

NHSAVES 2019 Button Up



EVERSOURCE



How to Improve the Energy Efficiency of Your Home

NHSAVES Button Up Overview

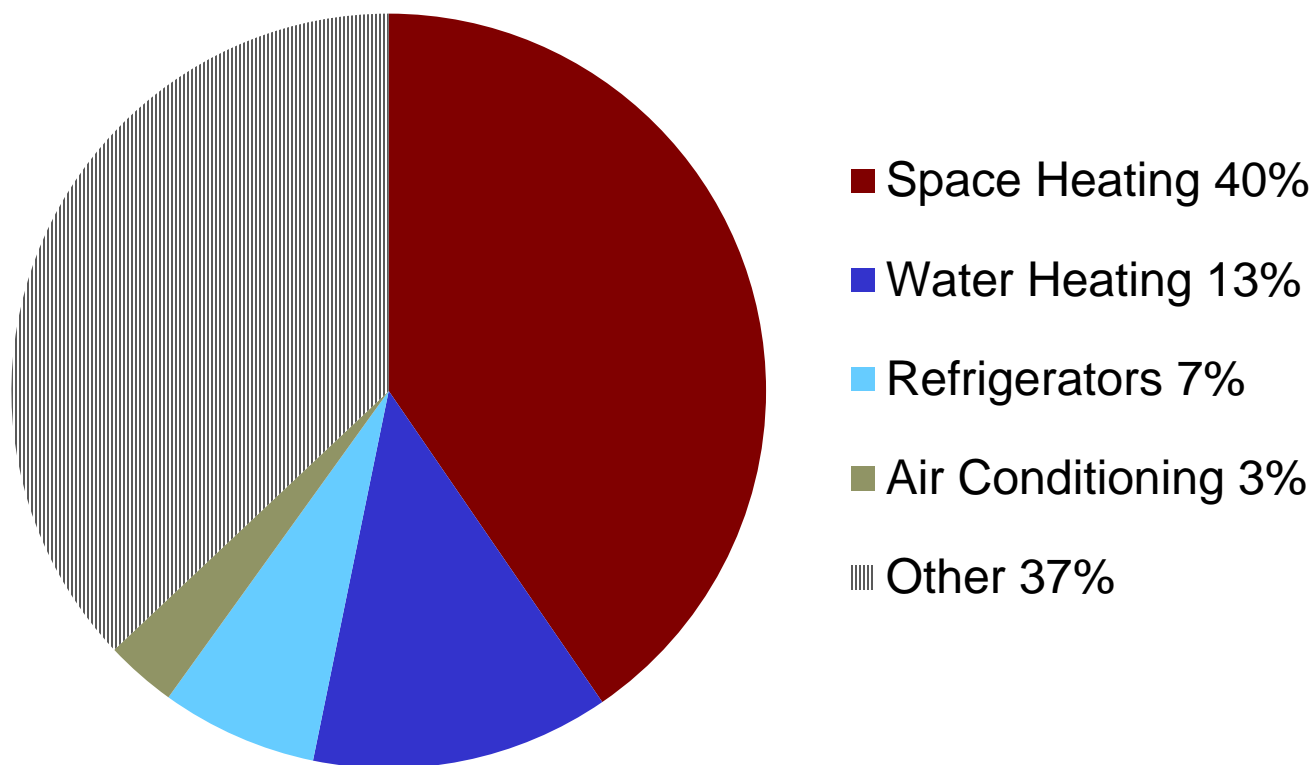
- Energy Use and Savings Tips
- Staying Warm and Reducing Heating Costs
- Air Sealing A-B-C's
- Insulation Options
- Addressing Health and Safety Concerns
- Working with Professionals
- NHSAVES Programs



■ ■ ■ ■ ■ ■ We Spend a Lot on Energy!

NH spends over \$6 billion per year on energy

Northern New England Household Residential
Energy Costs, ~\$3,600, 2014

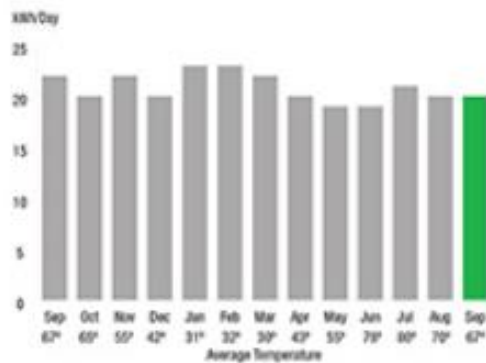


Current NH energy fuel prices: www.nh.gov/osi/energy/

Get to Know Your Energy Bills

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

Electric Usage History - Kilowatt Hours (kWh)

