

# NHSAVES Fall 2020 Button Up



EVERSOURCE



## How to Improve the Energy Efficiency of Your Home

# NHSAVES Button Up Overview

- Energy Use and Savings Tips
- Insulation and Air Sealing A-B-Cs
- What to Do?
- NHSAVES Programs



**What is the  
“greenest”  
energy?**





***Energy that you  
don't use!***

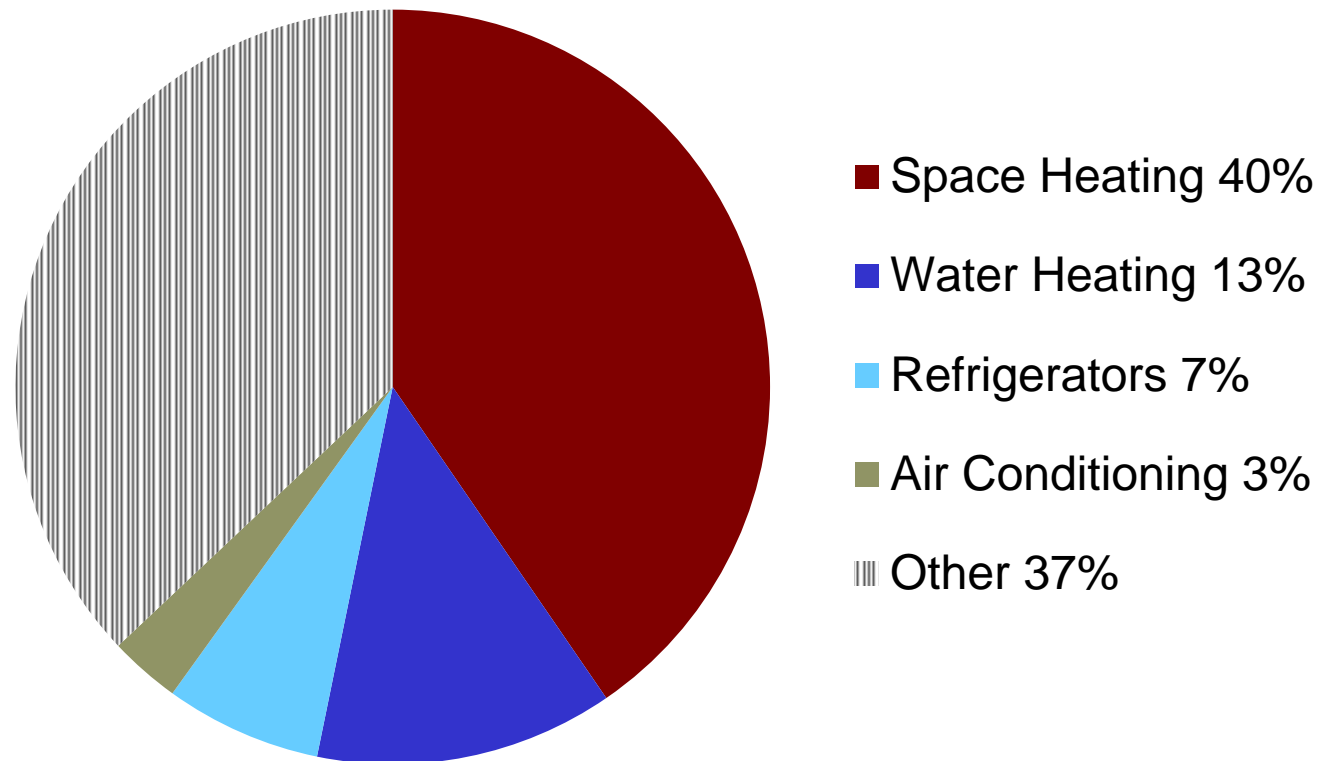




# We Spend a Lot on Energy!

NH spends over \$5 billion per year on energy

New Hampshire Residential Energy Costs per Household, ~\$3,100, 2017



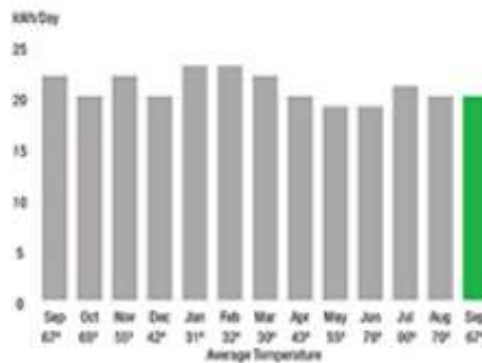
Current NH energy fuel prices: [www.nh.gov/osi/energy/](http://www.nh.gov/osi/energy/)



# Get to Know Your Energy Bills

## Know how much electricity you are using And what is using it

### Electric Usage History - Kilowatt Hours (kWh)

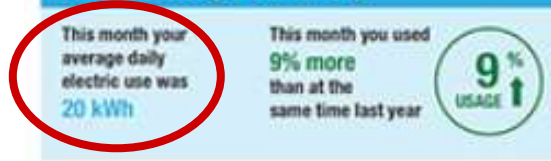


### Current Charges for Electricity



Bill source:  
Eversource

### Electric Usage Summary



**Average NH Usage:**  
*(residential bill -- varies widely)*

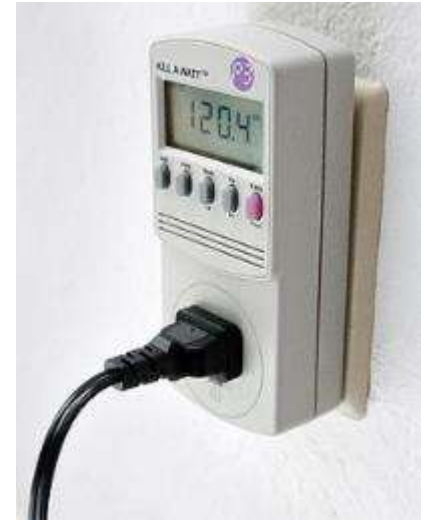
Daily:	~20 kilowatt-hours (kWh)
Monthly:	600 kWh
Annually:	7,200 kWh



# Measuring Electricity Use

**How much electricity do individual appliances use?**

- **Use a watt meter**
  - Available from NH public libraries
  - Measures watts, time, and kilowatt-hours with appliance on or off



# Electricity Usage Calculations

**Watts x Hours = Watt-Hours**  
**1,000 Watt-Hours = 1 Kilowatt-Hour (kWh)**

## Example-



**TV set:** 300 watts when on

Average use per day: 3 hours

Per day:  $300 * 3 \text{ hours} = 900 \text{ watt-hours}$

Per year:  $900 * 365 \text{ days} = 328,500 \text{ watt-}$

hours

Convert watt-hours to kilowatt-hours;

$328,500 / 1,000 = 328.5 \text{ kWh per year}$

~\$55 in electricity (@ ~17¢ per Kilowatt-Hour)







# Major Household Electricity Uses

Residential Electricity Use	Approximate Annual Kilowatt-hours	Potential for saving energy
Lighting	1,200	***
<i>Electric Water Heater</i>	<i>2,100</i>	***
Refrigerators & Freezers	1,050	***
Dehumidifiers	900	***
<i>Electric Clothes Dryer</i>	<i>800</i>	**
Entertainment Centers	650	*
Furnace Fans & Boiler Pumps	400	*
Dishwasher & Clothes Washer	350	**
Cooking	300	*



