

NHSAVES 2023 Button Up



EVERSOURCE

Liberty

NEW HAMPSHIRE
Electric Co-op

Unitil

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

*Full NHSaves Button Up presentation PDF
available from PAREI at:*

plymouthenergy.org/nh-saves-button-up/



What is the “greenest” energy?





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



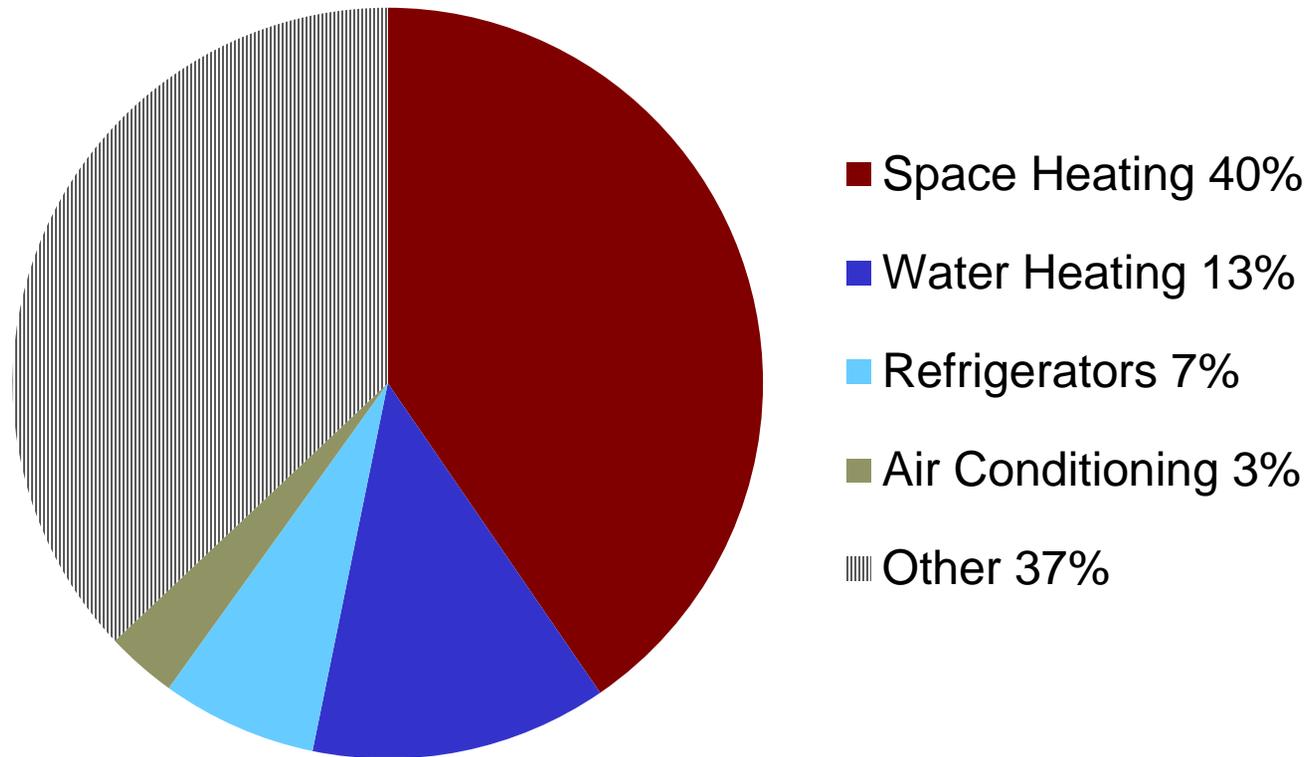


Rising Costs of Energy

Higher electricity rates are
looming for many N.H. customers

-NHPR 8/22

New Hampshire Residential Energy Costs per
Household, ~\$3,000 in 2020



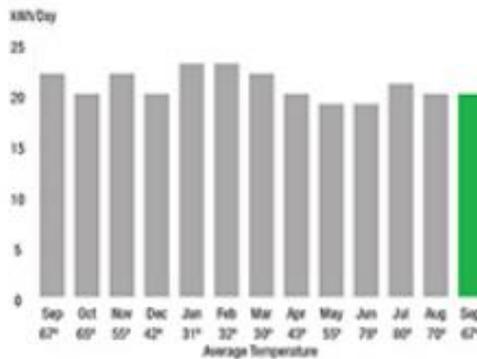
Current NH energy fuel prices: www.energy.nh.gov/energy-information/nh-fuel-prices



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





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	*

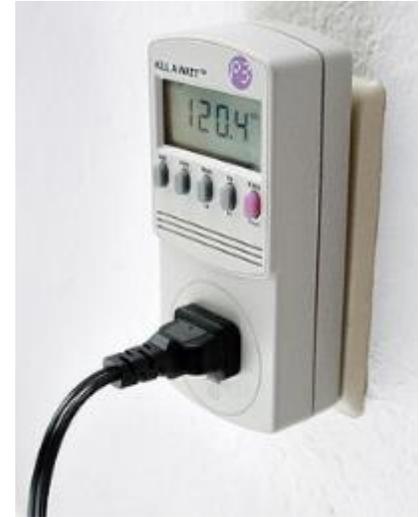


*Electricity consumption varies widely from household to household.
Energy savings come from efficiency and/or conservation.*

Measuring Electricity Use

How much electricity do plug-in devices use?

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



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, Smappee, Engage, TED, Vue Smart, etc.
 - \$100 - \$300
 - Electrician install



Energy Saving Tip: Conservation!

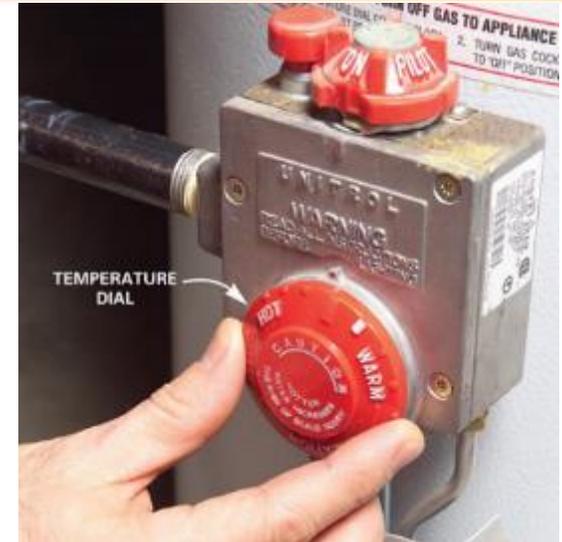
Shut things off
when not in use





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+
- Set dehumidifiers at 60-70% humidity
- 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 - \$50