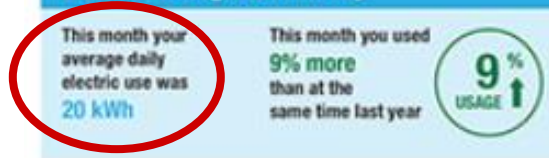


Current Charges for Electricity



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



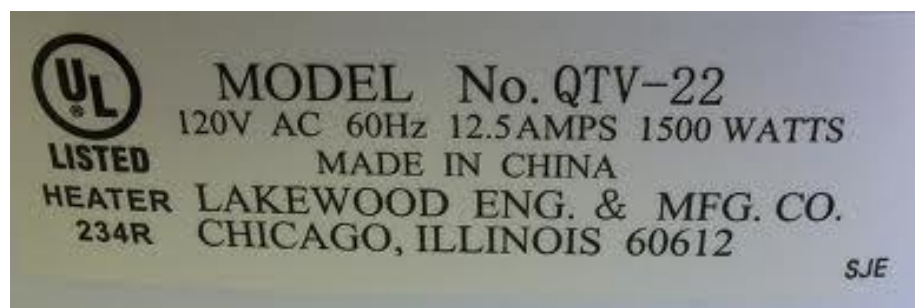
Measuring Electricity Use

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



- Read the appliance name plate and determine how many hours it is on: $\text{Amps} * \text{Volts} = \text{Watts}$



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.*

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



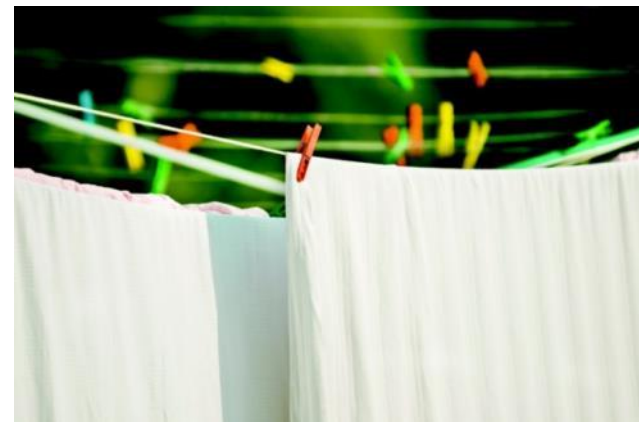
- Control with a smart power strip:



Available
from the
NHSaves
Catalog

Other Electricity Conservation Tips

- Turn down hot water heater temperature to 120° at tap
- Set dehumidifiers appropriately
 - Target ~70% 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”)
 - 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 – R-5 best
- 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
Dehumidifiers	\$25
Refrigerators	\$40 - \$75
Room Air Conditioners	\$20



Also pool pumps, room air purifiers & lighting fixtures

And free haul-away + \$30 for recycling an **OLD refrigerators and freezers**

www.energystar.gov lists appliance efficiency

NHSAVES.com/rebates for appliance rebate forms



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



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



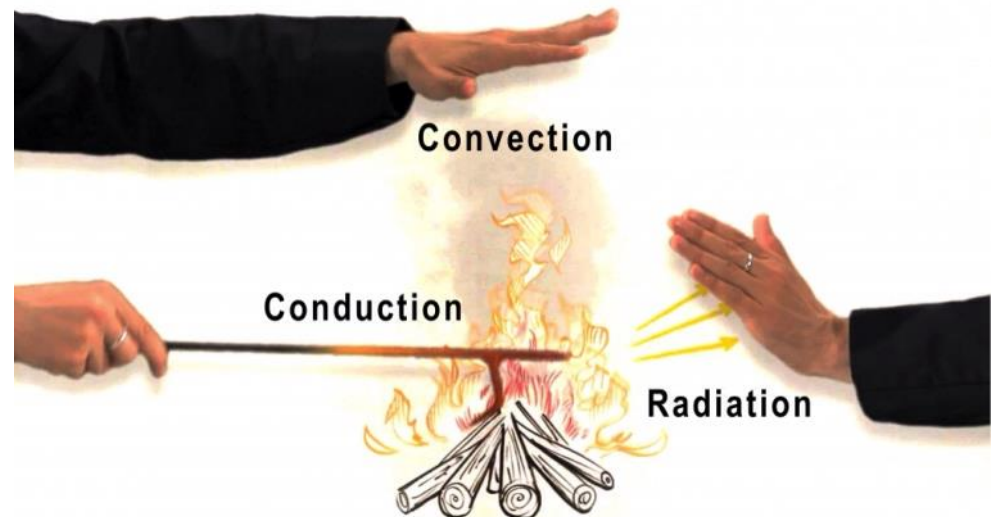
Staying Warm in Your Home: Building Science and Energy Efficiency