*Electricity consumption varies widely from household to household.  
Energy savings come from efficiency and/or conservation.*

# Whole House Electricity Monitors

- **Provides:**
  - Current electrical use
  - Total consumption by day, week, etc.
- **May also provide**
  - Usage by circuit
  - Individual device use
- **Brands:**
  - Sense, Smappie, Engage, TED, Vue Smart, etc.
  - \$100 - \$300



# Energy Saving Tip: Conservation!

Shut things off  
when not in use



# Find and Control Energy Drips

Energy “drips” use power when the device is off



- **These phantom loads include:**
  - Plug in chargers
  - Anything with a clock
  - Anything with a remote
  - Anything with a light
  - DVRs and set-top boxes

# Phantom Loads- Some Examples

## POWER DRAINS



**LG washing machine**  
7W ■ On but not running  
4W ■ Off



**Apple TV, first generation**  
21W ■ On  
17W ■ Off



**Samsung cable box**  
28W ■ On and recording  
26W ■ Off and not recording



**Apple MacBook, plugged in**  
48W ■ Open, charging  
48W ■ Closed, charging  
27W ■ Open, fully charged

By The New York Times

A good solution – **smart** power strip:

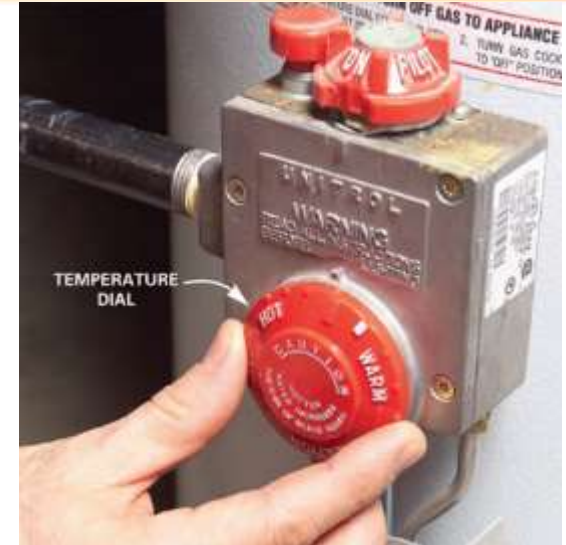


*Available  
from the  
NH Saves  
Catalog*



# Other Energy Conservation Tips

- Turn down hot water heater temperature to 120° at tap
- Set dehumidifiers appropriately
  - Target +/-60% max humidity
- Wash clothes in cold water
- Line dry clothes *outside*, if possible



*Solar clothes dryer*



# Lighting Efficiency

## The LED Lighting Revolution!

- Any existing 60+ watt light bulbs?
  - *Easy \$\$ savings per year with LED bulbs*
- Lots of opportunities
  - Screw-in light bulbs
  - Outdoor lighting
  - Holidays lights
  - Can lights and linear lighting
- Look for:
  - Light color (2700° K = “warm white” is what most people like)
  - Dimming and dimmer capability
  - “Suitable for enclosed fixtures”
  - “Suitable for damp locations”



# Other Energy Efficiency Tips

## Saving electricity and other fuels

- Low-flow showerheads and faucet aerators
- Hot water and heating pipe insulation: R-3+
- Smart plugs, hubs and switches
- Use ENERGY STAR labeled appliances and electronics





# NHSAVES Rebates on ENERGY STAR Appliances

## Rebates include:

Electric Clothes Dryers \$40 - \$200

Clothes Washers \$25 - \$50

LED light bulbs instant rebates

Refrigerators \$40 - \$75

Room Air Conditioners \$20

Also pool pumps, room air purifiers & dehumidifiers



And free haul-away + \$30 for recycling an **OLD refrigerator or freezer**

[www.energystar.gov](http://www.energystar.gov) lists appliance efficiency

[NHSAVES.com/nh-rebates](http://NHSAVES.com/nh-rebates) for appliance rebate forms & updates



# Staying Warm in Your Home

**Fact:** We have to heat our homes to live in New Hampshire and stay warm

**Goal:** Use less energy to heat our homes **and still stay warm and comfortable**  
*(not just turn down thermostat!)*



# Heating Energy Saving Tips

## No or low cost options to use less heat:

- Turn down heat when you're not in a room or in the house
- Use programmable or smart thermostats
- Remove window A/C units in winter
- Latch closed windows



# Staying Warm in Your Home: Building Science and Energy Efficiency

## 1. Heat always moves from Hot to Cold.

- **Fact:** The heat inside our homes is always making it's way through the building shell and heating the outdoors.
- **Goal:** Slow this process down

## 1. Heat moves via three methods:

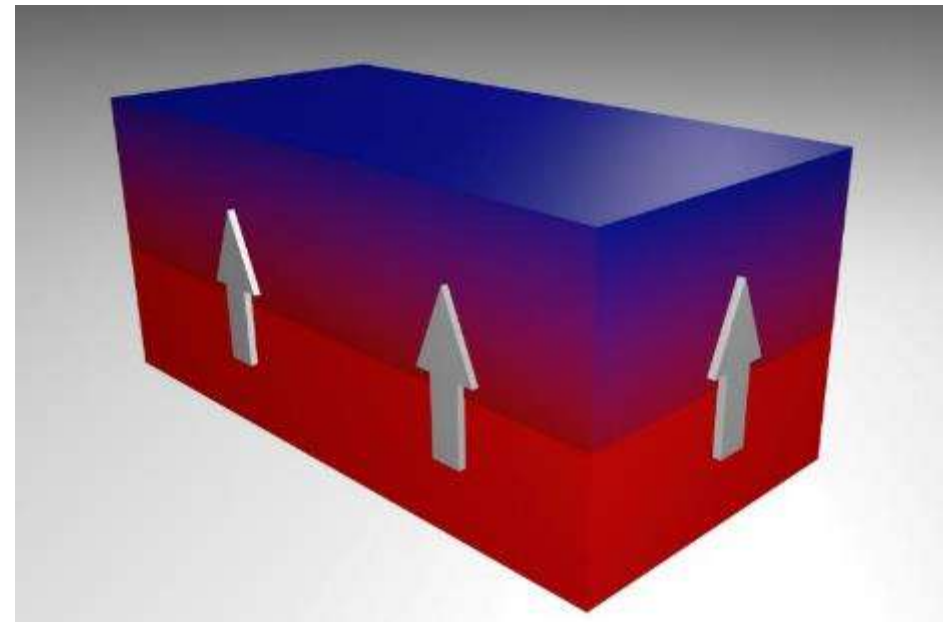
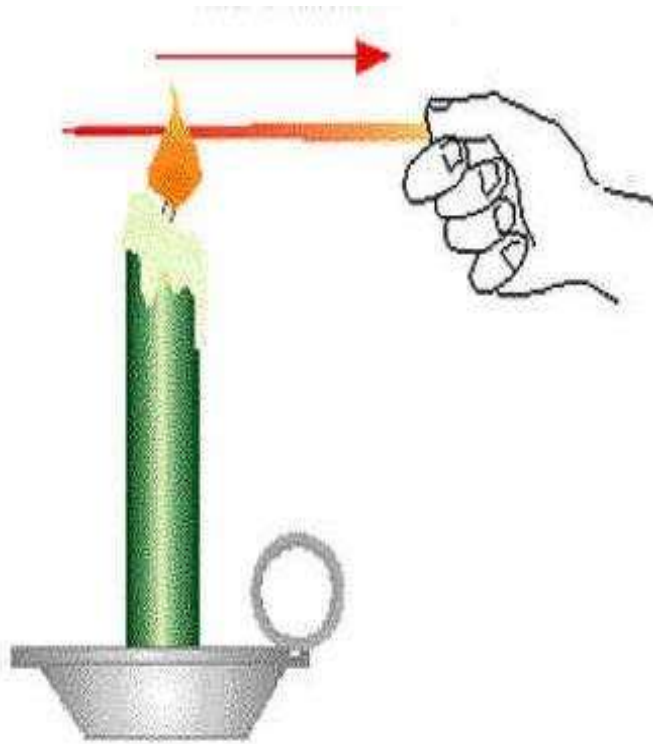
- Conduction
- Convection
- Radiation



