



# Your Home Energy Audit

## Home

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## Audit Date

Apr 3, 2018  
09:00 am

## Audited By

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## HEAT Squad

110 Marble Street  
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Office: (802) 438-2303



Thank you for having me in your home and allowing HEAT Squad to help make your home more energy efficient.

As you will see in this report there are many opportunities to save money and be more comfortable in your home. A comprehensive energy retrofit has benefits beyond fuel savings such as increased building durability and increased comfort. Please consider these recommendations and look into low interest NeighborWorks financing to help make these recommendations an affordable reality!

Please let us know how we can help you moving forward.

## Inside Your Report

- Cover
- Concerns
- Solutions
- Upgrade Details
- Financing
- Metrics



## We listened to you!

As our client, we want to make sure we are addressing all of your concerns for your home. If we have missed any concerns in this report, please let us know right away.

# Concerns

## Save Money

Reduce fuel usage and lower your energy costs.

## Increased Comfort

## Lower Your Carbon Footprint

## Project Cost - \$1,635.60 Incentives

If you complete all of the air sealing and insulation measures outlined in the following report you will be eligible for the estimated Efficiency Vermont Incentives listed above. If you change the workscope or reduce the amount of work completed, you will likely receive less incentive money.

In order to receive any incentives, the project must get at least a 10% reduction in air leakage as measured by the HEAT Squad follow up blower door test. Additionally, any health and safety issues would need to be addressed and remedied before incentives are approved.

Check [www.encyvermont.com](http://www.encyvermont.com) for a comprehensive list of all available rebates and incentives.



# Solutions for Your Home

Call us today to ask a question or discuss the next step!

## Totals

### Approximate Cost

\$ 13,400

This is a ballpark guess. Ask your contractor for a detailed bid.

### Estimated Savings

\$1,680 per year

This is an estimate of how much you could save starting in Year 1. Savings will only increase as energy prices rise over the years.

### Impact of upgrades

Energy Reduction	37%
Carbon (CO2) Savings	7 tons
Equivalent cars removed from the road	1.5/yr

DETAILS	APPROXIMATE INSTALLED COST	APPROXIMATE ANNUAL SAVINGS
Switch to LED lightbulbs	\$ 100	\$ 60
Insulate Basement Walls	\$ 4,500	\$ 489
Insulate Crawl Space Walls	\$ 3,000	\$ 373
Airseal & Insulate Attic Flat	\$ 2,900	\$ 289
Reduce Air Leakage by 25%	\$ 500	\$ 194
Upgrade Water Heater	\$ 2,400	\$ 275
Heat Pumps and Solar		



## LIGHTING

### Approximate installed cost

\$100

### Energy Savings

Approx. \$60

### Why it matters

Replacing incandescent bulbs with LEDs will save significant energy and replacement costs over time.

# Switch to LED lightbulbs



Replace incandescent light bulbs that are used more than an hour per day with LED bulbs. These bulbs typically reduce lighting energy use by 75%. The technology has come a long way in recent years and LED's now offer a broad spectrum of warm light and are dimmable. There is an LED option for virtually every style of bulb out there.

Buy your bulbs in Vermont to take advantage of Efficiency Vermont's outstanding rebates. With these rebates most bulbs cost less than \$5 a piece.



## BASEMENT

### Approximate installed cost

\$4,500

### Energy Savings

Approx. \$489

### Why it matters

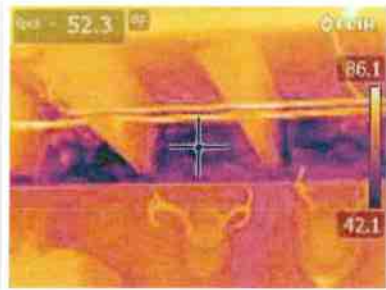
Insulating your basement walls will increase the overall temperature of your basement and make the floors above more comfortable. If heating systems are located in the basement the systems will function more efficiently. This is the most often recommended weatherization measure due to its relative simplicity, and high return on investment.

# Insulate Basement Walls



Spray foam insulation on the interior surface of at least the top 4' of basement walls or a minimum 2' below foundation exposed to the exterior where possible.

Any exposed foam must include a 15 minute ignition barrier.



Remove existing fiberglass if present in box sills and replace with either spray foam or rigid foam. If rigid foam is utilized, care should be taken to assure complete air sealing of box sills and top plate(s).