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

2. Heat moves via three methods:

- Conduction
- Convection
- Radiation





Building Science: Convection Causes Air Leakage

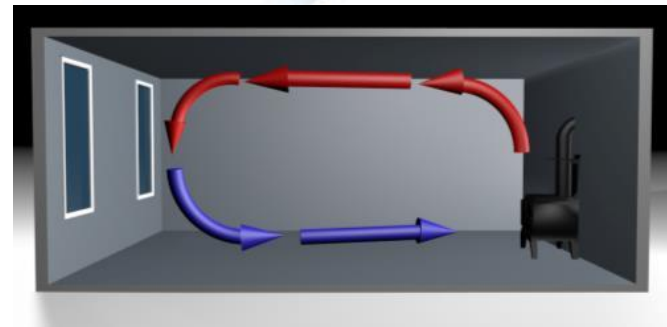
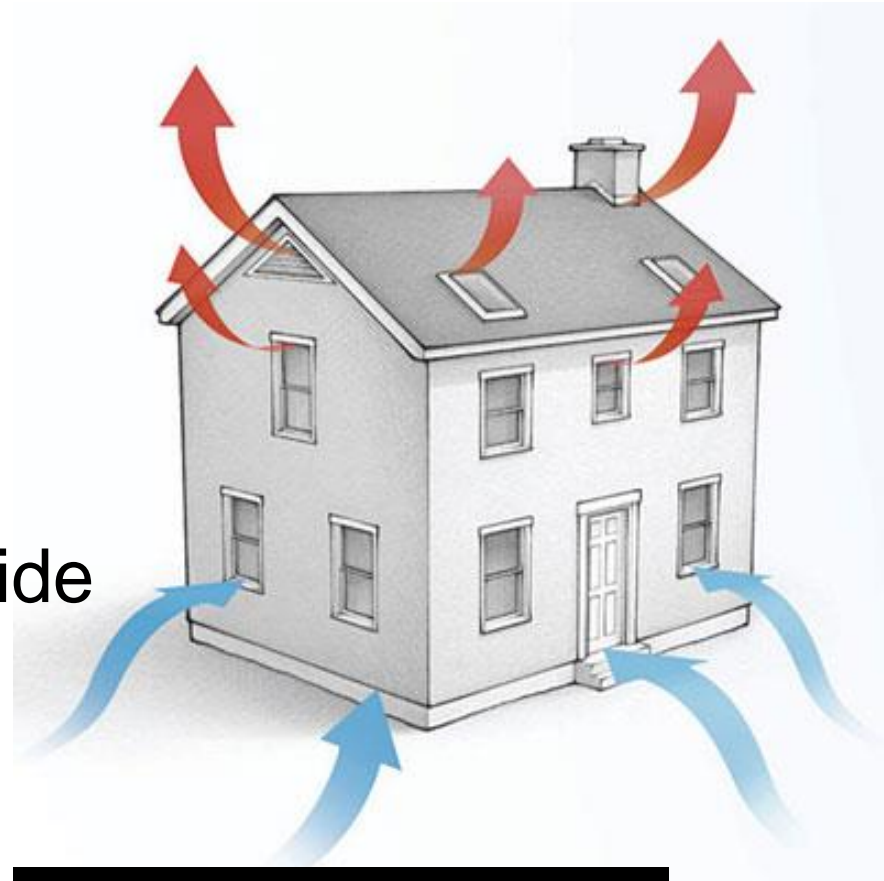
Warm air is more buoyant – rises and leaks out the top of a building

Cold air leaks in down low

Convective air currents
= “Stack Effect”

Stronger when colder outside

Quiz: Does “heat rise?”
NO, but warm air does!



■ ■ ■ ■ ■ ■ Air Sealing Priorities: A - B - C

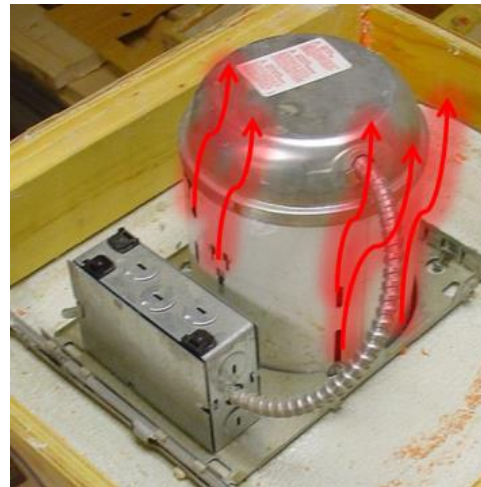


- **A – Attic** (top of the building)
- **B – Basement** (bottom of the building)
- **C – Center** of the building

■ ■ ■ ■ ■ ■ A - Attic Air Leak Reduction

Common air leaks at the top of a building.

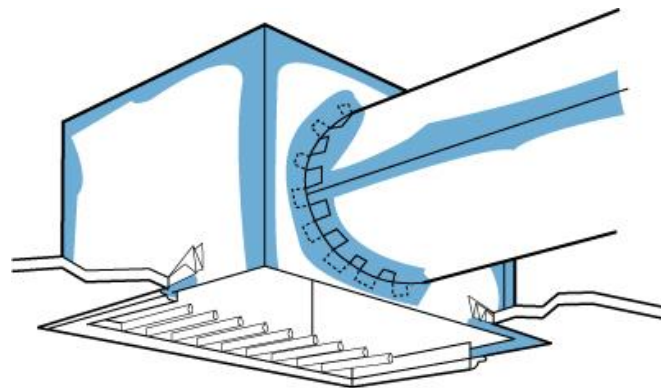
- Attic hatches and pull-down stairs
- Chimney chases
- Pipe and electrical penetrations
- Recessed ceiling lights
- Bath fans
- Electrical boxes in the ceiling



Seal Leaky Attic and Basement Ducts

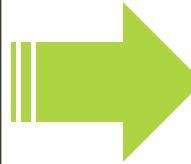
Mastic!