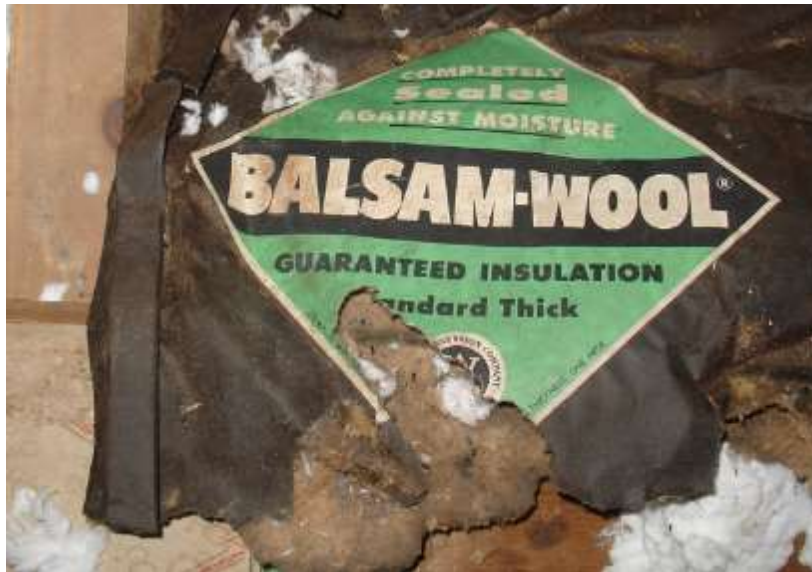
## Conduction

The movement of heat through materials

**Insulation** is a poor thermal conductor: GOOD!



Lots of materials can be insulating...



# Insulation & Building Materials R-Values

R-Values The higher the R-value the better the insulation

Approximate R-values: *(per inch, if installed properly)*

- Fiberglass R-3.7
- Cellulose R-3.6
- Rigid foam board R-4 - R-7
- Spray foam R-6 - R-7
- Double pane window R-3 (new windows)
- Softwood R-1.3
- 8" concrete wall R-1 (for 8"!)

*Functional R-values may be affected more by install quality than the material used.*



# Installed Insulation R-Values

A new house built to the new 2015 NH Energy Code:

Attic R-38 to R-49

Walls R-20

[www.puc.nh.gov](http://www.puc.nh.gov)

Basement walls R-15 to R-19

Doors and windows R-3.1 ( $U \leq 0.32$ )

Average NH House functional R-Values:

Attic R-10 to R-30 (some are R1!)

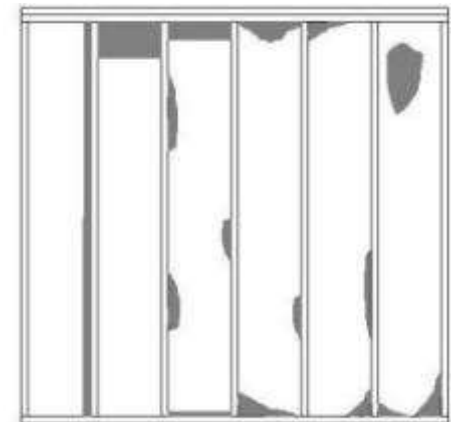
Walls R-3 to R-16

Basement walls R-1 to R-5

**Quiz:**

What is the average R-value of an attic with R-38 insulation covering 95% of the area?

*Hint: It's less than R-30...*





## Insulating Thermal Barriers May Be...

**Insufficient (not enough R value)**

**Incomplete (no R value in spots)**

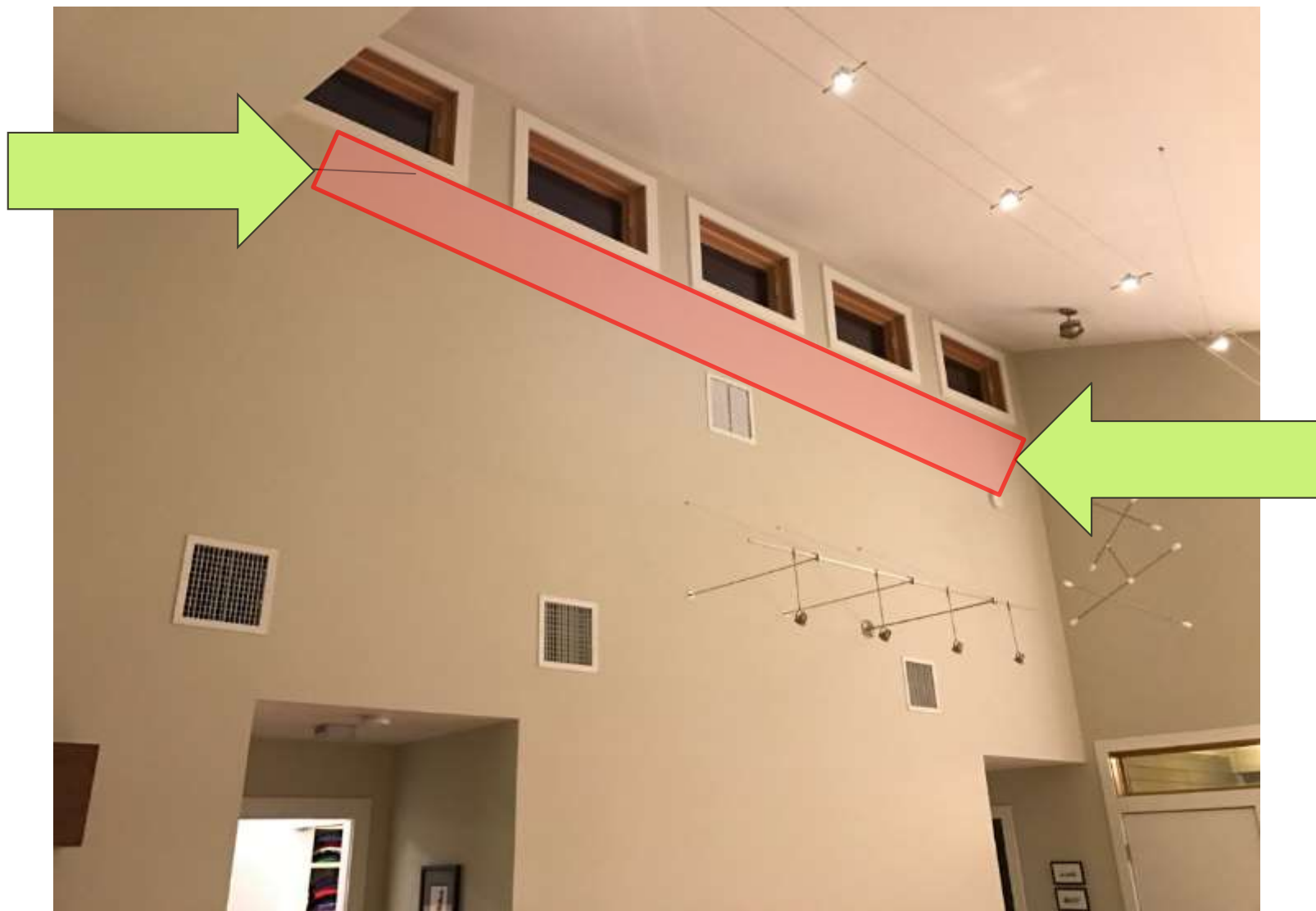
**Misaligned (R value there, but not working)**



