



**MGC ENERGY AUDITS**  
MIDCOAST GREEN COLLABORATIVE  
P.O. Box 84  
DAMARISCOTTA, ME 04543

SAMPLE  
Home  
100 Main Street  
Edgecomb, Maine 04556

# ENERGY AUDIT REPORT

**I. Potential first year energy savings:            \$2,927            74%**

## II. Your Building

A. Heated living space

1. Floor Area: 2925 Square feet

2. Volume: 23400 Cubic Feet

B. Number of Occupants: 2

C. Number of Smokers: 0

D. Date of audit: Wednesday, July 07, 2010

10:34 AM

E. Conditions at time of audit:

1. Indoor temperature: 81 °F

2. Outdoor temperature: 84 °F

3. Relative humidity 76 %

4. Dew Point 72.6 °F

5. Wind speed 5 MPH

6. Barometric pressure 30.00 inches of Hg.

E. Solar Orientation of southern wall of house: 208 degrees. 28 degrees off true.

F. Surface area of house 6585 square feet.

G. Surface area of windows: 521 sq. feet

H. Ratio of window area to floor area (heated): 8.52%

I. Ratio of South facing window area to floor area (heated): 3.15%

J. Building Shape Efficiency 69.8% Building Volume Efficiency 26.4%

## III. Energy Use (per year)

A. **Total purchased energy:** BTUs: 202,926,400 Cost: **\$2,647.66**

B. **Primary heating:** Furnace (hot air) Fuel: Oil Price: **\$2.70**

Used: 940.0 Gallons Efficiency: 85.0% BTUs: 130,660,000 Cost: **\$2,538.00**

C. **Secondary heating:** Boiler (hot water) Fuel: Softwood Price: **\$150.00**

Used: 2.5 Cords Efficiency: 75.0% BTUs: 37,500,000 Cost: **\$375.00**

D. **Tertiary heating:** Heat Pump, water Fuel: Electricity Price: **\$0.16**

Used: 0.0 kWh Efficiency: 98.0% BTUs: 0 Cost: **\$0.00**

E. **Electricity use:** 7200 kWh BTUs: 62,066,400 Cost: **\$1,512.60**

F. Total Carbon Dioxide (CO<sub>2</sub>) produced: **37,322** pounds per year.

G. Improvement trends (change from previous year):	Heating Energy:	Total Energy	
Figures are adjusted for	2009-2010	3.5%	3.0%
weather (degree-days).	2008-2009	14.4%	14.7%

H. The house used 34% less fuel than the calculations predict. All numbers in the sections below reflect the calculated values.

I. Solar Energy:

1. Active Thermal (solar heat panels)	0 BTU per year						
2. Passive Thermal (windows)	8,039,212 BTU per year						
3. Solar Electric (photovoltaic (PV))	0 BTU per year	0 kWh / year					
4. Total Solar	8,039,212 BTU per year	3.4% of all energy					
1. January	73%	2. February	77%	3. March	77%	4. April	82%
5. May	81%	6. June	78%	7. July	78%	8. August	80%
9. September	68%	10. October	72%	11. November	73%	12. December	74%

c. Rooftop (separate reading taken from the roof)

1. January	89%	2. February	90%	3. March	89%	4. April	92%
5. May	92%	6. June	89%	7. July	90%	8. August	91%
9. September	84%	10. October	88%	11. November	89%	12. December	90%

d. Photovoltaic (rooftop reading adjusted for PV panel characteristics)

1. January	81%	2. February	84%	3. March	84%	4. April	87%
5. May	89%	6. June	88%	7. July	89%	8. August	90%
9. September	83%	10. October	84%	11. November	81%	12. December	83%

K. Comparing your house with other houses:

7494 Degree days per year here (for Portland, Maine).

1. Your house currently uses:	27,079	BTU / Degree Day
2. With the improvements suggested:	9,790	BTU / Degree Day
3. Average of our audited houses	28,572	BTU / Degree Day
4. Energy efficient house	7,000	BTU / Degree Day
5. Passivhaus Standard	1,856	BTU / Degree Day
6. Prototype extremely efficient houses:	2,200	BTU / Degree Day

## IV. Heat Losses

	<u>BTU / year</u>	<u>% of total</u>	<u>Cost / year</u>	<u>Savings, 1st year</u>
<b>1. Walls</b>				
A Walls, Main	7,812,899	3.4%	\$135.34	\$75.70
B Walls, Addition	4,858,247	2.1%	\$84.16	\$0.00
C Walls, Family	2,662,973	1.2%	\$46.13	\$0.00
<b>Subtotal</b>	<u>15,334,120</u>	<u>6.7%</u>	<u>\$265.63</u>	<u>\$75.70</u>
<b>2. Attic &amp; Roof</b>				