By insulating the interior of your foundation, you will be able to eliminate tremendous amounts of heat loss that can be seen in this IR images from the outside.



# Insulate Crawl Space Walls

## CRAWL SPACE

**Approximate installed cost**

\$3,000

**Energy Savings**

Approx. \$373

## Why it matters

Insulating your crawl space will increase the overall temperature of the space and make the floors above it more comfortable. Crawlspace can be improved by sealing off any vents to the outside, insulating the foundation walls, and installing a vapor barrier on top of the dirt floor. Any heating or water lines will be better protected from freezing.



Spray or install rigid foam insulation on the interior surface of crawlspace walls. Any exposed foam must include a 15 minute ignition barrier. There are some instances where insulation can be installed to the exterior surface of the foundation and should be protected from incidental damage and the sun.



Moisture issues must be addressed prior to reducing air infiltration. All exposed earth or wet crawlspace floors should have a sealed vapor barrier to prevent moisture caused mold and structural damage. The vapor barrier should be protected from damage in areas of foot traffic. If the crawlspace has significant water infiltration other

treatments may be required to keep or get the water out of the basement such as gutters exterior drainage or interior French drains and sump pumps.



# Airseal & Insulate Attic Flat

## ATTIC

Approximate  
installed cost

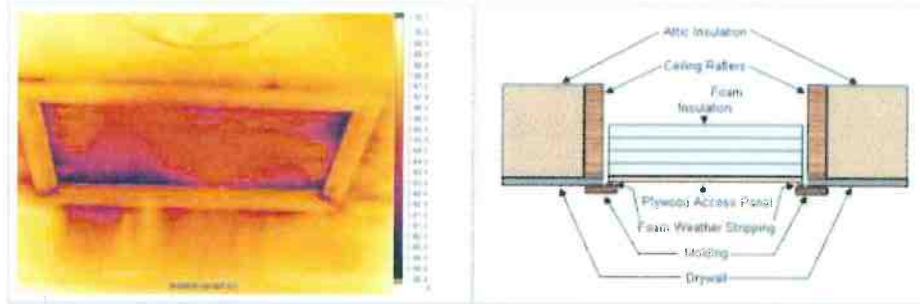
\$2,900

Energy Savings

Approx. \$289

## Why it matters

Adding insulation to your attic can lead to a significant reduction in your energy costs. This process will be combined with careful air sealing of the attic to ensure the new insulation performs at its maximum level.



Openings used for access to the attic such as hatches and scuttles, doors into knee walls, and drop-down stairs should be air sealed and insulated.



Any attic work must first start with creating a comprehensive air barrier along the attic floor. In many homes, especially older homes with plaster and lathe, the best way to fully seal the attic flat is with a continuous layer of closed cell spray foam.



A thick blanket of cellulose can be installed after air sealing to bring your attic to the R50 energy code and beyond. Cellulose is a recycled newspaper product and is treated to be both fire and rodent resistant. The image on the left is your attic and the image on the right is what your attic might look like after an insulation upgrade project.



# Airseal & Insulate Attic Flat

## ATTIC

Approximate  
installed cost

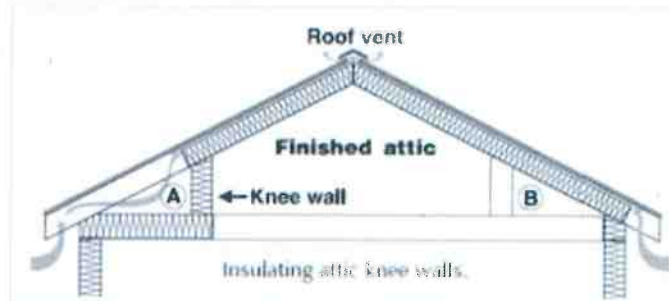
\$2,900

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### Why it matters

Adding insulation to your attic can lead to a significant reduction in your energy costs. This process will be combined with careful air sealing of the attic to ensure the new insulation performs at its maximum level.



Knee walls are vertical walls with attic space directly behind them. They are often found in houses with finished attics,

dormer windows, or above a garage areas. The knee wall should be conditioned to the same values as an exterior wall. In many cases, the insulation can be moved from the floor and wall (A) to the underside of the roof deck (B), as can be see in the image on the left. This is often done with spray foam insulation, like the image on the right.



**Skylight Shafts:** Skylight shaft walls should be insulated to the same R-value as other exterior walls if the attic they pass through is not insulated.