Room Air Conditioners \$20

Also pool pumps, room air purifiers & dehumidifiers



And **free haul-away + \$50** for recycling an **OLD refrigerator or freezer**

www.energystar.gov lists appliance efficiency

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:

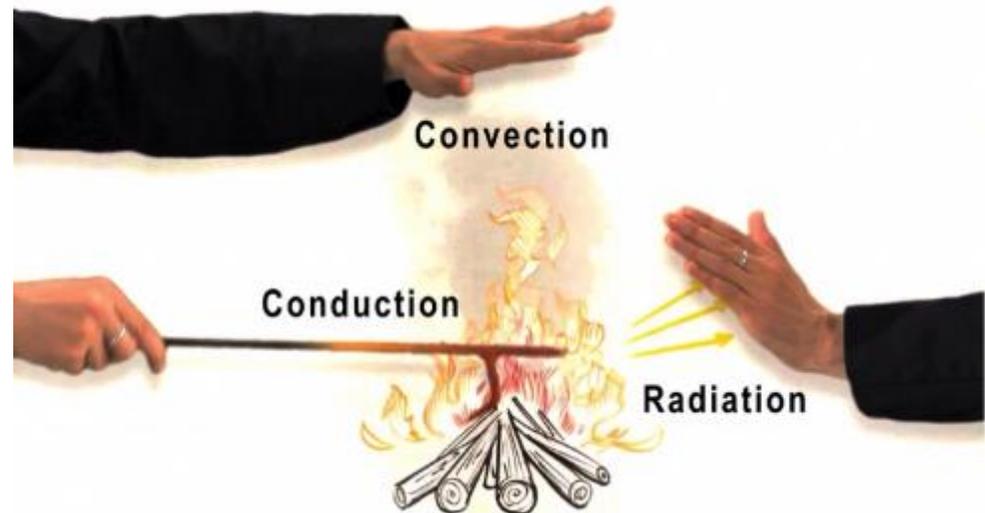
- Turn down heat when you're not in a room or in the house
- Use programmable or smart thermostats
- Remove window A/C's in winter
- Close storm windows
- Latch closed windows



Staying Warm in Your Home: Building Science and Energy Efficiency

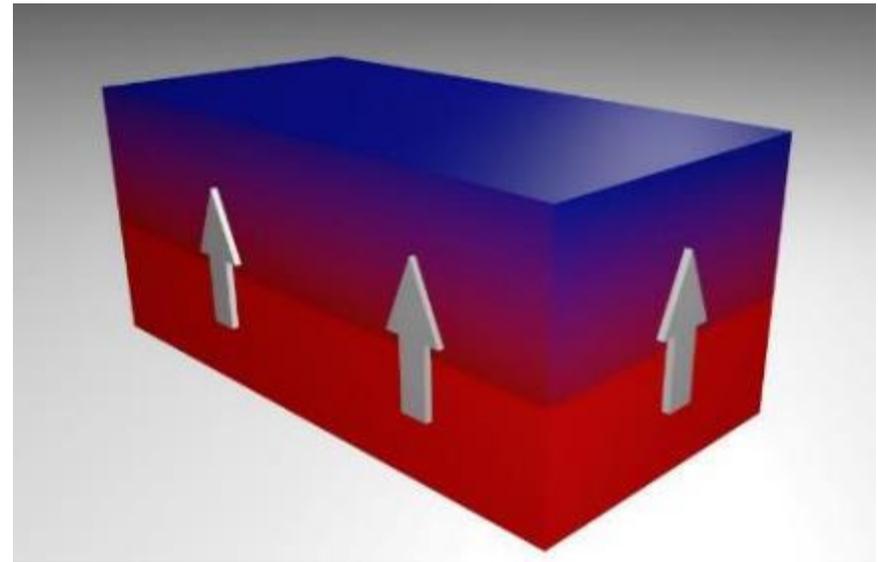
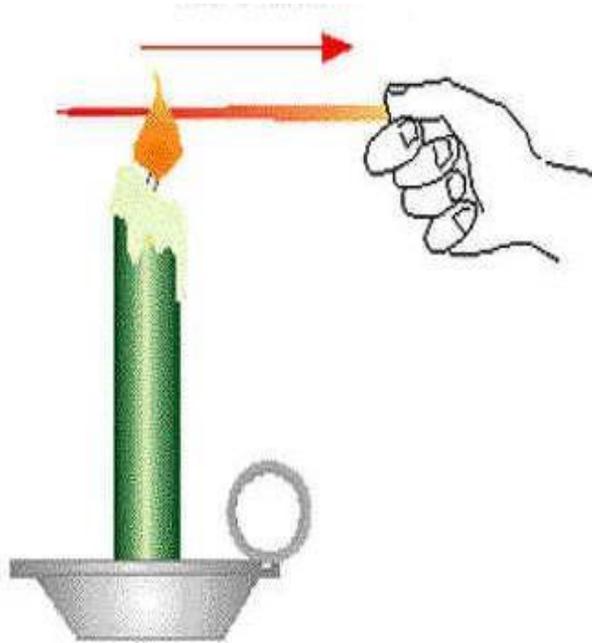
- **Heat always moves from Hot to Cold.**
 - **Fact:** The heat inside our homes is always making its way through the building shell and heating the outdoors.
 - **Goal:** Slow this process down
- **Heat moves via three methods:**

- Conduction
- Convection
- Radiation



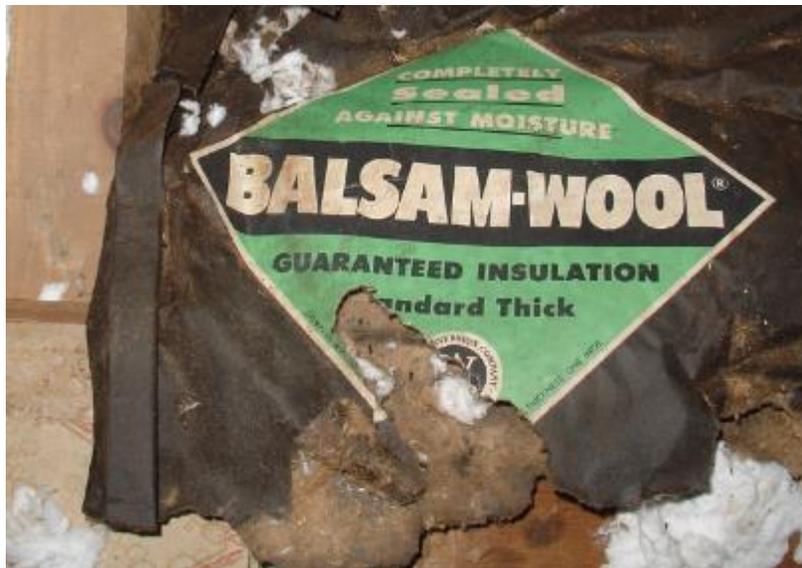
Thermal Conduction

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
- New double pane window R-3.5 (whole window)
- 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 **NH Energy Code**:

Attic R-38 to R-49

Walls R-20

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!)