F	Attic, Main	27,396,213	11.9%	\$474.58	\$356.50
G	Attic, Addition	3,062,234	1.3%	\$53.05	\$36.71
H	Attic, Family	323,171	0.1%	\$5.60	\$2.89
	<b>Subtotal</b>	<b>30,781,617</b>	<b>13.4%</b>	<b>\$533.22</b>	<b>\$396.10</b>
<b>3. Basement</b>					
M	Basement Ceiling, Addition	20,421,569	8.9%	\$353.76	\$324.72
O	Foundation, exposed, Main	9,265,268	4.0%	\$160.50	\$148.08
R	Foundation, buried, Main	9,514,213	4.1%	\$164.81	\$156.15
U	Slab, Main	25,446,887	11.1%	\$440.81	\$109.57
W	Slab, Family	18,984,884	8.3%	\$328.87	\$244.11
	<b>Subtotal</b>	<b>39,201,050</b>	<b>17.1%</b>	<b>\$679.07</b>	<b>\$628.95</b>
<b>4. Utilities</b>					
ZA	Pipes, 3/4" Heating pipes	5,131,586	2.2%	\$88.89	\$78.01
ZC	Ducts,	19,607,165	8.5%	\$339.65	\$294.71
	<b>Subtotal</b>	<b>5,131,586</b>	<b>2.2%</b>	<b>\$88.89</b>	<b>\$78.01</b>
<b>5. Windows &amp; Doors</b>					
ZE	Windows (South facing)	4,755,123	2.1%	\$82.37	\$49.66
ZF	Windows (other directions)	5,162,724	2.2%	\$89.43	\$81.73
ZG	Skylights	946,054	0.4%	\$16.39	<b>-\$0.22</b>
ZH	Doors	816,657	0.4%	\$14.15	\$2.42
	<b>Subtotal</b>	<b>11,680,558</b>	<b>5.1%</b>	<b>\$202.34</b>	<b>\$133.58</b>
<b>6. Air Leakage and Ventilation</b>					
ZI	Infiltration	63,519,532	27.7%	\$1,100.34	\$637.78
ZJ	Ventilation				\$328.39
	<b>Subtotal</b>	<b>63,519,532</b>	<b>27.7%</b>	<b>\$1,100.34</b>	<b>\$966.17</b>
<b>H. Total</b>		<b>229,687,399</b>	<b>100.0%</b>	<b>\$3,978.83</b>	<b>\$2,926.91</b>

Note: **Negative** numbers above indicate that heat gains through windows exceeds heat losses.

## V. Infiltration Analysis:

LBL Infiltration Factor 12.24

- A. Air changes per hour at 50 pascals of pressure: 10.19 ACH50
- B. Cubic feet per minute air flow through blower door 3,974 CFM50
- C. Natural House air exchanges per hour 0.83 ACH(natural)
- D. Natural air flow (Cubic feet per minute) 324.71 CFM(natural)
- E. You can safely reduce air leakage by: **58%**  
(and stay within ASHRAE Standard Guidelines) without the need for ventilation.
- F. Equivalent leakage area: 356.9 square inches 2.48 square feet (CGBS)
- G. Every square inch of this that you can plug for less than \$0.00 is worth doing.
- H. Recommended Ventilation: None needed

Until sealing is done, no decision should be made on the need for mechanical ventilation.

## VI. Recommendations:

A. Our recommendations below are presented in order of logical progression and in what we predict will be a decreasing order of return on investment. We try to give as many recommendations as possible, with an eye toward achieving a maximally efficient house. Some recommendations may not currently meet the general guideline of the cost not exceeding seven (7) times the projected first year savings, but might in the future if fuel prices rise (or if the work is combined with other maintenance or renovations). All savings numbers are given in terms of a single year at fuel prices at the time of the audit (see above).

1 **Fix Issues.** Replace cracked window panes. Install a vapor barrier plastic sheet over the open dirt in the basement. Keep windows in the basement closed at all times (unless the dew point is likely to be below the basement temperature for an extended period).

Savings: **unknown**

2 **Lower Water Temperature.** Lower the the temperature of the hot water heater to 120°F.