## AIR LEAKAGE

### Approximate installed cost

\$500

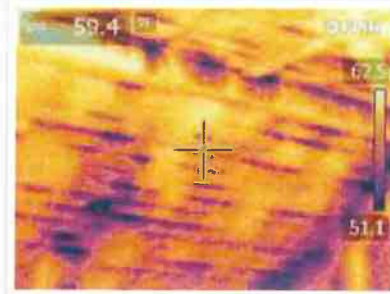
### Energy Savings

Approx. \$194

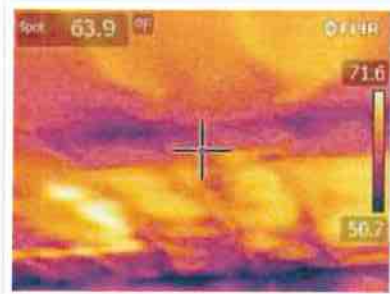
### Why it matters

Air sealing is typically the most cost effective improvement you can make to your home. What ends up having the most profound impacts on reducing air leakage rates are retrofits to entire sections of your home's thermal boundary. Installing or establishing air barriers in attics, sloped ceilings, kneewalls, basements, and crawlspaces where none is present will dramatically increase the comfort of your home and help you save significant energy.

# Reduce Air Leakage by 25%



Your home is very leaky, as measured by the blower door test. Your blower door number was **4500 CFM50** and that equates to you heating the volume of air in your house **19.5 times a day**. To put that in context, the average Energy Star home is measured at 8 air changes a day.



Your extremely high air leakage rate is less about specific areas of leakage and more a result of systemic thermal boundary and air barrier flaws in the building envelope. There was never any intention when the home was built, 100 plus years ago, for the home to be airtight. There is no house wrap, no blocking, open interior wall tops, etc. There is no air barrier in the attic space, the exterior walls are not air tight (and largely empty), and the basement is very leaky as well.

What ends up having the most profound impacts on reducing leakage rates are systemic retrofits to entire sections of your home's thermal boundary when completed by a BPI certified Home Performance Contractor. Installing or establishing air barriers in attics, sloped ceilings, kneewalls, basements, and crawlspaces where none is present is the way to most effectively reduce your home's air exchange.



## AIR LEAKAGE

**Approximate  
installed cost**

\$500

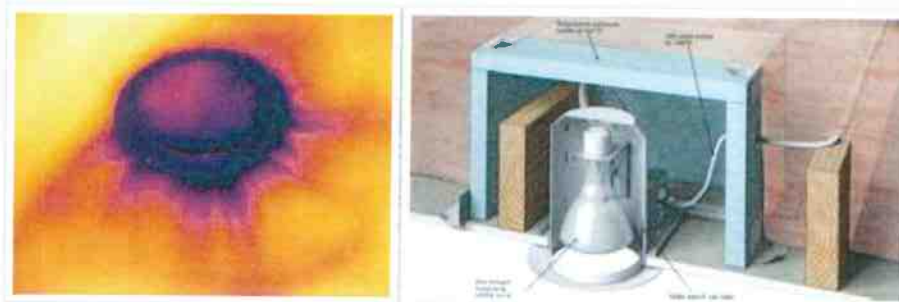
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# Reduce Air Leakage by 25%



Air leakage at Can Lights and  
typical solution



## WATER HEATER

### Approximate installed cost

\$2,400

### Energy Savings

Approx. \$275

### Why it matters

High efficient hot water heaters save energy and are safer due to carbon monoxide. Older units run the risk of leaking. Consider replacement if your hot water heater is 13 or more years old.

# Upgrade Water Heater



Install a heat pump hot water heater, like the Rheem Performance Platinum, Bradford White Aerotherm, or a similar model by another manufacturer. These units look like a traditional hot water heater (with the heat pump unit on top) and create hot water at 250% -310% efficiency. These units are estimated to use 1416 kWh annually (for an average size family). Based on current Vermont electrical costs, that is only \$182 annually.

These units also dehumidify at these same high efficiencies, so if you run a traditional dehumidifier (even an Energy Star one) there are significant additional electrical savings that are not reflected in the savings number above.

Limited Time Offer of up to \$500 on all sizes of qualifying Hybrid Heat Pump Water Heaters through June 30th, 2018.