Insufficient (not enough R value)



Incomplete (missing R value in spots)



Any Problems?





# Misaligned Insulation (R value not doing anything)



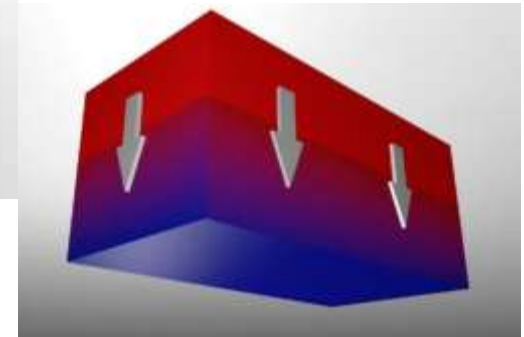
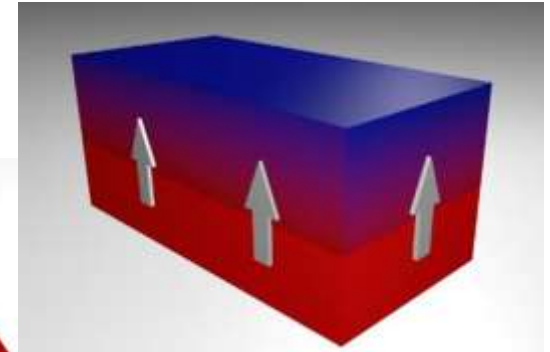
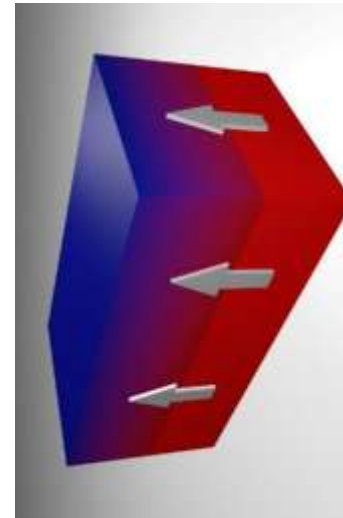
# “Heat Rises:” True or False?

Answer: FALSE!

*Heat conduction can move in any direction*

But... Warm AIR will rise (making it look like heat is rising)

Heat actually moves from hot to cold





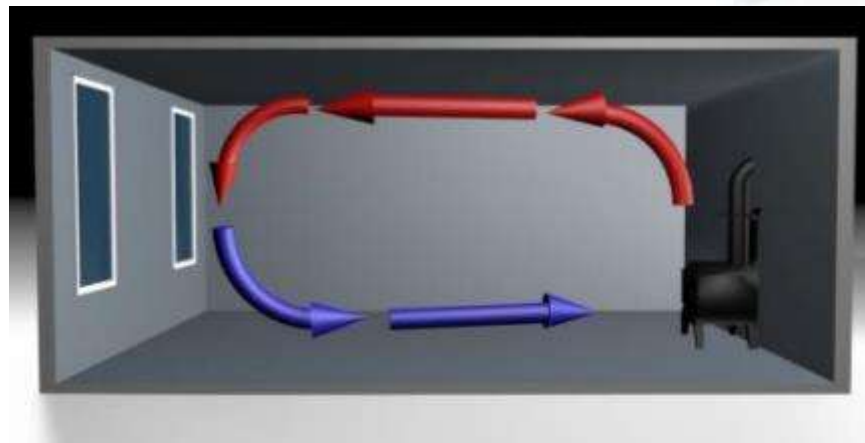
# Convection Causes Air Leakage

Warm air is more buoyant – rises and leaks out the top of a building

Cold air leaks in down low

Convective air currents  
= “Stack Effect”

Stronger when colder outside



# Biggest Air Leakage Areas: “A - B – C”



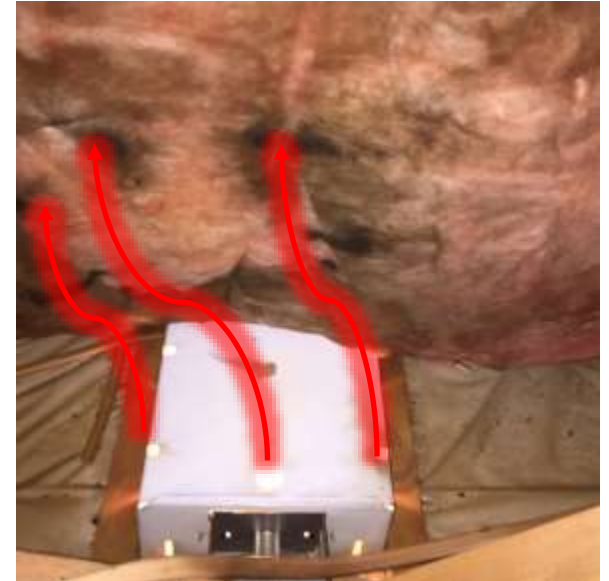
- **A – Attic** (top of the building)
- **B – Basement** (bottom of the building)
- **C – Center** of the building



# ■ ■ ■ ■ ■ A – Lots of Air Leaks in the Attic

## Common air leaks at the top of a building:

- Attic hatches and pull-down stairs
- Chimney chases
- Pipe and electrical penetrations
- Recessed ceiling lights
- Bath fans
- Electrical boxes in the ceiling



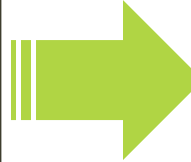
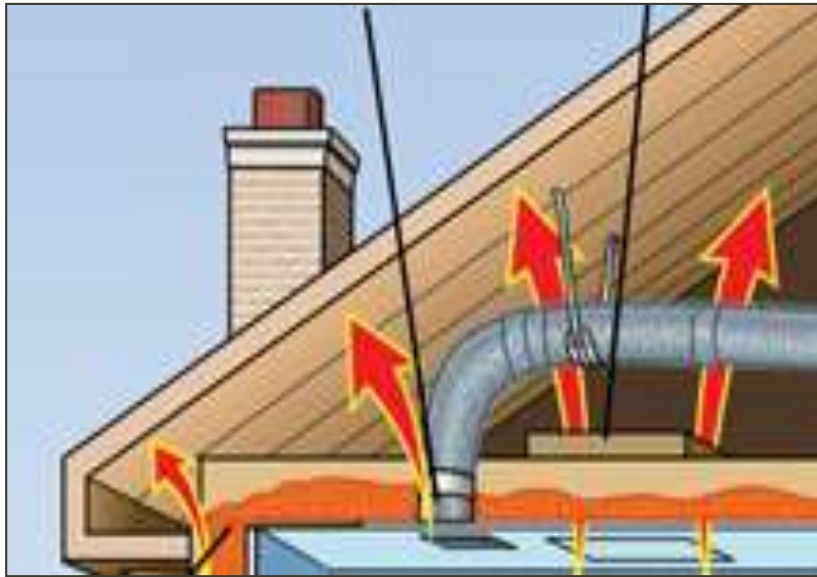
■■■■■ This Attic Hatch w- 16" Fiberglass: Good?