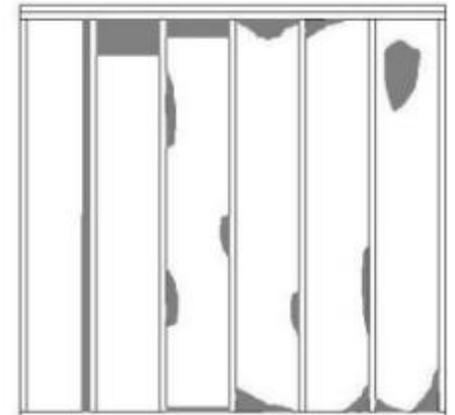
Walls R-3 to R-16

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 (low R value in spots)

Misaligned (R value there, but not working)



Heat rises: true, or false?

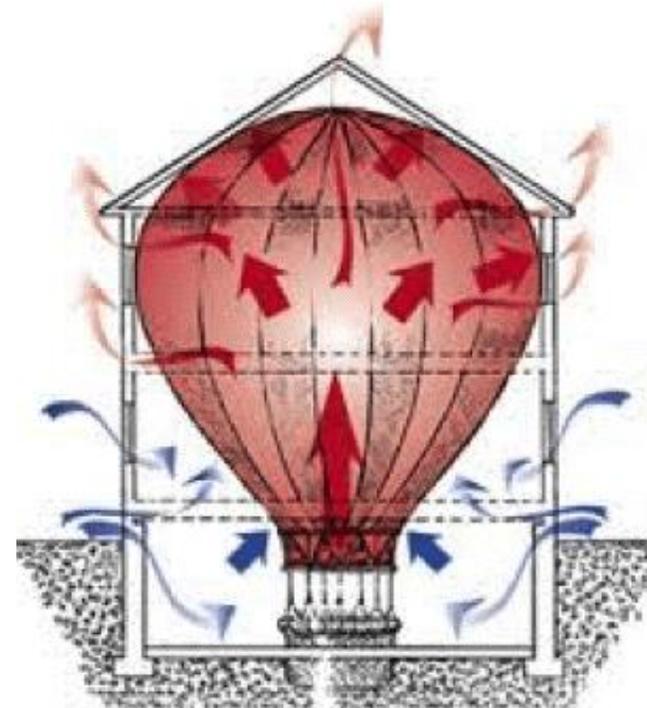
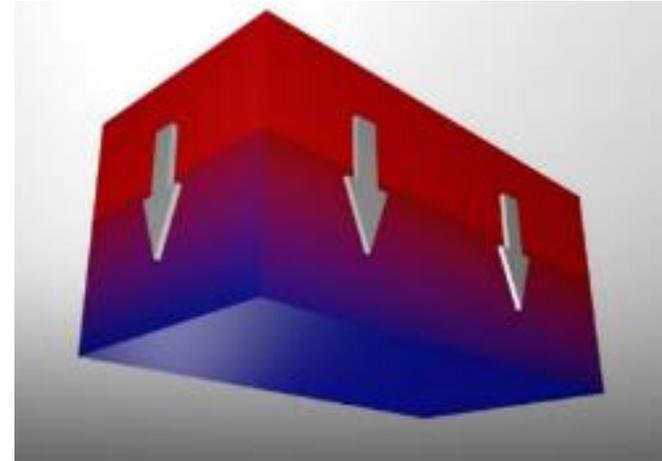


True or False: “Heat Rises”

Answer: FALSE (sort of)
Heat conduction can move in any direction!

Heat conducts from hot to cold *up, down, and sideways.*

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





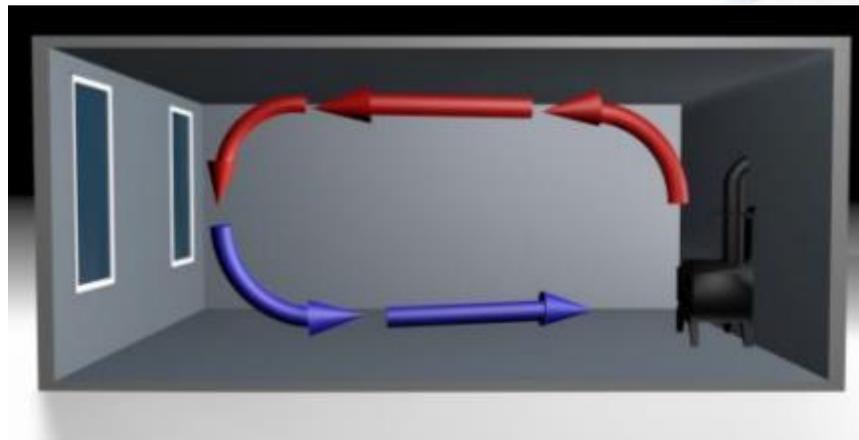
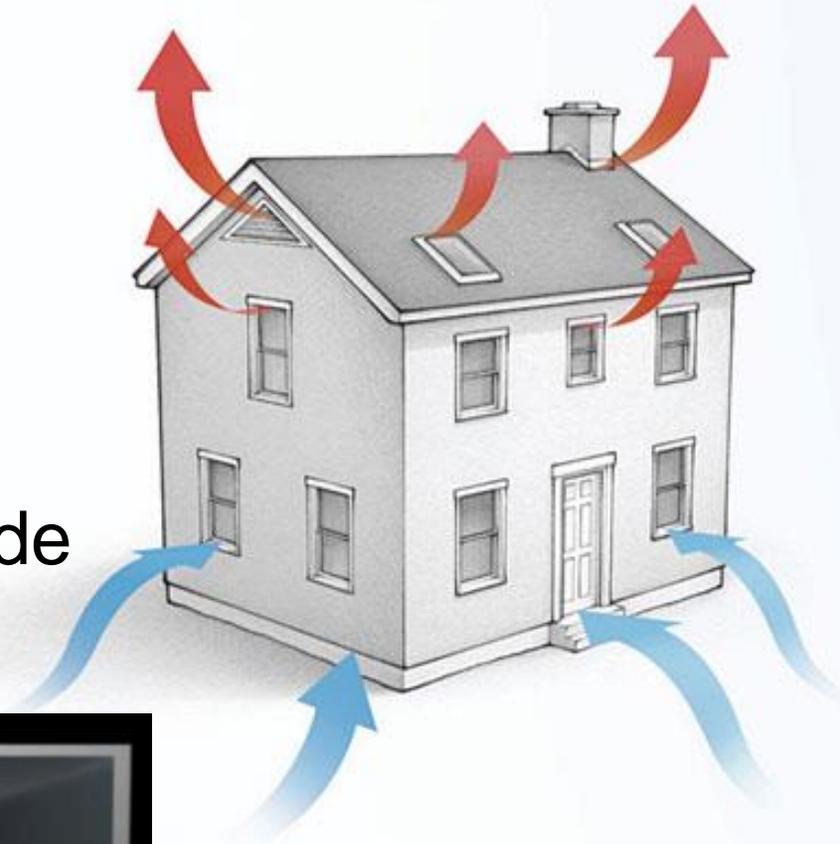
Convection Causes Air Leakage