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



Moisture in Attics and Air Leakage

Attic air leaks can lead to condensation, mold and rot



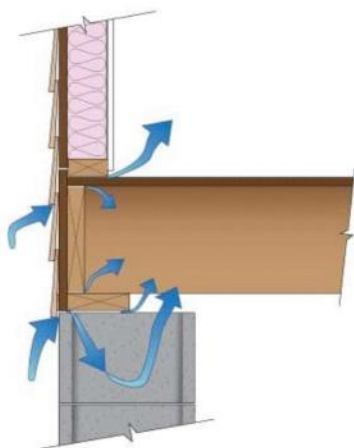
Warm, moist air leaks into the attic where it hits cold surfaces and condenses.

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

■ ■ ■ ■ ■ B - Basement Air 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

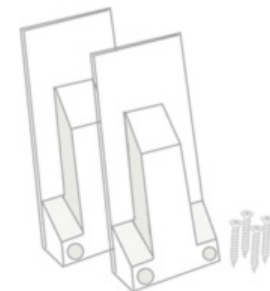




C – Center of the House Air Sealing

More visible, but fewer air sealing opportunities

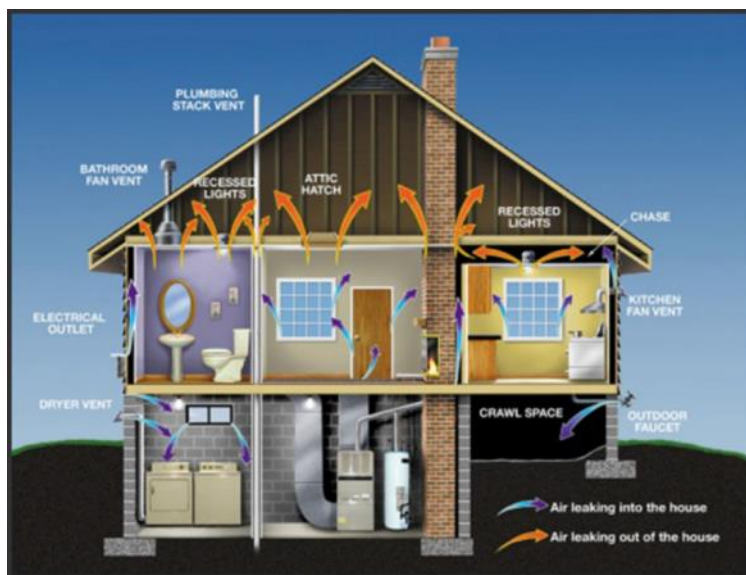
- Install or improve exterior door weatherstripping
 - “Q-Ion” style door kits on exterior
 - Bottom of door sweeps
- Securely seal unused fireplaces
- Seal wall outlets with gaskets ~
- Seal around old pulley-hung windows