*Hint: filter...*

# Moisture in Attics and Air Leakage

Attic air leaks can lead to condensation, mold and rot



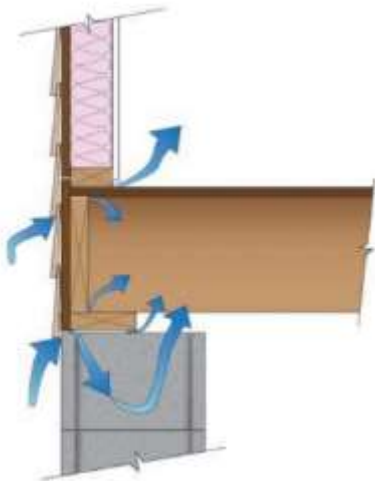
Warm, moist air leaks into the attic where it hits cold surfaces and condenses.

NOT a leaky roof.  
An (air) leaky ceiling!

# B - Basement Air Leakage & Air Sealing

## Air Sealing Opportunities in Basements and Crawl Spaces

- Exterior doors
- Electrical, plumbing and other penetrations
- Box sill (rim joist) area
- Around old basement windows





## C – Center of the House Air Leakage

### More visible, but fewer air sealing opportunities

- Cracks around exterior doors
  - “Q-Ion” door kit weatherstripping
  - Bottom of door sweeps
- Fireplace flues can be huge leakers
- Old pulley-hung windows
- Most windows don't leak much air



# ■ ■ ■ ■ ■ Air Sealing and Fresh Air

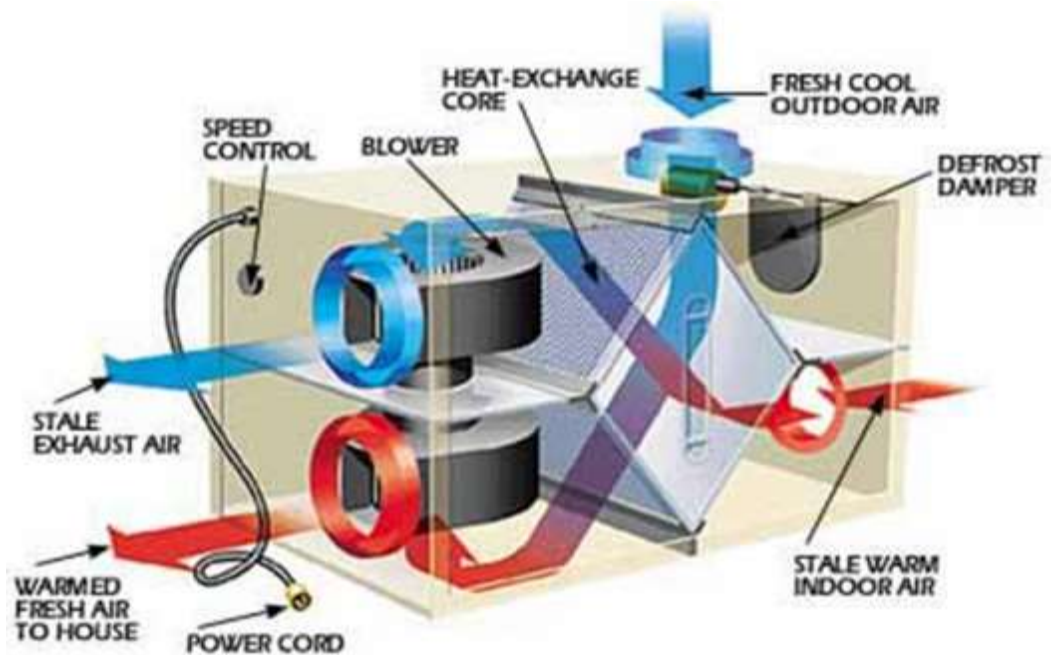
## Fresh Air is needed for a healthy home

- For a typical home, about 1/3 of the home's air should be exchanged every hour
- Many NH homes are 2 – 4 times too leaky!
  - Leaky homes are “nosebleed dry” in winter





# “Seal Tight and Ventilate Right” Mechanical Ventilation



Control air leakage, and...

Provide measured fresh air & stale air exhaust

As simple as a high quality bathroom fan

Or a heat recovery ventilator (HRV)

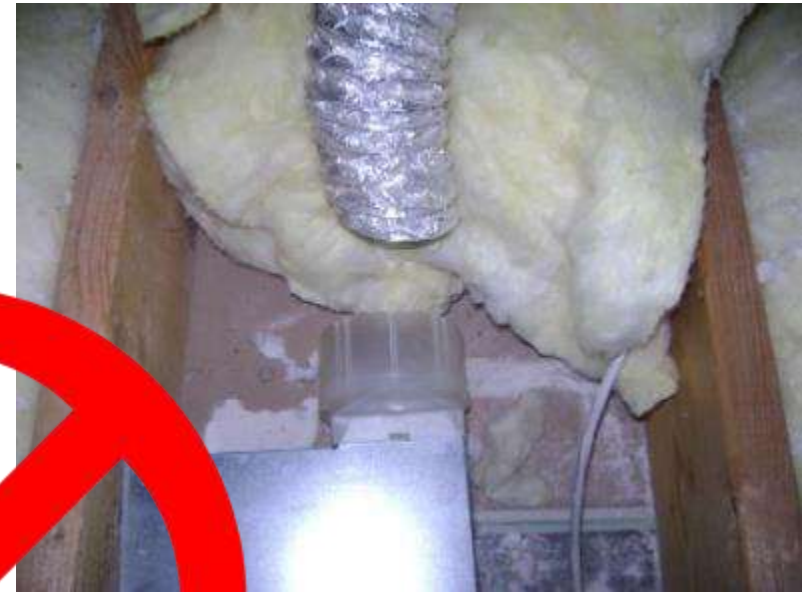
With controllability

High and low air flow settings

Timers, occupancy sensors, CO<sub>2</sub> sensors, etc.