Savings: **\$19**

3 **Remove window screens in the winter.**

Savings: **\$33**

4 **Seal air leaks.** Air leaks were marked with removable painter's tape during the audit (Representative leaks are marked). In addition to the locations marked, the following should be addressed:

- i All penetrations of the attic ceiling, best done with expanding foam insulation.
- ii All penetrations of the basement ceiling, expanding foam insulation.
- iii In particular, seal the area surrounding the chimney whenever it passes through a surface (floor or ceiling). High temperature materials are required.
- iv Seal all leaks in the space between floors, around the perimeter of the building. This can be done by either filling the entire space between floors with an air tight insulation, or doing so only at the wall with methods such as the bag trick (see our website).
- v Plug up any unused (either temporarily or permanently) chimneys or fireplaces.
- vi All outlets and switches should have foam gaskets installed behind the wall plate. Childproof caps should be used in all outlets not currently in use.
- vii The attic hatch should be made such that it closes firmly against the jam, and then that gap should be weatherstripped.
- viii All intersections between dissimilar materials (for examples brick and wood) should be sealed with caulk.
- ix Get pulley covers for any weight and pocket windows. Or remove altogether, and fill the space where the weights were with low expanding foam insulation.
- x Seal any gaps above the inside of the closet doors.
- xi Replace recessed lights with lights that can be sealed (either IC rated recessed lights or fixtures within the living space). Alternatively the lights can be insulated by making a box at least 2" inches away from the lights, and insulating and sealing that.

Savings: **\$638** For 7 years: **\$4,464** Per square inch: **\$0.00**

5 **Insulate hot water pipes in the basement.** We recommend at least 5/8" thick ozone friendly foam pipe insulation, sized to snugly fit the pipes.

Savings: **\$78** For 7 years: **\$546** Per linear foot: **\$1.30**

- 6 **Insulate heating ducts.** The heating ducts in the basement should be sealed (with duct mastic, not duct tape) and insulated. This will ensure that heating gets to the proper place in the house.

Savings: **\$295**      For 7 years: **\$2,063**      Per linear foot: **\$19.65**

- 7 **Insulate basement ceiling.** After air sealing is done, and a vapor barrier added against the bottom of the floor above. Insulation should be added to fill the area between the joists.

Savings: **\$325**      For 7 years: **\$2,273**      Per square foot: **\$7.58**

- 8 **Further insulate the attic.** After the air sealing has been accomplished in the attic, a vapor barrier should be added, and then insulation added to bring the total up to at least 20" (R-60).

Savings: **\$396**      For 7 years: **\$2,773**      Per square foot: **\$1.21**

- 9 **Install interior storm windows.** The windows and sky lights will benefit from having interior storm panels installed. These are available finished, in kit form, or can be made at home from instructions on our website:

[http://www.midcoastgreencollaborative.org/Documents/storm\\_pamphlet.pdf](http://www.midcoastgreencollaborative.org/Documents/storm_pamphlet.pdf)

Savings: **\$101**      For 7 years: **\$705**      Per square foot: **\$1.35**

- 10 **Insulate exterior walls.** The uninsulated walls should have cellulose insulation blown into them either from the outside or inside (which ever is more convenient).

Savings: **\$76**      For 7 years: **\$530**      Per square foot: **\$0.75**

- 11 **Continue air sealing and add heat retaining ventilator (HRV).** Air sealing beyond the amount recommended above will necessitate adding fresh air. This is an opportunity to use an HRV to supply that air while maintaining 85% of the heat in it.

Savings: **\$328**      For 7 years: **\$2,299**      Per square inch **\$0.00**

## VII. Additional Recommendations

- A. These recommendations may not meet seven year payback, however they can be worth doing if, for instance, work is already being done in the area, for comfort reasons, or for ethical or environmental considerations.
1. If air sealing is done such that the 58% figure is exceeded then in order to ensure continued healthy indoor air an HRV is likely to be required to bring in fresh air while retaining up to 85% of the heat in the outgoing air.
  2. All surfaces which are insulated should have a vapor barrier on the inside (warm side). For existing installations, the easiest way to do this is to use a vapor barrier paint on the surface (e.g. BIN).
  3. The exterior walls could have insulation added. If other renovation is being done, such as residing, or removal of interior wall surfaces, extra insulation should be added to the walls.
  4. Whenever insulation is being put into a previous empty cavity ensure that there is no exposed or know and tube wiring. This could be a fire hazard.

## VIII. General Recommendations

Materials

**Caulk:** For best performance select a caulk based on expected lifetime; 25-30 year caulk is available. For exteriors, non-paintable caulk is generally best. For interiors, either paintable or clear caulk depending on the surfaces which it will bridge. At the moment these recommendations mean that silicone or siliconized acrylic latex are the best ready available options. Caulk should be worked in with a tool or finger to ensure a good bond and proper shape and appearance.

**Backer Rod:** For spaces where caulk is needed, and the gap exceeds 1/4", backer rod is recommended. This is a foam rod which is used to fill the space, to reduce the amount of caulk required and to ensure that it forms the proper profile.

