



Energy Audit: the First Step to Saving Energy and Money

by Amy Ellsworth

According to the American Council for an Energy Efficient Economy, each year in the U.S. about \$13 billion worth of energy – in the form of heated and cooled air – escapes through holes and cracks in residential buildings. An energy audit of your home can help you to identify areas where energy – and money – are being wasted.

There are several professional energy auditors in the Front Range that can perform this service for you. A professional auditor or home energy rater can provide you with detailed information and a prioritized list of your most cost effective investments in energy efficiency. If an energy audit isn't in your budget, or if you're a diehard do-it-yourselfer, you can get a pretty good idea of your home's energy leaks with a diligent walk through, a pencil and paper, and some online tools.

Step 1: Getting Ready

Compare your home to other homes in the region. In the Front Range, an average single family home uses between 700 and 1,000 kWh of electricity per month. Before starting on your home energy audit, collect copies of a year's worth of your utility bills. If you don't save old bills, you can call your utility company and request them for the past year. For Xcel customers, call customer service at 1-800-895-4999.

As you investigate each aspect of your home's energy use be prepared to take notes of areas that feel drafty, the number and type of doors and windows (single paned or double-paned), the number of lighting fixtures in each room, the location of ducts, the settings on your thermostat, the number and type of home electronics and office equipment, and an estimate of the amount of time each is used. As you go through each step of the audit, take detailed notes.

Step 2: Locate and Seal Air Leaks

Plugging air leaks around your home is easy to do, can save between 5% and 30% on your energy costs, and will make your home much more comfortable. With paper and pencil in hand, carefully inspect the areas throughout your home where air leaks (drafts) are most likely to occur. The most common areas are around windows and doors, electrical outlets and switch plates, gaps along the baseboards or edge of the flooring, fireplace dampers, attic hatches, and along the junctures of the



Make sure that you have the correct settings on your thermostat.

haust fans (generally in the kitchen and bathrooms), a whole house fan, or use a large fan sealed in an open window to suck the air out of the rooms. Pass an incense stick, candle or your damp hand along the edges of potentially leaking areas and look for the smoke to waver, or for places where drafts feel cool to your hand.

Be sure to check the basement or crawlspace, attic and mechanical room. Air leaks are most common around places where pipes, ductwork, chimneys, wires and mechanical equipment come into the house. Finally, head outside to look at any areas where two different building materials meet such as exterior corners, places where siding and chimneys meet and the foundation meets the exterior siding or brick.

walls and ceiling or around pipes and wires. Make sure caulking and weather stripping are applied correctly. Look for places where you can see daylight through gaps, or feel an obvious draft. Try to rattle windows (rattling indicates the fit is not tight).

Finding leaks can be easier on a windy day, or by pressurizing your home. To do this, close all exterior doors, windows, and fireplace flues. Turn off all combustion appliances such as gas burning furnaces and water heaters, then turn on all ex-

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Step 3: Check Insulation

Once you've dealt with air leaks, insulation is a home's next best defense against heat loss and one of the most cost effective investments you can make. If your home was built before 1980, chances are good that it is under-insulated or worse, not insulated at all. It can be tricky to test insulation on your own, but a couple of simple checks can help you decide whether you need to bring in a professional insulation contractor.

The easiest place to check insulation is in the attic. It is also generally easy to add insulation in the at-

fiberglass batts, should have the R value printed on them. For blown fiberglass or cellulose, measure the depth in several places (if your attic has a floor installed, lift up the floor boards); the equivalent of R-30 in blown fiberglass should be at least 12" thick; cellulose should be 8.25." The attic hatch should also be at least as heavily insulated as the attic and weather stripped to ensure a tight seal when closed.

If possible, take a look under the attic insulation to see if there is a vapor barrier. This could be tarpaper or a plastic sheet. A vapor barrier helps to keep moisture out of insulation,

stick or screw driver. Try to get a feel for the depth of the insulation.