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



Ranking of 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 (and insulation opportunities)

Common air leaks at the top of a building:

- Attic hatches & stairs
- Chimney chases
- Pipe & electrical penetrations
- Ceiling lights & bath fans
- Ducts, registers and chases



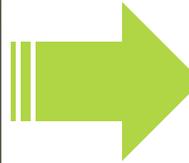


This Pegboard Attic Hatch with 16" Fiberglass Insulation: Good?



Moisture in Attics and Air Leakage

Attic air leaks can lead to condensation, mold and rot



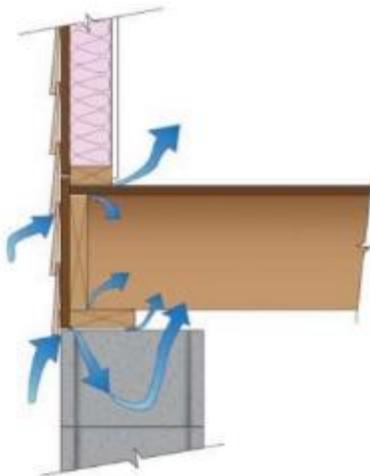
Warm, moist air leaks into the attic where it hits cold surfaces and condenses.

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
- Fireplace flues can be huge leakers
- Old pulley-hung windows
- Most windows don't leak much air



■ ■ ■ ■ ■ Air Sealing and Fresh Air

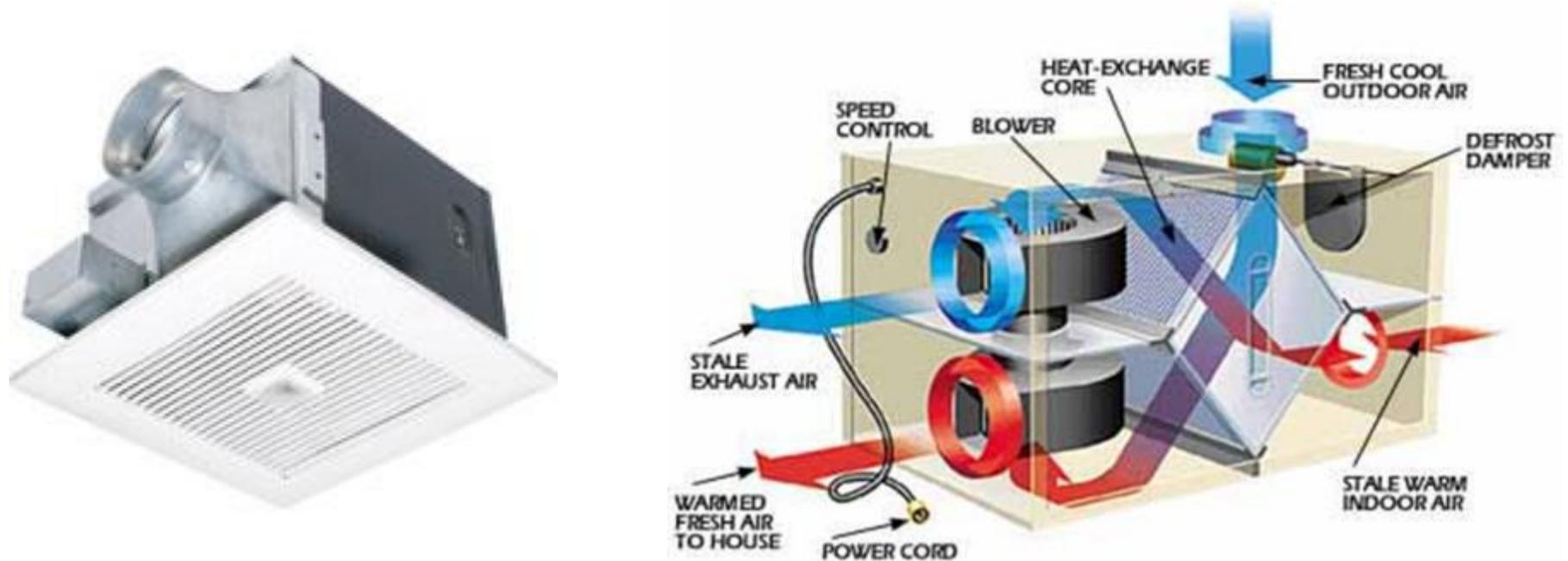
Fresh Air is needed for a healthy home

- 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, CO₂ sensors, etc.



■ ■ ■ ■ ■ Bath Fan Venting



Vent fans to Outside
with insulated rigid
vent pipe

NOT into attic!



ADVANCED

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

Quiz



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



■ ■ ■ ■ ■ ■ ■ ■ ■ ■ The Solution?