# ■ ■ ■ ■ ■ Bath Fan Venting



Vent fans to Outside  
with insulated rigid  
vent pipe

*NOT into attic!*



**ADVANCED**





# Guess What This Is?



■ ■ ■ ■ ■ ■ Bathroom Vent House in Attic



## ***Sources of Indoor Moisture***

- **Eliminate, Isolate or Control:**
  - Wet basements and crawl spaces
  - Dirt basements and crawl spaces
  - Bath fans venting into attics
  - Bathrooms without bath fans
  - Disconnected clothes dryer vents



*Other indoor moisture sources:* Plants, humans, pets, open sump pits, cooking, leaky pipes, new construction materials, open basement windows in summer



## Indoor Air Pollution

Eliminate, Isolate or Control:

- ✓ Tobacco smoke
- ✓ Cooking odors
- ✓ Paints
- ✓ Solvents
- ✓ Fuel & engines
- ✓ Cleaning products
- ✓ New carpet / pads
- ✓ New furniture
- ✓ Dust
- ✓ Asbestos insulation



Quiz



What is the biggest factor causing ice dams on this house?



■ ■ ■ ■ ■ ■ ■ ■ ■ ■ The Solution?



# Remember “ABC”-- Attic, Basement, Center -- for Insulation and Air Sealing

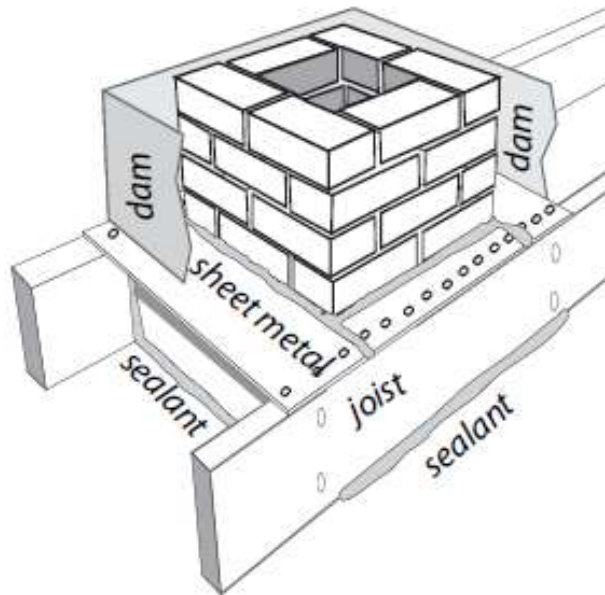


If using blown insulation, cover attic with 12” – 16”  
***AFTER*** air sealing!

Photo: blown-in cellulose attic insulation



# ■ ■ ■ ■ ■ A: Attic Air Sealing





# Attic insulation and hatches





# Cape / Kneewalls Air Sealing & Insulation







# Basements- Thermax or Spray Foam



*Fix basement water issues first*

*Uncovered foam needs a fire barrier.  
Professional installation advised.*



# ■ ■ ■ ■ ■ ■ C: Air Sealing in Center of House



“Chimney Balloon”



# Framed Wall Insulation- best after attic and basement are improved

Densepack cellulose air seals & insulates empty cavities



*During installation, densepack tube is inserted into each cavity.*

*Professional installation recommended.*



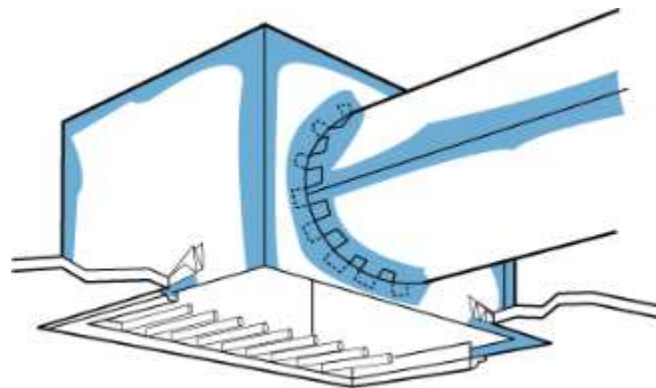
Image courtesy of Vermont Dept. of Children & Families



# Seal Leaky Attic and Basement Ducts

## Mastic!

- Goop on to seal ducts
- Reinforce with drywall joint tape
- NOT duct tape!
- Then insulate ducts completely



# Window Options

## What about windows?

There are many reasons to replace windows...

...*Cost-effective* energy savings is rarely one of them

New windows ~R-3 – R-4

Old windows, with leaky sashes, can be replaced, *or...*

*Other options* include adding storm windows, indoor storms, cellular shades, or window quilts







Are you feeling overwhelmed?





# Priorities-1: The \$100 DIY Package

*~50% return on investment*

- LED light bulbs
- Low-flow showerheads and faucet aerators
- Simple DIY air sealing in Attic and Basement
- Smart power strips





## Priorities-2: The \$1,000 Package

~20% ROI

*All the items in the \$100 package, plus:*

- **Strategic air sealing**
  - A-B-C Attic and basement priorities
- **Smart thermostat(s)**
- **Pipe insulation** where needed
- **Duct sealing** with mastic, and added duct insulation
- **Window treatments** – cellular insulating shades, etc.
- Home Performance with ENERGY STAR \$100 energy assessment, if qualified





## Priorities-3: The \$10,000 Package

~10% ROI



*All of the items on the \$1,000 package, plus:*

- Full energy **assessment** with prioritized recommendations
  - TREAT, REM-Rate or Home Energy Score energy modeling if considering options
- Blower-door guided **air sealing** throughout the house
- Upgrades to attic, basement and wall **insulation**
- New **bath vent fan** and improved exhaust vent ducting
- Strategic **appliance, heating, cooling** and domestic **hot water** improvements





# Home Performance Professionals (Energy Auditors and Contractors)

## Comprehensive, whole-house energy assessment

- Building envelope inspection & tests
- Combustion equipment efficiency & safety tests
- Written report with prioritized list of cost-effective improvements



# Finding Qualified Energy Professionals

- Look for -
  - Certifications: BPI Building Analyst or RESNET Energy Rater
  - Tools of the trade: blower door, infrared camera, combustion analyzer, etc.
  - Experience, references, written energy assessment / proposal
- Qualified contractor lists
  - REPA - NH Residential Energy Performance Association vetted full member profiles  
[www.repa-nh.org](http://www.repa-nh.org)
  - NHTSaves qualified residential contractors





# Tools of the Trade: Blower Door

## Blower Door

- Measures *amount* of air leakage: CFM<sub>50</sub>
- Identifies *sources* of air leakage
- Determines air ventilation rates
- Prioritizes air sealing opportunities
- Confirms amount of air sealing accomplished