Recommended R-value for walls is R-19 to R-25. Ideally, the wall cavity should be totally filled with some form of insulation material. If you encounter only slight resistance, or if you don't feel anything at all, your home could be under-insulated and you should call a professional insulation contractor or energy rater to do a more rigorous thermographic inspection. If insulation is needed, blown insulation can be added to walls through small holes without removing your drywall. It's worth the cost and hassle; an under-insulated home can easily save hundreds of dollars a year on heating bills.



Inadequate insulation in the attic is a good indicator that your entire home is under-insulated.

tic since it is accessible and the cost savings can be quite good. Blown insulation is better than fiberglass batts, because of its greater coverage. In the Front Range, a minimum of R-38 is and up to R-50 is optimal.

Bring a pair of gloves, a ruler and a flashlight up to the attic with you. Take note of the type of insulation;

which can decrease its efficiency.

Check the wall insulation. This can be easily accomplished by removing an electrical outlet or light switch on an exterior wall or by drilling a small hole in a hidden exterior wall, such as inside a closet. First, turn off the power and get a flashlight. Then probe inside the wall with a chop

Step 4: Investigate Heating and Cooling Equipment

Take a look at your heating, cooling and water heating systems. Write down the basic information about your systems. Do you have a furnace or boiler? What type of fuel does it use and how is the heat distributed through the home? Write down all of the information listed on the nameplates (and energy guides if you have them) on all of your major mechanical systems (look for fuel type, efficiency rating, system capacity, year made, energy



Wrapping your water heater with an insulating blanket can save you money and energy. To see if your tank needs an insulation blanket, place your hand on the tank. If it feels warm then you need a blanket.

**Simple Steps
to Save Energy and
Money**

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Check Insulation

**Investigate Heating and
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**Inspect Appliances and
Lighting**



CFLs can save 75% of your lighting costs.

star rating, etc.). If you have a forced-air furnace, check your filters and replace them as needed (this should be done monthly during the heating season). Check to see if visible ducts and pipes are sealed and insulated. Look for dirt streaks on the ductwork, especially near seams. These indicate air leaks, and they should be sealed with mastic. Insulate any ducts or pipes that travel through unheated spaces, R-6 is the recommended minimum. If you haven't had a professional check and clean your equipment, you might want to consider it.

Next, take a look at the hot water tank. Does it have an insulating blanket? What is the temperature setting? Are all of the exposed pipes insulated? On your central air conditioning unit, check the refrigerant charge and air flow. Then take a look at the evaporator coils and blower. Are they clean? Once again, check to make sure that ducts are sealed. Remember, even if your air conditioner is efficient and in good shape, it is an expensive way to cool your home. Consider implementing some low cost alternatives to cooling your home and turn the A/C unit down or off.

For safety reasons, major modifications to your heating or cooling systems are best left to professionals. However there are several simple things you can do yourself to improve the efficiency of your heating and cooling systems and the comfort of your house. The most effective and often overlooked of these is to change your furnace filter monthly during the heating season. If your heating system is more than 15 years old, is expensive to maintain, or your heating bills are more than \$1,000 per year, you should consider replacing the system with a new, high

efficiency unit. Buying a high-efficiency model will almost certainly be cost-effective. If you weatherize and insulate your home first, you should be able to reduce your capital outlay by buying a smaller heating system. Make sure your contractor takes these factors into account.

Step 5: Inspect Appliances and Lighting

Maximizing the efficiency of household appliances is generally more about how you use and maintain them than about what they are or how much money you spent on them.

Refrigerators may be the exception; they can account for between 9 and 25 percent of a home's energy use. Because refrigerator efficiency has radically improved over the past decade, it is worthwhile to take a look at your fridge's energy use and think about whether it is cost effective to replace it.