**Foam Sealant:** For holes which will see no movement between the various components, expanding foam sealant is often the best option. The proper amount of expansion can be purchased depending on the job; low expansion for doors and windows (to avoid warping the frame and impeding closure), Large expansion for big holes, and normal for the rest. The stuff is sticky beyond measure, and care, gloves, safety glasses and old clothes are recommended. It also helps to identify sufficient areas which need fixing in order that an entire can is used all at once; it does not keep, as the straw gets filled with hardened product. Great Stuff® and Pūr® are two brands.

**Plastic Sheeting:** For vapor barriers, 6 mil Polyethylene sheets are sufficient. For spaces (such as crawl spaces) which may see hard use or foot traffic thicker is recommended.

#### A. Windows

1. In the Fall, clean your windows, and all surfaces where they meet.
2. In the Fall, remove all screens, and air conditioners. They reduce the passive solar gains by as much as 30% for screens and 100% for air conditioners.
3. Close all windows and lock them shut, when you turn on your furnace.
4. Keep basement windows closed at all times, except when the basement is wet and the weather is very dry (dew point below 50°).

#### B. Doors

1. Weatherstrip all doors (including the door to the basement and the hatch to the attic).
2. Install storm doors on doors without them.
3. Cover doors unused in the winter with insulation or heat shrink plastic.
4. Bulkhead doors are huge energy losers. They leak air, and heat. Seal them tight, and insulate.

#### C. Electric Usage

1. Replace all incandescent bulbs with compact fluorescent bulbs. They are available in large and small versions, flood lamps, 3 way, dim-able, or almost anything you need. They have a return on investment of around 300%
2. Eliminate or reduce phantom appliance loads. Standby-mode, plug-in transformers use electricity even when the appliance is "off".
3. Turn off computers when not in use. Set the energy saving "power options" to suit your needs
4. Put any plug containing a transformer (heavy cubical plugs) on a power strip, and switch it off, or unplug them when not in use
5. Clean out dryer vents regularly to ensure that they close when not in use.
6. Post a graph or list of monthly electrical usage where all household members can see it.

#### D. Heat Energy Usage

1. Get your boiler or furnace serviced every year.
2. Get your chimney examined and cleaned every year.
3. Set the thermostat down several degrees while you sleep and when you are away or or install a programmable thermostat that will do this for you. You can save up to 2% of your heating energy for every degree of setback.
4. Replace the filter on you furnace at least every few months. Clean the fuel filter on your furnace or boiler regularly (as per manufacturer's instructions)

#### E. Cooling Energy Usage

1. When the outside air is warmer than the desired inside temperature, close all the windows. When the temperature inside is too warm and the outside is cooler, open some windows. Open windows, low on the windward side of the house for incoming air, and windows high on the leeward side of the house for outgoing air. Open twice as much window area for incoming air as outgoing air.
2. Turn off all unneeded electrical appliances. (see electrical usage suggestions).
3. Use fans aimed at human bodies to promote evaporate cooling. Don't leave fans running in unoccupied rooms (it will make them hotter).
4. Reduce activities which produce steam, showering, cooking, etc. Use covers on pots.
5. Ceiling fans should be set to direct air downward (in summer; in winter, the opposite).
6. Use the microwave instead of the stove when possible.
7. Put air conditioner in a shaded (north) window, and only run it with all windows shut.

#### F. Hot Water Energy Usage:

1. Reduce the tank temperature to 120°F. Savings: \$19
2. Close the tub-drain while showering; drain the water only after it has cooled; the still warm water will help heat your house (cool weather only of course).
3. Wrap your tank water heater in insulation. A kit is often available for the asking from your utility. Also available at the hardware store.
4. Wash clothes in **cold** water. With proper detergents, clothes will get just as clean.
5. Regularly check (or have checked) the sacrificial anode rod in your hot water tank, and replace it if needed
6. Regularly release a bucket or so of water from the bottom of your water tank, to clean out sediment which settles there. Let it cool down before dumping it.
7. Reduce the use of hot water.

#### G. Water Usage:

1. Turn off water while shaving, brushing teeth, etc.
2. Avoid using a garbage disposal. They significantly reduce the life of your septic tank and leach field. Compost your kitchen waste instead.
3. Consider a composting toilet, or at least a low volume toilet, to conserve water. Flush toilets are the biggest water wasters in a house

#### H. Composting and Recycling

1. You will save energy because recycled materials take less energy to make than new.
2. You will save energy because less waste will have to be trucked away.

3. You will save tax money because it costs over \$90 per ton to process solid waste.
4. You will save on oil based fertilizers when using compost in the garden.

If you have any questions about this report, you can reach us at:

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