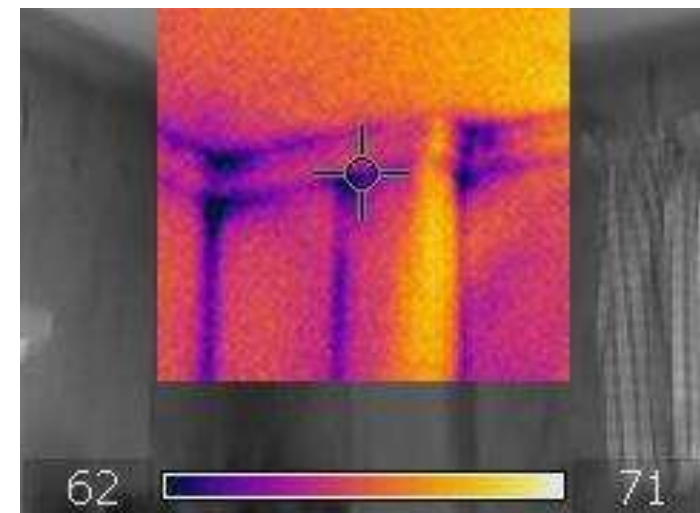
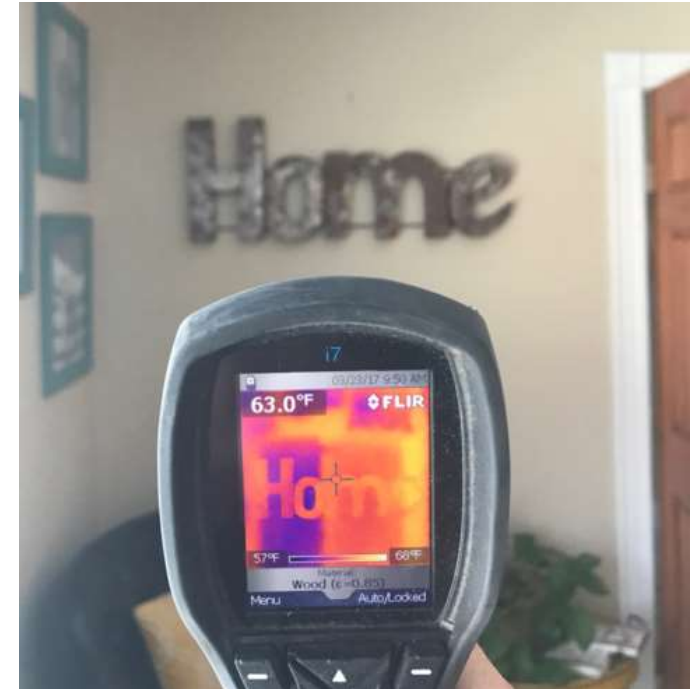
*Blower door tests now Energy Code-required*



# Tools of the Trade: Thermal Camera

## Infrared Thermal Camera

- Visual images of hot and cold areas
- Helps sleuth insulation issues
- Used with a blower door to show air leakage pathways





# Combustion Safety and Carbon Monoxide

Back-drafting flue gases into a home can poison occupants



*Seek combustion safety assistance from a home performance professional.*

*Make sure CO detectors are installed and functional.*





# Heating System Recommendations



Test & Clean



Replace filters



- Test & clean regularly
- Seal and insulate ducts
- Replace furnace filters regularly
- Consider a more energy efficient replacement



# Energy Audit Examples



Beautiful, large, expensive... but a *huge energy hog*, with a *massive ice dam problem!*



Recessed can lights in attic



What is different about this house?



Shelf lighting was the culprit!



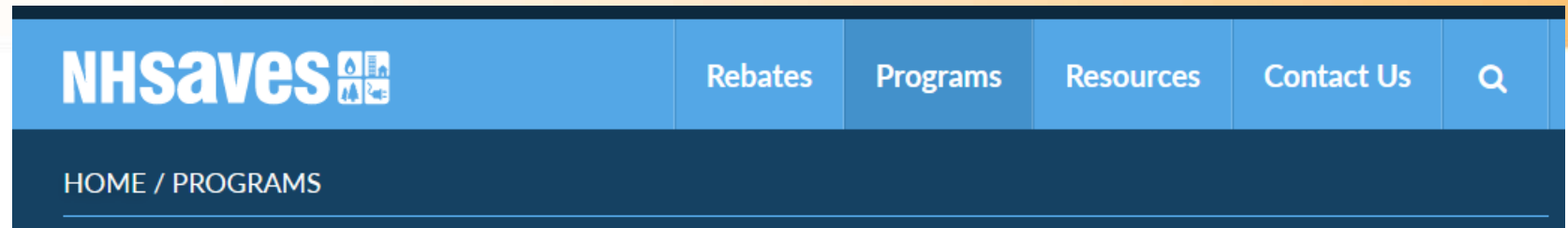
More attic ventilation?







# NHSaves Programs and Incentives



- Lighting and ENERGY STAR appliance rebates
- Heating, cooling and water heating systems
- ENERGY STAR new homes
- Net Zero home competition
- Home Energy Assistance
- Financing
  
- **Energy audits and weatherization**
  - Home Performance with ENERGY STAR

[nhsaves.com](https://nhsaves.com)



# Heating, Cooling & Hot Water Incentives

## NHSaves rebates for *efficient* systems

- Mini-split cold climate heat pumps as well as a/c only
- Natural gas boilers, furnaces & hot water
- WiFi smart thermostats (w-heat pumps & natural gas)
- Heat pump electric hot water heaters

Go to [NHSAVES.com](https://www.nhsaves.com) for specific incentives

- Utility-specific
- Financing
- Funding availability



# High Efficiency Heat Pumps

## Ductless Cold Climate Heat Pumps for A/C & Heat

- “Mini splits” heat and cool air
- “Cold climate” models
  - Can extract heat from  $-20^{\circ}$  air!

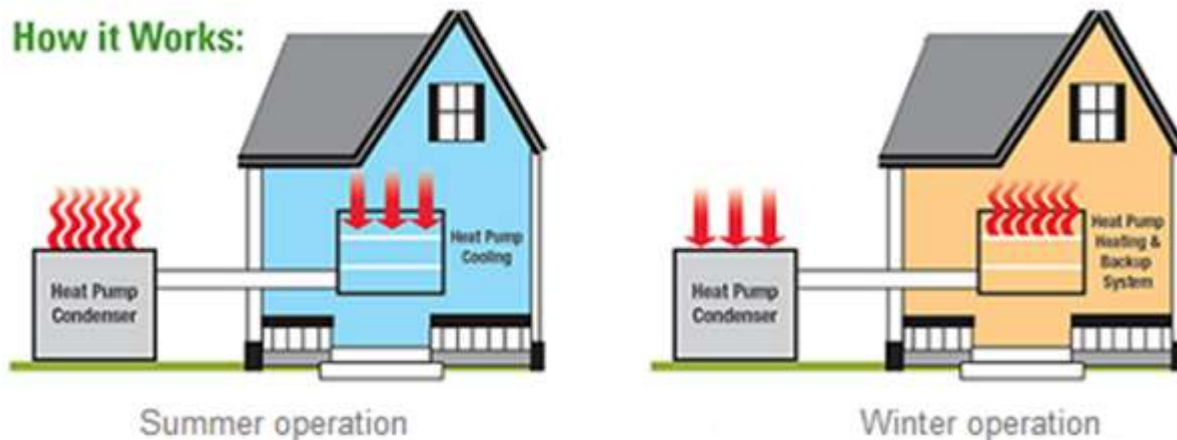


## Heat Pump Hot Water Heaters

- More efficient than regular electric water heaters

How Heat Pumps Work

How it Works:





# Energy Efficient NEW Construction



## NHSaves ENERGY STAR Certified NEW Homes

- Incentives for builders
- Verified by a HERS Rater
- Energy savings, more comfortable and higher resale value
- “Drive to Net Zero Competition” for home builders
  - Net zero homes = no net usage of energy
  - “Reduce then produce”
    - typically with solar PV
  - Cash prizes for builders



# Net Zero Homes: The Future



Solar PV on the roof, heat pump heating, cooling and hot water, super insulated and excellent air quality

Picture: Vermod



# NHSaves Existing Homes- Home Performance with ENERGY STAR

[NHSaves.com/programs/energy-audits-weatherization](https://NHSaves.com/programs/energy-audits-weatherization)

- Qualify with online “Home Heating Index” calculator
- Provides home energy audit for \$100
  - Credited towards improvement work -- **net cost: \$0**
- Pays for *50%\** of eligible energy improvements up to *\$8,000 (2021)*      *\*Utility cost-share may increase in 2021*
- Low or no interest financing may be available



EVERSOURCE

 Liberty Utilities

 NEW HAMPSHIRE  
Electric Co-op  
A Testamc Energy Cooperative

 Unitil



HOME / PROGRAMS / ENERGY AUDITS & WEATHERIZATION

## ENERGY AUDITS & WEATHERIZATION



Save money and energy with Home Performance with ENERGY STAR®!