The easiest way to measure your refrigerator's, or any other appliance's, energy consumption is with a device called a Kill-A-Watt. This is a



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The Kill-A-Watt is available for purchase or for a two-week loan at the CRC office on 17th and Walnut.

small meter that plugs into the equipment you want to test, and then into the wall. The device tells you the energy consumption of the equipment over the time period it is plugged in. A simple calculation can then tell you how much you are paying for the appliance's energy use.

Lighting can also use a significant amount of energy that is easy to reduce. Think about the lights you use most in your home. If you still have incandescent bulbs in them, it's time to change them out for compact fluorescent bulbs (CFLs), which can save 75% on your lighting costs. CFLs are three to four times more efficient than incandescent bulbs and last 10 times longer. In the last several years, the cost of CFLs has come down and their availability, variety and light quality have increased.

As you consider other household appliances (laundry, cooking, entertainment and office electronics) think about how they are used and take a look at the CRC's tips for increasing their efficiency. For example, com-

puter equipment and other electronics consume surprising amounts of energy even when they are turned off. You can reduce this "phantom" electric load by plugging these devices into a power strip with an on/off switch and turning it off when you are not using them.

Step 6: Put it all Together

Now that you have looked at all of the major sources of energy waste in your home, it's time to do your analysis. There are two online tools available to help you analyze and compare your home's energy use.

Xcel Energy's Home Energy Analyzer www.energy-guide.com/ha/HAPortalPage.asp, is easy to use and lets you compare your home's efficiency to an average home. It also breaks down how energy is used in your home and lists your top opportunities for savings.

A more rigorous energy audit tool is The Home Energy Saver, developed by Lawrence Berkeley National Laboratory (<http://hes.lbl.gov/>). This tool requires that you answer detailed questions about your home and your energy using systems, so your exhaustive notes will come in handy.

Each of these tools generates different, but complementary reports. By using both, and then comparing the reports with your notes and with the CRC's tips for "tightening up" (www.conservationcenter.org/TightenUp.htm) your home, you will start to get a very good picture of where your efforts and energy efficiency dollars are best invested. Make a list of the low-cost, easy to implement measures and set a goal for accomplishing each. Then make a second list of the higher-cost, but larger energy savings measures and start planning your longer term upgrades. By implementing the actions on your lists, you will not only save money and enjoy a more comfortable home, you will also increase your home's value and reduce your impact on the planet – not a bad day's work.

For a complete list of simple, low cost things you can do to tighten up your home and start saving money go to:

www.conservationcenter.org/TightenUp.htm

To contact Amy please send an e-mail to:

aellsworth@conservationcenter.org or call: 303.441.3278 ext. 13

More Helpful Resources:

www.conservationcenter.org, The Center for ReSource Conservation's website has useful information for homeowners, including energy efficiency tips, contractor referral lists, information on renewable energy and more. We also offer a lending library of books on energy efficiency, including *Homemade Money* produced by the Rocky Mountain Institute. You can also visit us at the office at 17th and Walnut in Boulder or call 303-441-3278.

www.xcelenergy.com or call Xcel Energy (customer service 1-800-895-4999) for a copy of the "Guide to Home Energy Savings." This 20 page booklet offers useful tips for saving energy and detailed instructions on energy efficiency measures you can do yourself.

www.eere.energy.gov/consumer/your_home/ The Department of Energy's Consumer's Guide to Renewable Energy and Energy Efficiency has an abundance of information on home efficiency, renewable energy, remodeling and design considerations, tips for renters, and more.

www.rmi.org The Rocky Mountain Institute's series, "Home Energy Briefs" includes detailed guidance on every aspect of a home's energy use and waste and can help in evaluating options for saving energy and money.

<http://www.ci.boulder.co.us/environmentalaffairs/energy/> The City of Boulder's Energy & Climate Change Portal has information on local environmental programs and incentives and links to additional Front Range resources.

www.energystar.gov Energy-Star is a government sponsored program that helps businesses and consumers locate energy efficient products and regional service contractors.

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