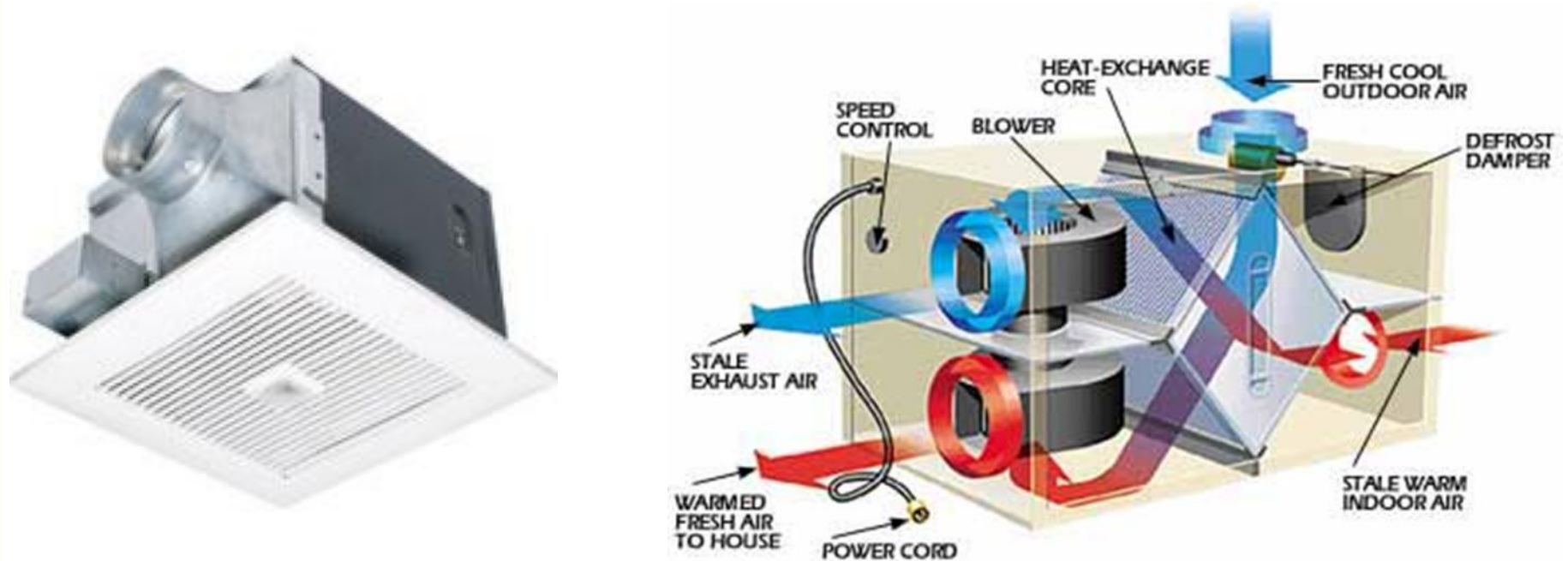
■ ■ ■ ■ ■ Air Sealing and Fresh Air

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”



Control air leakage, and...

Provide measured fresh air flow

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

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

Pop Quiz!

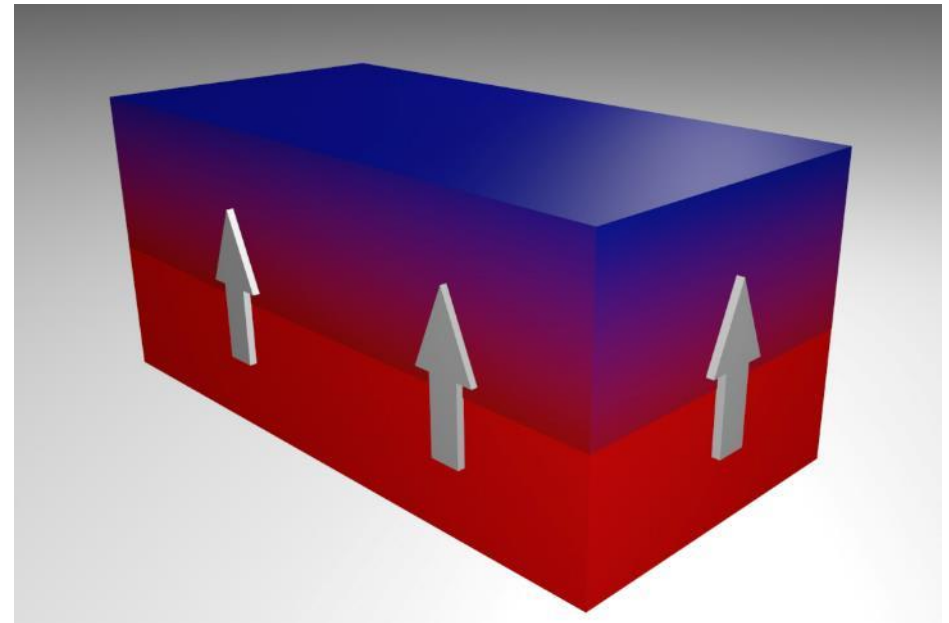
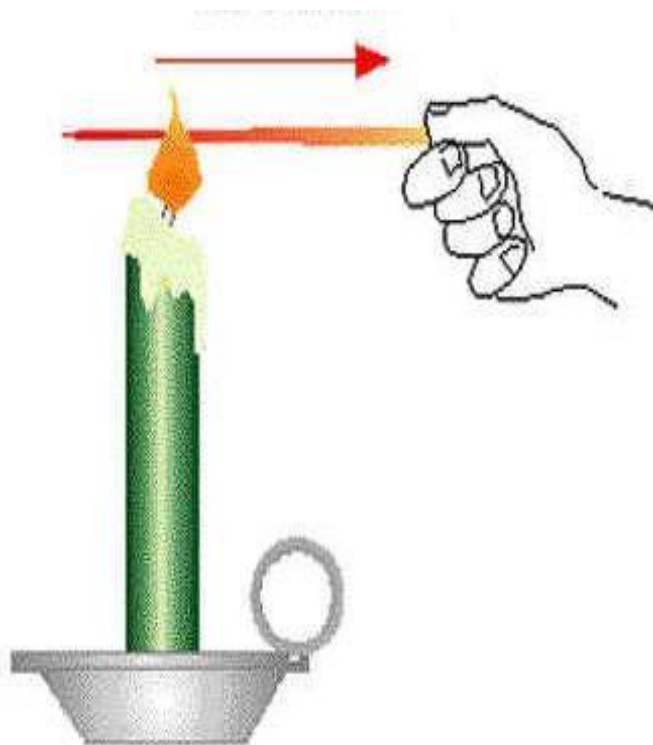


What is the biggest factor causing ice dams on this house?