Home Performance with ENERGY STAR® is a comprehensive, whole house approach to improving energy efficiency and comfort at home, while reducing your energy costs and helping the environment. Installing energy efficient upgrades can save you up to 20% or more on your annual energy costs.

[TEST YOUR HOME](#)



EVERSOURCE

Liberty Utilities

NEW HAMPSHIRE  
Electric Co-op  
A Southern Energy Company

Unitil



# NHSaves- Home Heating Index Calculator

NHSaves

[Back to NHSaves.com](#)

## CHECK YOUR ELIGIBILITY

### STEP 1 | Basic Information

Electric Utility

Eversource

Zip Code

03246

Conditioned Square Footage

2000

[How do I calculate Conditioned Square Footage?](#)

### STEP 2 | Annual Heating Fuel Usage

Only the amount of fuel used to heat your home for the last 12 months

Electricity (kWh)

Enter Usage Value

Natural Gas (Therms)

Enter Usage Value

Heating Oil (Gallons)

800

Propane (Gallons)

Enter Usage Value

Wood (Full Cords)

2

Wood Pellets (Tons)

Enter Usage Value

Kerosene (Gallons)

Enter Usage Value







# Home Heating Index Results: 8+ ✓

## YOUR RESULTS

### Basic Information

Electric Utility **Eversource**

Zip Code **03246**

Conditioned **2000**  
Square  
Footage

### Annual Heating Fuel

Usage **75,400.00 BTUs/SF**

Fuel Types Heating  
Oil, Wood

Heating Oil **800 Gallons**

Wood **2 Full Cords**

### Heating Index

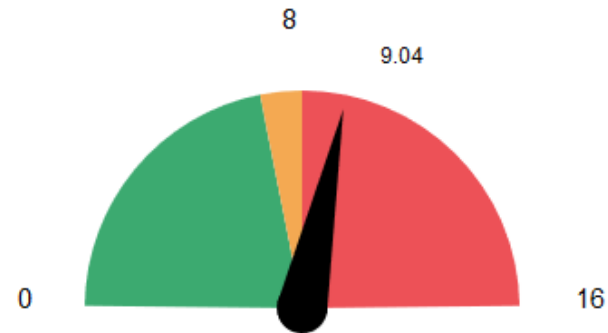
Your home may be a good candidate for weatherization services.

0 - 4 **Low Energy**

4 - 8 **Moderate Energy**

7 - 8 **High Energy**

8+ **Very High Energy**



### Enroll For Home Efficiency Audit

Complete and submit your enrollment form. For more information about our energy audits and weatherization program, [click here](#).

[PROCEED TO ENROLLMENT FORM](#)





# Sample NHTSaves Report (@ 50% cost-share)

Proposed Improvement	Total Cost	Utility Rebate	Customer Co-Pay	ESTIMATED VALUES **	
				Pay Back Period (years)	Customer Cost Savings (\$/year)
AC Ancillary Savings	\$0.00	\$0.00	\$0.00	0.0	\$13.42
Boiler Ancillary Savings	\$0.00	\$0.00	\$0.00	0.0	\$4.70
LED Bulbs	\$138.60	\$138.60	\$0.00	0.0	\$110.04
Attic	\$4,194.30	\$3,774.87	\$419.43	0.3	\$1,347.56
Basement	\$646.00	\$581.40	\$64.60	0.3	\$196.80
Air Sealing	\$1,700.00	\$1,700.00	\$0.00	0.0	\$227.04
Health And Safety	\$252.00	\$226.80	\$25.20		
Program Delivery/Audit Fee	\$992.17	\$992.17	\$0.00		
Customer Co-Pay Pre-Payment			- \$100.00		
<b>Totals</b>	<b>\$7,923.07</b>	<b>\$7,413.84</b>	<b>\$409.23</b>		

Annual energy savings: \$719

Total customer payment: \$2,047

35% return on investment!

*Utility max rebate increasing in 2021, and will be other ways to qualify*



# Income-Qualified Weatherization and Fuel Assistance Programs

- Weatherization Assistance Program & Home Energy Assistance
  - Financial assistance that pays for energy reduction measures in a home
  - Contact:
    - County-based Community Action Agencies (CAAs)
    - Your utility, or dial 211
- NH Electric and Fuel Assistance programs
  - Financial assistance with electricity and fuel bills
  - Same CAA, utility and 211 contacts





# Contacts for Income-Qualified Programs

Contact a Community Action Agency (CAA) to learn more about income-qualified Weatherization and Fuel Assistance programs:

Office Location	County ▾	CAA	Phone Number
Laconia	Belknap	CAPBMCI	524-5512
Meredith	Belknap	CAPBMCI	279-4096
Tamworth	Carroll	TCCAP	323-7400
Keene	Cheshire	SCS	352-7512 or 800-529-0005
Berlin	Coos	TCCAP	752-3248
Ashland	Grafton	TCCAP	968-3560
Hillsborough (M, W, Th & F)	Hillsborough	SNHS	924-2243 or 877-757-7048
Manchester	Hillsborough	SNHS	647-4470 or 800-322-1073
Milford	Hillsborough	SNHS	924-2243 or 877-757-7048
Nashua	Hillsborough	SNHS	889-3440 or 877-211-0723
Peterborough	Hillsborough	SNHS	924-2243 or 877-757-7048

Concord	Merrimack	CAPBMCI	225-6880
Franklin	Merrimack	CAPBMCI	934-3444
Suncook	Merrimack	CAPBMCI	485-7824
Warner	Merrimack	CAPBMCI	456-2207
Derry	Rockingham	SNHS	965-3029 or 855-295-4105
Portsmouth	Rockingham	SNHS	436-3896 or 800-639-3896
Raymond	Rockingham	SNHS	895-2303 or 800-974-2303
Salem	Rockingham	SNHS	893-9172 or 800-939-9172
Seabrook	Rockingham	SNHS	474-3507 or 800-979-3507
Dover	Strafford	CAPSC	435-2500
Farmington	Strafford	CAPSC	435-2500
Claremont	Sullivan	SCS	542-9528 or 800-529-0005



*More information at:*

[www.nh.gov/osi/energy/programs/weatherization/index.htm](http://www.nh.gov/osi/energy/programs/weatherization/index.htm)



## Summary

- Know about your energy use and savings opportunities
- Air seal first: A-B-C
- Add insulation where you can
- For expert work, work with a home performance professional
- Utilize NHSAVES energy efficiency programs



# Thank You

## *Presenters:*

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Visit [www.plymouthenergy.org](http://www.plymouthenergy.org) for a copy of the presentation

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