■ ■ ■ ■ ■ ■ A: Attic Air Sealing -- prior to insulation

***Remember “ABC”-- Attic,
Basement, Center -- for
air sealing and insulation***





Blown-in Attic Insulation

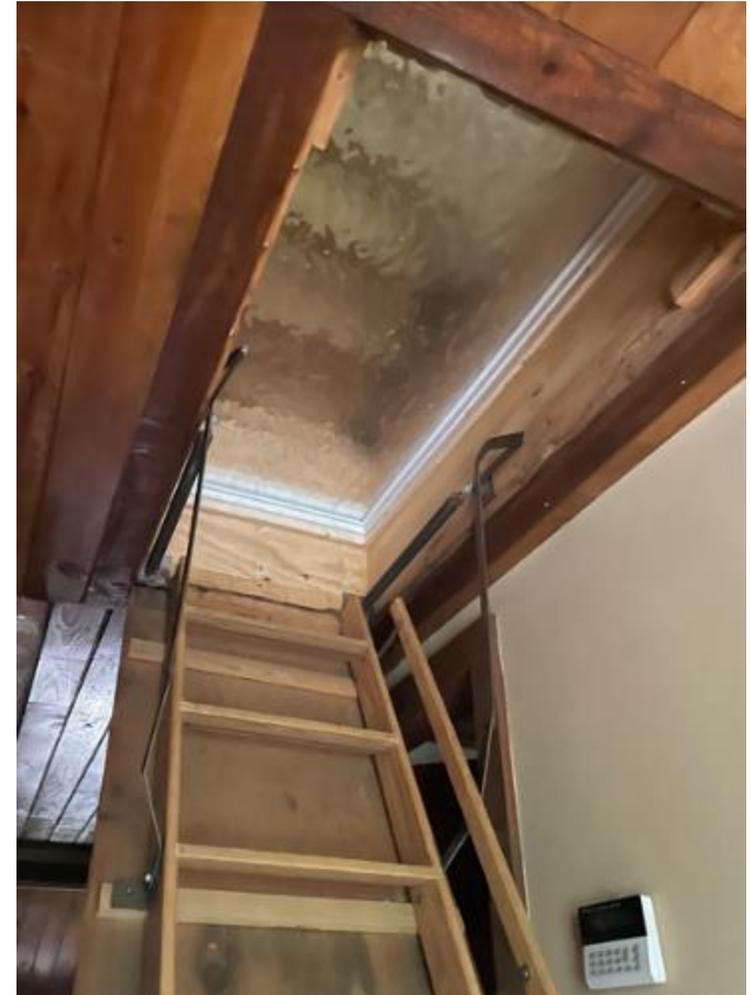


If using blown insulation, cover attic with 12" – 16"
AFTER air sealing!



Photo: blown-in cellulose attic insulation

■ ■ ■ ■ ■ A: Attic Insulation and Hatches





Cape / Kneewalls Air Sealing & Insulation



Spray foam prior to drywall fire barrier



Metal-faced "Thermax" foam board is fire-rated

Basements- Thermax or Spray Foam



Fix basement water issues first

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



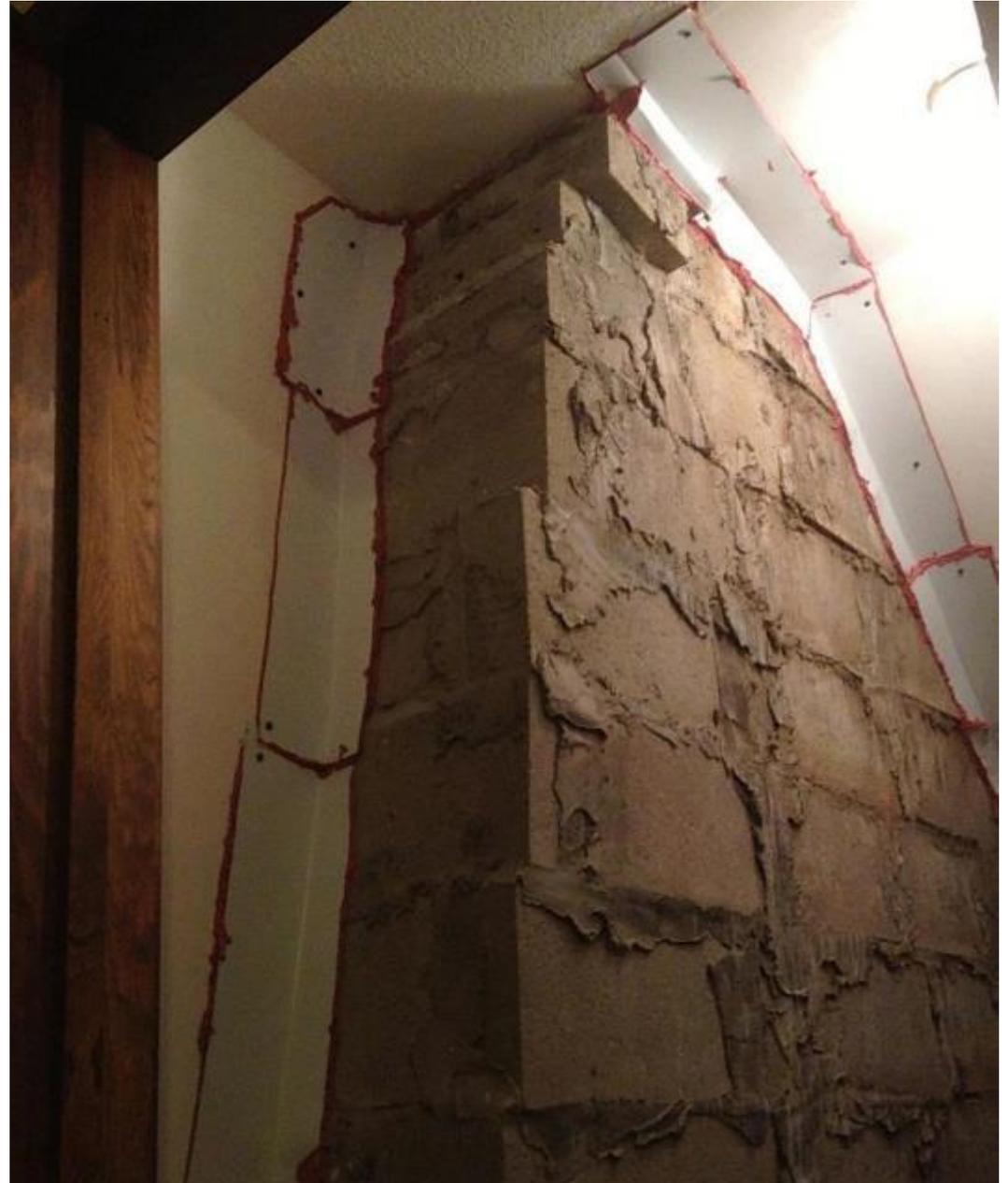
■ ■ ■ ■ ■ ■ C: Air Sealing in Center of House



chimney flue blocker



exterior door “Q-lon”
style weatherstripping





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.