Conduction

The movement of heat through materials



Conductive Heat Loss and Insulation

Materials that conduct heat quickly are “**Conductors**”.

Materials that conduct heat slowly are “**Insulators**”



Which is a better insulator: 1” of solid wood or 1” of fluffy wood?

Conductive Heat Loss and Insulation R-Values

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

<u>Approximate R-values:</u>	<i>(if installed properly)</i>
• Fiberglass	R-3.7 per inch
• Cellulose	R-3.6 per inch
• Rigid foam board	R-4 - R-7 per inch
• Spray foam	R-6 - R-7 per inch
• Double pane window	R-3 (new windows)
• Softwood	R-1.3 per inch
• 8" concrete wall	R-1 (for 8"!)

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



Installed R-Values

A **new house** built to the current 2009 **NH Energy Code**:

Attic R-38 to R-49

Walls R-20

Basement walls R-15 to R-19

Doors and windows R-3

www.puc.nh.gov

Average NH House functional R-Values:

Attic R-10 to R-30

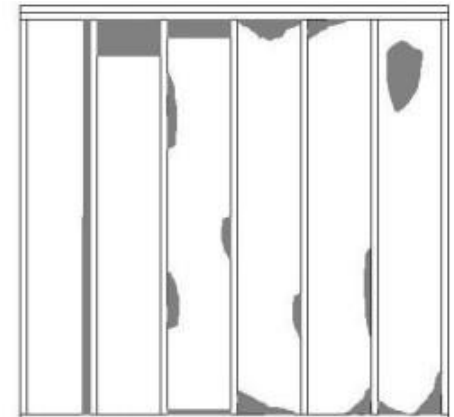
Walls R-3 to R-16

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...



Blown Attic Insulation



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



Photo: blown-in cellulose insulation

Basement Insulation

Fix moisture problems first

Put tightly sealed rigid or spray foam on walls



*Foam needs a fire barrier.
Professional advice recommended
before undertaking this project*



■ ■ ■ ■ ■ Framed Wall Insulation

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

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





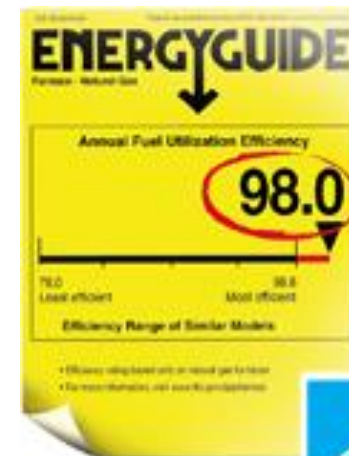
Heating System Recommendations



Test & Clean



Replace filters



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



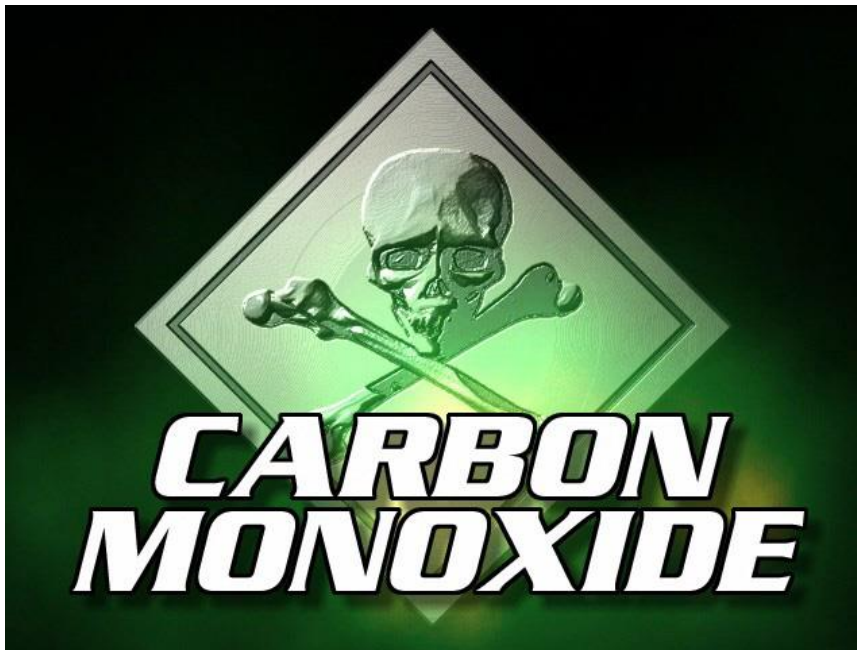
Combustion Safety and Carbon Monoxide

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.



