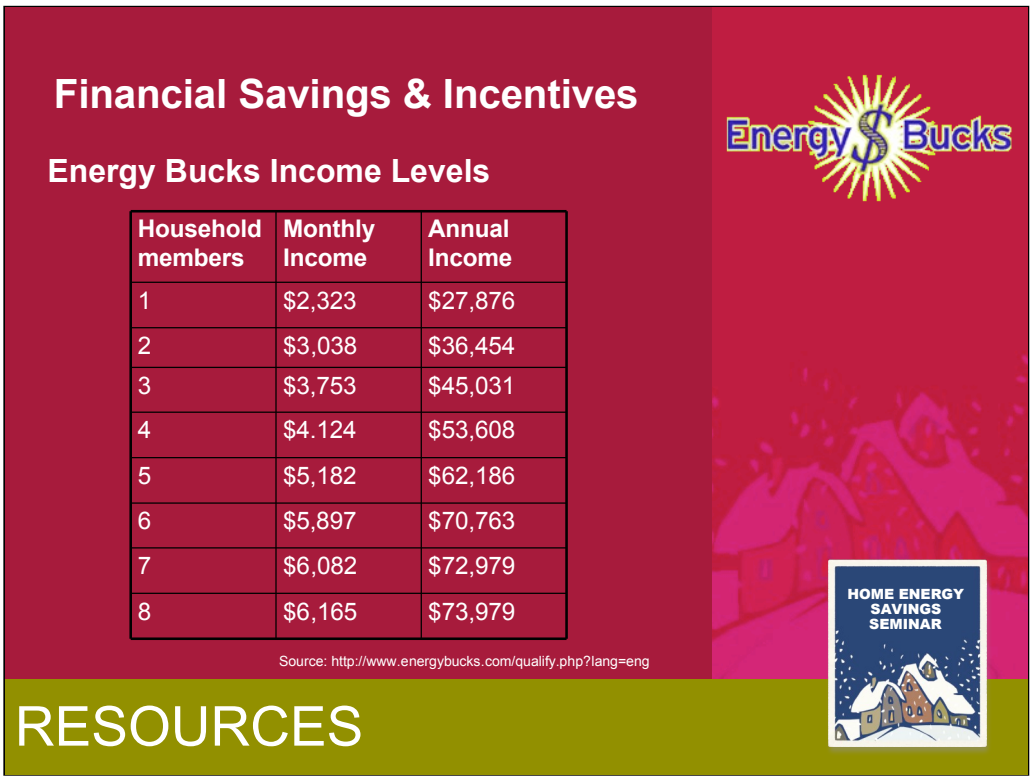
Financial Savings & Incentives-
Heat with oil or propane

Electric Utility rebates service from participating electric utilities - Apply through MassSAVE

- **High-Efficiency Heating Systems:** Up to **$500** rebate
- **Indirect Water Heater**: Up to **$300** rebate
- **Energy Star Windows**: **$10** per window, up to **$500**
- **Energy Star Thermostat**: **$25** per thermostat, up to **$50** (until April 30, 2009)

RESOURCES

- As of April 1st all the major Electric companies are participating: National Grid, NSTAR, WEMCO, Cape Light Compact. This can change over time if any of them use up their funding.
- High-Efficiency Oil or Propane Heating System
  * New furnace or boiler can reduce your heating fuel usage
  * Up to $500 in rebates for high efficiency oil or propane heating system
- High-Efficiency Oil or Propane Indirect Water Heater
  * Saves energy by allowing the boiler to cycle less frequently
  * Qualified installations are eligible for a $300 rebate
- Responsive Controls for Oil or Propane Forced Hot Water Heating Systems
  * Also known as a boiler reset or boiler water temperature control
  * Adjusts your heating system water temperature in relation to the outdoor temperature
  * Helps your home maintain a constant temperature for better comfort
  * 10-20% reduction in heating fuel usage
  * Less wear and tear on your boiler
  * $100 rebate per weather responsive heating system control



You *may* be eligible if your family's income level is at or below these numbers.

Source: Energy Bucks website: http://www.energybucks.com/qualify.php?lang=eng

In some cases will replace refrigerators, lights

CAP is an abbreviation of Community Action Program. There are a total of 24 CAPs in Massachusetts. They are community based, non-profit agencies that seek to help low-income residents improve themselves economically. In any given year, the CAPs provide support and services to close to 450,000 individuals in the Commonwealth and 225,000 families of the poor and working poor.

Multi-Unit buildings

- Multi-family facility
- Condominium
- Facility consisting of five or greater dwelling units.

- Provides services to the entire complex in coordination with the owner, property manager, or condominium association.

- Facility may qualify for a free energy analysis, lighting system upgrades or other electric efficiency measures. If the facility is electrically heated, your facility may qualify for insulation and air sealing.

- National Grid & Cape Light call 1-800-889-0096
- NSTAR call 1-866-757-2059

National Grid, NSTAR, Cape Light Compact

RESOURCES

EnergyWise - National Grid
Multi-Family Assessment Program - NSTAR

Installation of some energy efficiency measures requires a customer co-payment

Important Information:

- **You can save money** by using energy more efficiently and conserving wherever possible
- **Finding and sealing air leaks** are typically the most cost-effective energy saving measure
- **Moisture, chemicals, and combustion gases** can create health problems – source control and proper ventilation is key
- **There are technical and financial resources** available to help

SUMMARY

When You Get Home… Priorities

- Review your personal habits (free)
- Install low-cost weatherization measures
- Call MassSAVE for an energy audit or call a private company, or your local CAP agency
- Arrange for more sophisticated sealing and insulating
- Assess your building technologies (furnace, boiler, water heater, appliances)
- Consider renewable energies (PV, etc.)

TO DO LIST

Refer them to the handout we provided on things to do in their home, resources are listed on the back page of it.

The Massachusetts Municipal Association thanks the following for their help in this presentation:

- Much of the content of this presentation is from the "Button Up Vermont" program created by the Central Vermont Community Action Council with funding from the Vermont Agency of Human Services
- Marc Breslow, Executive Office of Environmental Affairs Director of Transportation and Buildings Policy, contributed important content and provided critical feedback
- Un-credited photos are courtesy of Marc Breslow and Anja Kollmus
- These Massachusetts Municipal Association seminars are provided with support from Neptune LNG LLC, a subsidiary of GDF SUEZ Gas North America.

!!! THANK YOU !!!

Notes:
- Ask people to fill out the evaluation
- Direct folks to the "information table"
- Thank them for coming
- Thank workshop host and any public officials or organization again