CUSTOM

Approximate  
installed cost

Why it matters

## Heat Pumps and Solar



Install a cold climate heat pump, like the Mitsubishi Hyper Heat or similar models from Daikin or Fujitsu. These units are specifically designed to perform even in our extreme cold climates in Vermont. The units also cool and dehumidify – all at these same high efficiencies. Mini-Splits can operate at

optimum efficiency down to 10 degrees F, and will continue to generate heat (albeit at a slightly reduced efficiency) down to -13 F (this number can vary slightly depending on the brand and model). Your existing heating system will serve as a backup when temps fall below this threshold.

The savings here are based on the heat pump(s) taking over 50% of your heating load. More heat pumps would lead to more savings.

The HVAC contractor we recommend can provide more specifics on sizing and location to optimize your comfort and the unit's efficiency.



**Solar Power**  
If you were to install solar panels to offset the new electrical demands for your home

that will have 50% of the heating needs provided with a Cold Climate Heat Pump, you would likely need to install roughly a 9 KW system.

So, after you have completed the measures in this report to reduce your energy consumption, the next step to reduce your carbon footprint would be design heat pumps and solar to fit your needs. The



CUSTOM

**Approximate  
installed cost**

**Why it matters**

# Heat Pumps and Solar

Installation of a heat pump unit that might offset 50% of your heating needs would likely cost around \$4,500 and save you \$269 a year in heating costs. The installation of a 9 KW solar array might cost around \$22,000 and save you approximately \$1,500 a year in electrical charges.



## About financing

The loan scenario(s) listed are examples only and are not a formal offer of financing. Rates, terms and closing costs and eligibility requirements may vary.

# Financing

## Energy Loan

### THE MATH

Job Cost	\$13,400
Cash down and/or Incentives	\$ 1,636
Loan amount	\$ 11,764
Your loan payment: 4.99 % @ 120 months	\$ 125
Estimated energy savings	\$ 140
Net Monthly Savings	\$ 15

### TERMS & CONDITIONS

Minimum Loan	\$ 2,500
Maximum Loan	\$ 40,000
Min. Cash Down	\$ 0
Rate	4.99 %
Term	120 months
Min. FICO Score	620
Closing costs	250

### DESCRIPTION

Can be used for Thermal Shell improvements, Weatherization, Heating and Ventilation, Heat pump Technology Energy Efficient Appliances and Renewable Energy. Rebates are estimated

**Amanda Moore:** [amoore@nwwwvt.org](mailto:amoore@nwwwvt.org) (802) 797-8106



## About the metrics

These metrics are for the whole house in a pre and post-retrofit state.

The 'Baseline' savings numbers will likely not be the same as the actual energy consumption of the home. These numbers are weather normalized and then projected based on the Typical Meteorological Year for the past 30 years (TMY30). In other words, this is the energy consumption of the home for a typical year, not the year that the utility bills were from.

# Metrics

FUELS	BASELINE	IMPROVED	SAVED
Total Fuel Energy Usage <small>therms/year</small>	1,986	1,253	733
Propane Energy Usage <small>gallons/year</small>	85	85	0
Oil Energy Usage <small>gallons/year</small>	1,363	839	524

METRIC	BASELINE	IMPROVED	SAVED
Electric Energy Usage <small>kWh/year</small>	7,101	4,242	2,859
Total Energy Usage <small>MMBtu/year</small>	223.00	140.00	83.00
Fuel Energy Cost <small>\$/year</small>	\$ 3,401	\$ 2,210	\$ 1,191
Electric Energy Cost <small>\$/year</small>	\$ 1,216	\$ 726	\$ 490
Total Energy Cost <small>\$/year</small>	\$ 4,617	\$ 2,936	\$ 1,681
CO2 Production <small>Tons/year</small>	18.9	11.8	7.1
Payback <small>years</small>			7
Total Energy Savings			37%
Total Carbon Savings			38%
Net Savings to Investment Ratio <small>SIR</small>			2.2
Net Annualized Return <small>MIRR</small>			9.0%

## HEATING & COOLING LOAD CALCULATIONS

Heating Load <small>Btu/hr</small>	Base: 92,228	Improved: 62,831
Cooling Load: Sensible <small>Btu/hr</small>	Base: 33,159	Improved: 28,338
Cooling Load: Latent <small>Btu/hr</small>	Base: 800	Improved: 800
Winter Design Temperature	Outdoor: -6°	Indoor: 70°
Summer Design Temperature	Outdoor: 86°	Indoor: 75°