High Efficiency Heat Pumps

Ductless Cold Climate Heat Pumps for A/C & Heat

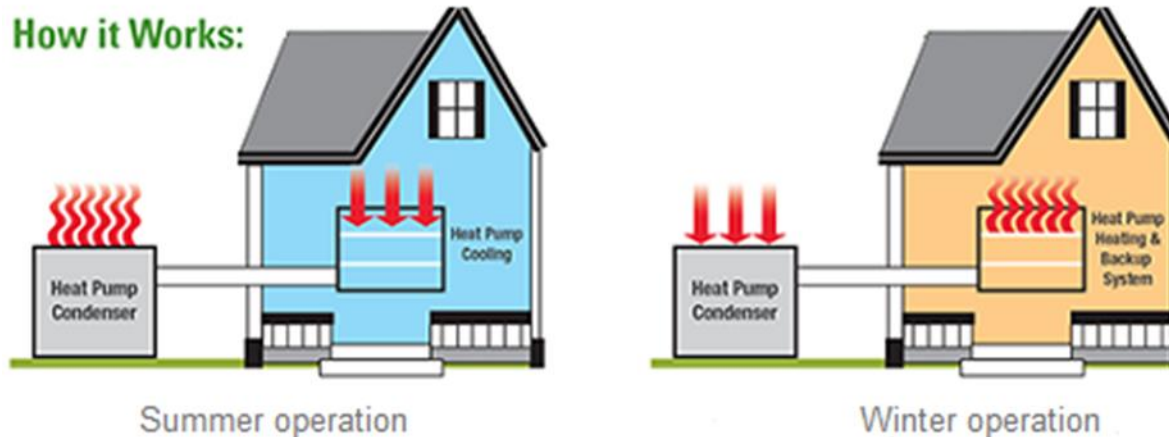
- “Mini splits” heat and cool air
- “Cold climate” models
 - Can extract heat from -20° air!



Heat Pump Hot Water Heaters

- More efficient than regular electric water heaters

How Heat Pumps Work



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 hot water heaters

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

- Utility-specific
- Financing
- Funding availability



Next Steps

Are you feeling overwhelmed?





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



■ ■ ■ ■ ■ Priorities-1: The \$100 DIY Package

~50% return on investment

- LED light bulbs
- Low-flow showerheads and faucet aerators
- Simple air sealing in A-attic and B-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
- Maybe **appliance, heating, cooling** and domestic **hot water** improvements





Home Performance Professionals (Energy Auditors and Contractors)

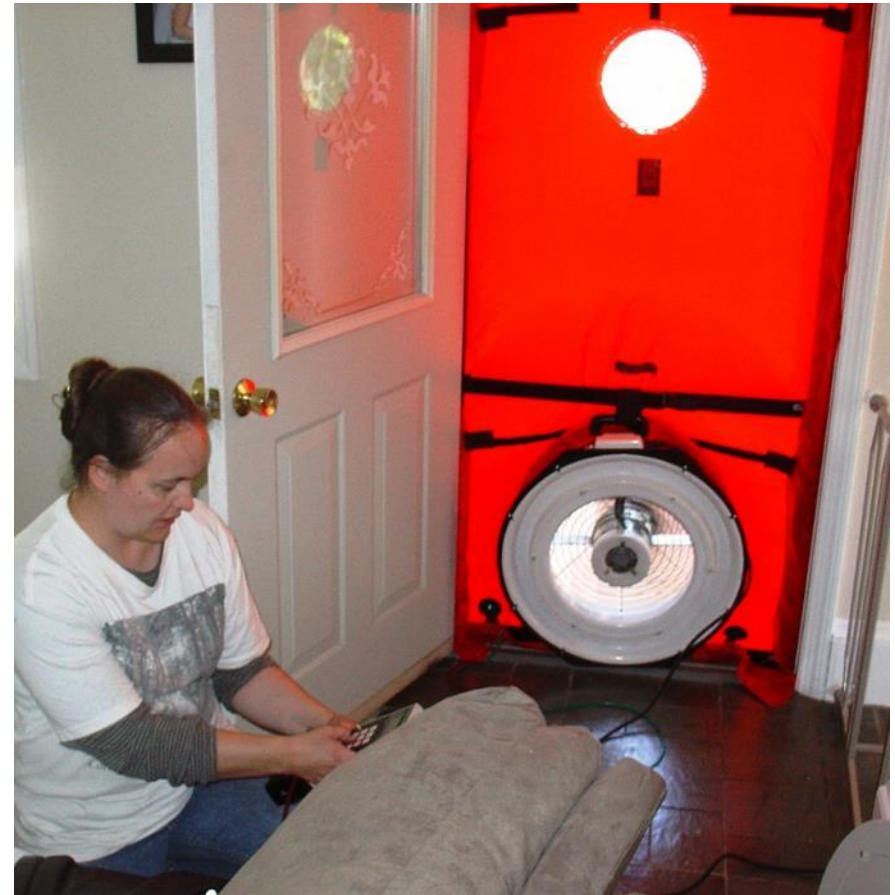
Comprehensive, whole-house energy assessment