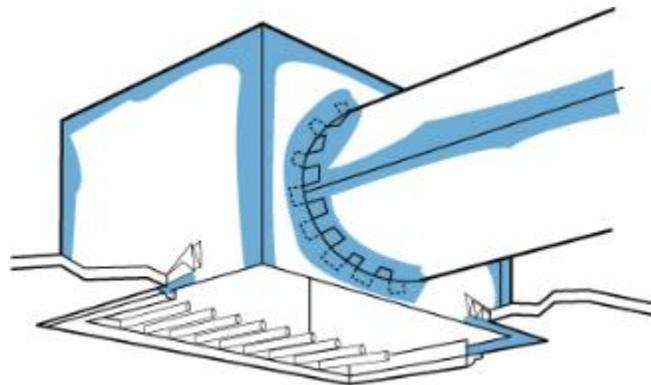
Image courtesy of Vermont Dept. of Children & Families



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

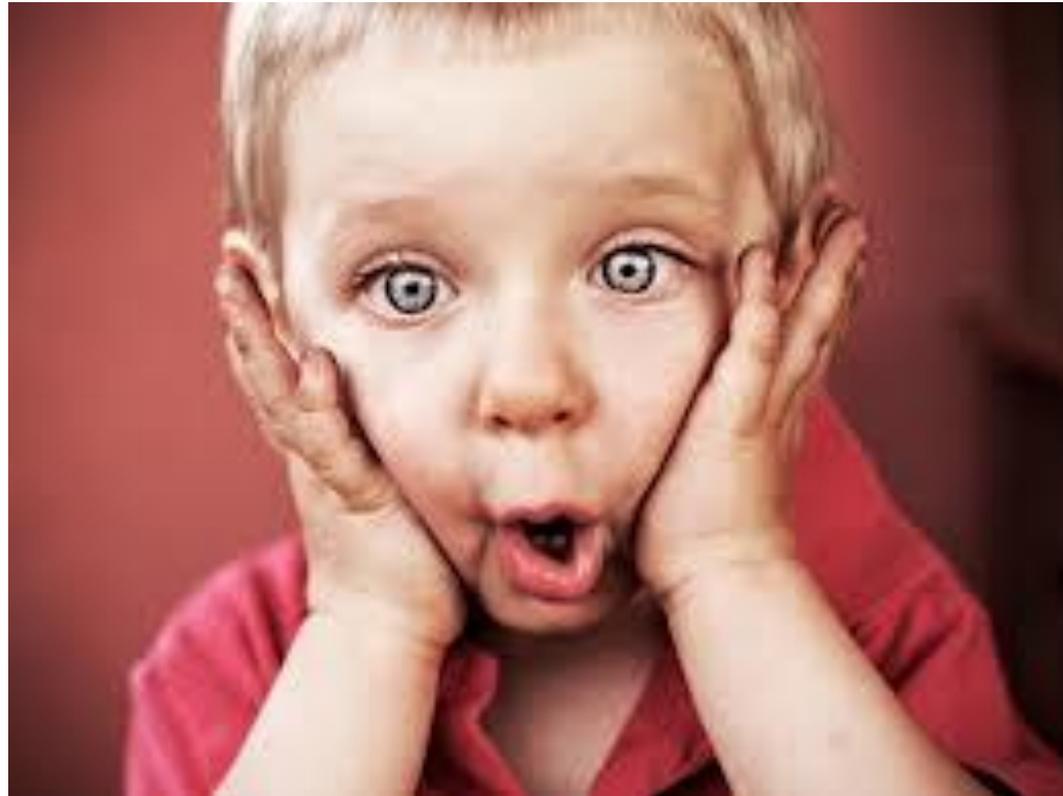
Old windows, with leaky sashes, can be replaced, *or...*

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





Are you feeling overwhelmed?





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 Energy Auditor, 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
 - NHTSaves qualified residential contractors



Tools of the Trade: Blower Door

Blower Door

- Measures *amount* of air leakage: CFM₅₀
- Identifies *sources* of air leakage
- Determines air ventilation rates
- Prioritizes air sealing opportunities
- Confirms amount of air sealing accomplished

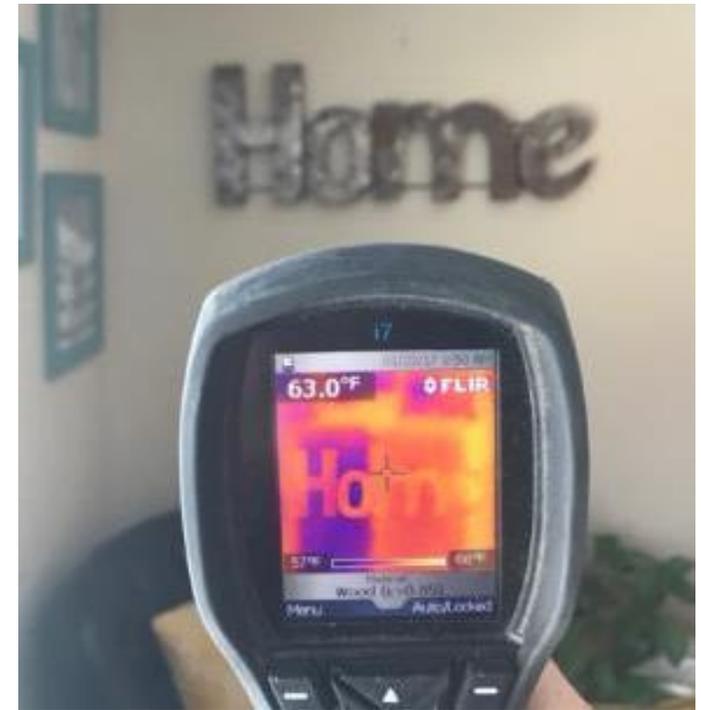
*Blower door tests now
Energy Code-required*





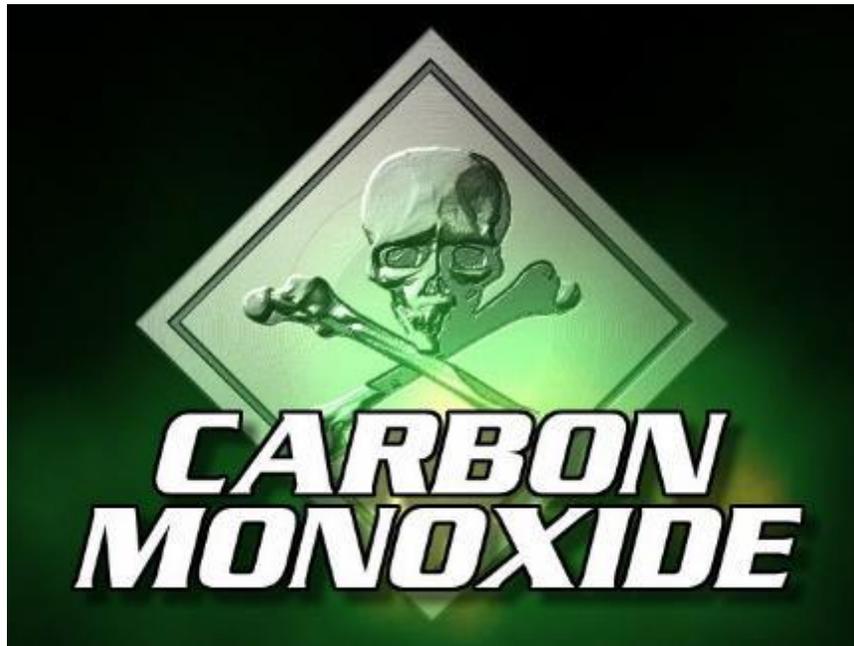
Tools of the Trade: Infrared Thermal Camera

- 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 properly installed and functional.



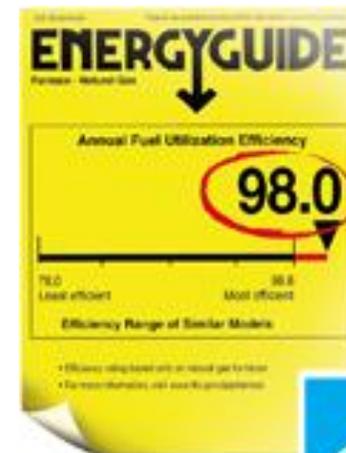
Heating System Recommendations



Test & Clean



Replace filters



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



Energy Audit Examples



Massive air leak to the attic hiding behind a mirror



NHSaves Rebates and Services



EVERSOURCE

Liberty

NEW HAMPSHIRE
Electric Co-op

Unitil

- Lighting and ENERGY STAR appliance rebates
- Heating, cooling and water heating incentives
- ENERGY STAR new homes
- Home Energy Assistance
- **Energy Audits and Weatherization:**
 - **Home Performance with ENERGY STAR**
 - Visual audit (if not qualifying for HPwES)
 - Financing

nhsaves.com



Efficient Heating, Cooling & Hot Water

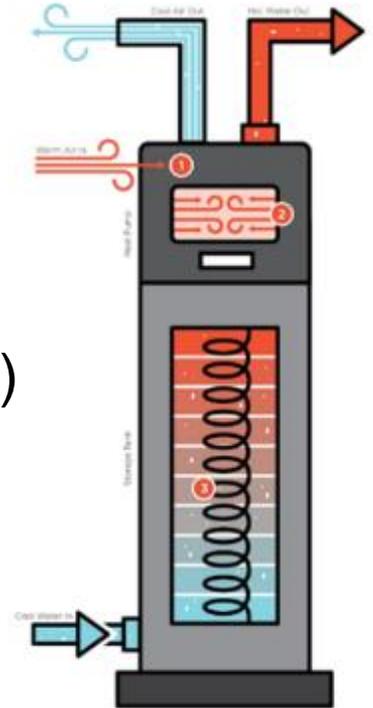
Plenty of high efficiency options & incentives

- High efficiency gas boilers and furnaces (IRA)
- Mini-split cold climate heat pumps (IRA)
- Heat pump electric hot water heaters (IRA)
- EPA 2020 certified wood and pellet stoves (IRA)
- WiFi smart thermostats

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

Focus on the building envelope first, then heating and cooling systems

- An efficient heating or cooling system in a leaky envelope still wastes a lot of energy!
- Also seal & insulate ducts & distribution pipes



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° air!

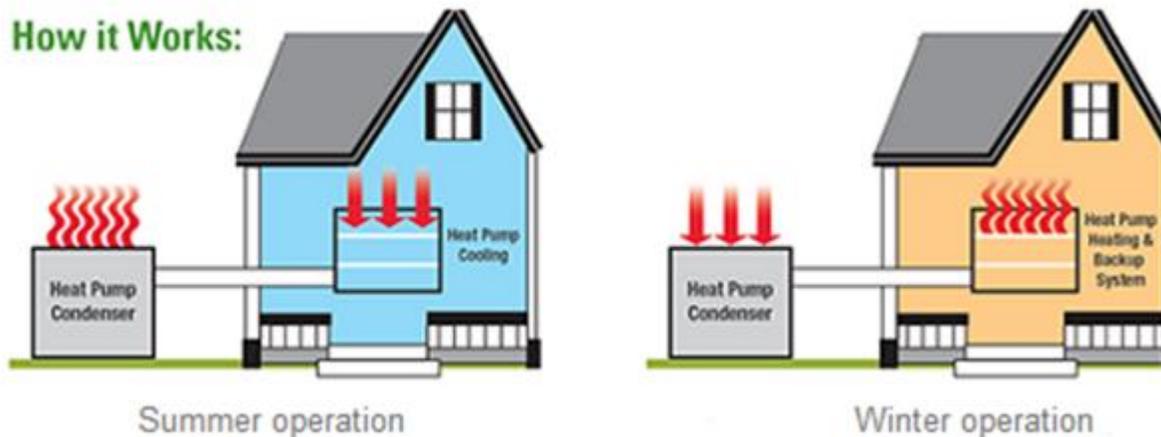


Heat Pump Hot Water Heaters

- More efficient than regular electric water heaters

How Heat Pumps Work

How it Works:





NHSaves Heating, Cooling & Hot Water Incentives

A sampling of NHSaves rebates for *efficient* systems:

- Mini-split cold climate heat pumps: \$250*/ton
1 ton = 12,000 BTUs (*NHEC: higher rebates)
- Natural gas boilers and furnaces: up to \$1,500
- Heat pump hot water heaters: \$750
- WiFi smart thermostats: \$85*
(With heat pumps or natural gas heat)

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

- Utility-specific
- Low-interest financing options
- Funding availability





Energy Efficient NEW Construction



NHSaves ENERGY STAR Certified NEW Homes

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





NHSaves Existing Homes- Home Performance with ENERGY STAR

nhsaves.com/learn/service/energy-audits-weatherization/

- Qualify with online “Home Heating Index” calculator
- Comprehensive home energy audit for \$100
 - Credited towards improvement work -- **net cost: \$0**
- Pays for 75% of eligible energy improvements* up to \$6,000 **that meet benefit/cost ratio*
- Low or no interest financing may be available





NHSaves.com: “Test Your Home”



Test Your Home

Here's what you will need to get started:

- ✓ Your heating usage for the past twelve months
- ✓ The conditioned square footage of your home
- ✓ Your heating fuel source and your utility provider
- ✓ Your zip code

TEST YOUR HOME





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



If Home Heating Index Results Are High Enough* – Your Home Qualifies!