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



Blower Door

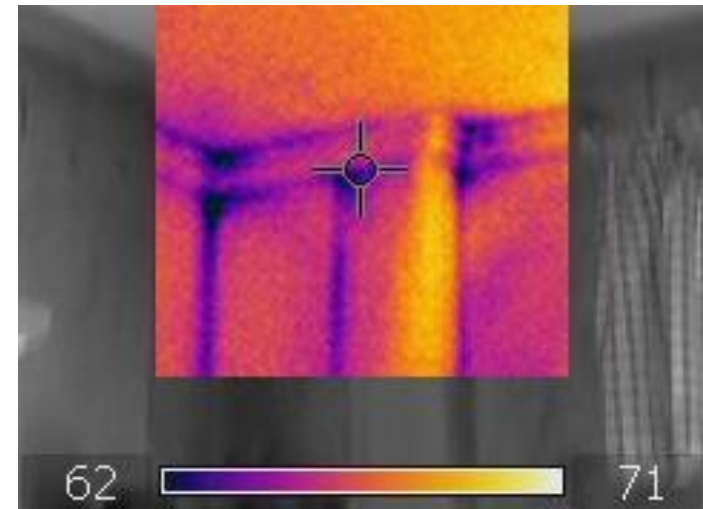
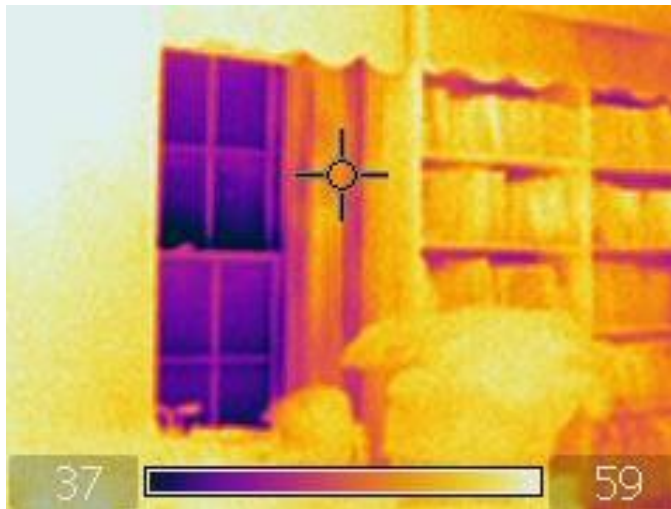
- Measures *amount* of air leakage: CFM₅₀
- Identifies *sources* of air leakage
- Determines air ventilation rates
- Prioritizes air sealing opportunities
- Confirms amount of air sealing accomplished



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



Home Energy Improvements

Improvement Services

- Air sealing
- Insulation
- Heating system improvements
- Moisture control and ventilation



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
- NHTSaves qualified residential contractors



NHSaves Existing Homes- Home Performance with ENERGY STAR

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 \$4,000
- Low or no interest financing may be available



EVERSOURCE

 Liberty Utilities

 NEW HAMPSHIRE
Electric Co-op
A Touchstone Energy
Cooperative

 Unitil



NHSaves.com “Test Your Home”

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 Touchstone Energy Cooperative

Unitil

NHSaves- Home Heating Index Calculator

NHSAVES

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Test Your Home

Step 1: Your Home

What is your zip code?

03246

What is the [conditioned square footage](#) of your home?

2000

Step 2: Your Energy Use

Enter the amount of **fuel used to heat your home** for 12 months.

Annual Usage

Electricity kWh (Only if used for heating)

Natural Gas Therms

Propane Gallons

Heating Oil Gallons

Kerosene Gallons

Wood Full Cords

Wood Pellets Tons

Coal Tons

Calculate

Reset



Home Heating Index Results: 8+ ✓

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Your Home Heating Index: 11

Your home may be a good candidate for weatherization services.



Legend

0 - 3	Zero Energy Home
4 - 6	Energy Efficient Home
7 - 8	Code Compliant Home
9 - 15	Room for Improvement
15+	Inefficient Home

Sign-up for a Home Energy Audit - 2 Easy Steps!

1. Complete and print an [enrollment form](#). For more information about our energy audits and weatherization program, click [here](#).
2. Obtain 2 years of heating fuel bills. Send copies of bills with completed enrollment form to the address at the bottom of the enrollment form.



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



*Weatherization
Works*



New Hampshire 
2-1-1TM
Get Connected. Get Answers.
An initiative of Granite United Way



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



Summary

- Know about your energy use and savings opps.
- Air seal first: A-B-C
- Add insulation where you can
- Keep your home safe
- Utilize NHSAVES energy efficiency resources



Thank You

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

To host a workshop in your community contact:
Robbin Adams (603) 536-5030
<robbin@plymouthenergy.org>

Support future workshops ...let your utility know

Visit www.plymouthenergy.org for a copy of the presentation