YOUR RESULTS

Basic Information

Electric Utility	Eversource
Zip Code	03246
Conditioned Square Footage	2000

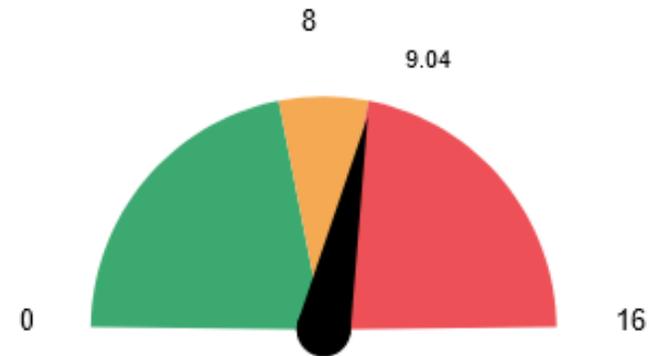
Annual Heating Fuel Usage

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 Use
- 4 - 7 Moderate Energy Use
- 7 - 9 High Energy Use
- 9+ Very High Energy Use



Enroll For Home Efficiency Audit

Complete and submit your enrollment form.

[PROCEED TO ENROLLMENT FORM](#)



*Minimum HHI values for NH HPwES eligibility:

Eversource & NHEC: **9**

Liberty Electric and Unitil Electric / Gas: **10**

Liberty Gas: **12** (as of 11/22)

If your home doesn't qualify for HPwES, ask about Visual Audits or other NHC Saves programs you may qualify for.



Home Doesn't Qualify for HPwES? *Visual Audit Program*

Minimum Home Heating Index (HHI) values to qualify for HPwES program: *(as of 3/23)*

- Eversource: **9**
- Liberty Electric: **10**
- Liberty Natural Gas: **12**
- NH Electric Co-op: **9**
- Until Electric & Gas: **10**

NHSaves “Visual Audit” program

- If your home does Not qualify for HPwES, includes:
 - Quick walk-through energy assessment
 - *Free installation of:* Sense thermostat, LED light bulbs, low-flow devices, and up to 6' pipe insulation
- Apply through the NHSaves HHI calculator





Sample NHSaves HPwES Report (@ 75%)

Proposed Improvement	Total Cost	Utility Rebate	Customer Co-Pay	ESTIMATED VALUES **		
				Pay Back Period (years)	Customer Cost Savings (\$/year)	Customer Accepts
Improve 1,150 sq ft of attic floor insulation from 6 inches to 15 inches.	\$3,409.31	\$558.61	\$2,850.70	21.9	\$129.95	
Reduce the house air leakage from 1905 CFM50 to 1705 CFM50.	\$800.00	\$800.00	\$0.00	0.0	\$86.01	
Improve 15 sq ft of rim joist from No insulation to High insulation	\$292.00	\$219.00	\$73.00	3.6	\$20.42	
Improve 673 sq ft of basement wall from No insulation to High insulation	\$4,745.00	\$3,558.75	\$1,186.25	4.0	\$298.14	
Ancillary Savings - Central A/C (1.0)		\$0.00	\$0.00	0.0	\$10.05	
Program Delivery/Audit Fee	\$863.64	\$863.64	0.00			
Customer Co-Pay Pre-Payment						

Totals \$10,109.95 \$6,000.00 \$4,109.95 7.5 \$544.57

Total Eversource Rebate: \$6,000.00

Total Rebate: \$0.00

Customer Co-Pay Balance: \$4,109.95



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



■ ■ ■ ■ ■ Inflation Reduction Act Tax Credits



Lots of financial carrots! IRA has three main energy efficiency programs for existing homes:

1) **25C Energy Efficient Home Improvement Tax Credit**

- 30% tax credit for 2023+, with limits, for example:

Heat pumps, incl. hot water: \$2,000	Weatherization: \$1,200
Biomass stoves & boilers: \$2,000	Energy audits: \$150
Fossil fuel heaters: \$600	Windows: \$600

- Equipment or installations must meet efficiency criteria
- For homeowners' principal residence or renters
- Available NOW. Claim in 2024 on 2023 federal taxes





IRA's Electrification Rebates (HEEHR)

2) Home Electrification Rebates (HEEHR)

- *Future program- to be administered by NH Dept. of Energy*
- Income-qualified occupants- using area median income (AMI)
 - Under 80% AMI: 100% rebates
 - 80% - 150% AMI: 50% rebates
- Total point-of-sale rebate up to \$14,000 for qualified installations, with limits:

Heat pumps: \$8,000	Weatherization: \$1,600
Heat pump hot water: \$1,750	Electric wiring: \$2,500
Electric range or HP dryer: \$840	Electric load center: \$4,000

- For owned or rented residential units- using AMI of occupants
 - 50+% occupants LMI: building qualifies



IRA's Home Efficiency Rebates

3) Home Efficiency Rebates (HOMES)

- *Future program- to be administered by NH Dept. of Energy*
- Whole home retrofit program- weatherization, potentially HVAC, etc.
- Maximum rebate amount depends on income and % energy savings:

<i>(assuming modeled energy savings)</i>	<i>Rebate %</i>	<i>Max rebate w- 20-35% savings</i>	<i>Over 35% savings</i>
Under 80% AMI	80%	\$4,000	\$8,000
All higher incomes	50%	\$2,000	\$4,000

- For owned or rented residential units- using AMI of occupants
- *IRA rebate programs can be combined with IRA tax credits and NHTSaves incentives!*





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 & IRA energy efficiency programs



Thank You!

The NHSaves Button Up program is coordinated by the Plymouth Area Renewable Energy Initiative with support from the NHSaves' utilities.

For a PDF copy of the presentation, please go to:

<https://plymouthenergy.org/nh-saves-button-up/>

Support future workshops- let your utility know.

To inquire about hosting a Button Up workshop in your town, please contact: Robbin Adams, robbin@plymouthenergy.org

