



# Justice in Your Home Heating Bills



Center for Earth, Energy and Democracy at IATP

**Center for Earth, Energy and Democracy at the Institute for Agriculture and Trade Policy  
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**Natural gas well:** Argonne National Laboratory Environmental Science Division, "Constraints to Natural Gas Production," accessed February 18, 2011, [http://www.evs.anl.gov/project/dsp\\_fsdetail\\_new.cfm?id=118](http://www.evs.anl.gov/project/dsp_fsdetail_new.cfm?id=118).

**Gas Meter:** Accessed February 9, 2011, [http://commons.wikimedia.org/wiki/File:Gas\\_meter.JPG](http://commons.wikimedia.org/wiki/File:Gas_meter.JPG).

**Checking Furnace:** Courtesy of the Department of Energy, National Renewable Energy Laboratory, Credit – Strand Brothers LLC, accessed January 24, 2011, <http://www.nrel.gov/data/pix/searchpix.php?getrec=15076>.

**Woman caulking:** Image by Flickr Creative Commons user St. Bernard Project, accessed February 18, 2011, <http://www.flickr.com/photos/stbernardproject/4933163281/>.

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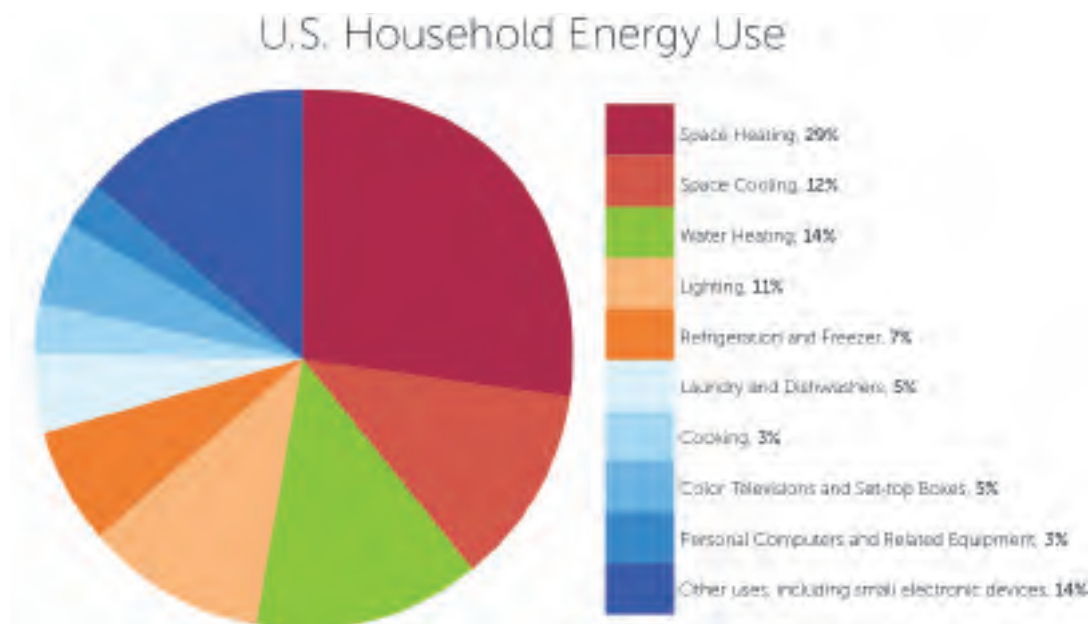
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## How do we use energy in our homes?

These are the basic ways most families use energy at home.

- Heating for your house in the winter
- Cooling for your house in the summer
- Lights to see when it is dark
- Heating water for showers, baths, and washing dishes
- Refrigerators and freezers to preserve your food
- Appliances like televisions, computers, radios, video games



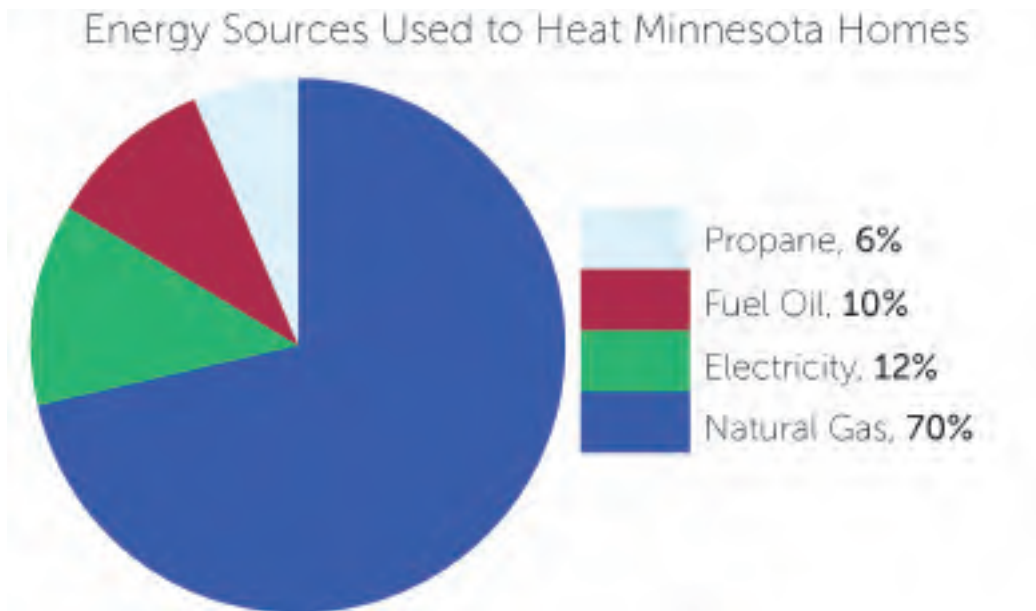
Almost half of the energy used in homes in the United States is for space and water heating. Source: Data from US Energy Information Administration, "Annual Energy Outlook 2011 Early Release Overview," Table A4, Residential Sector Key Indicators and Consumption, December 16, 2010, accessed January 24, 2011, [http://www.eia.gov/forecasts/aeo/early\\_consumption.cfm](http://www.eia.gov/forecasts/aeo/early_consumption.cfm).



## Is it different in Minnesota? YES!

In Minnesota, the average temperature in January is 7 degrees. In Florida the average January temperature is 58 degrees. The winters in Minnesota are much colder than most other states. In fact, Minnesota has one of the lowest average temperatures in the winter months. That means that a greater share of our home energy used is for heating our home.

## What kind of energy do we use to heat our home?

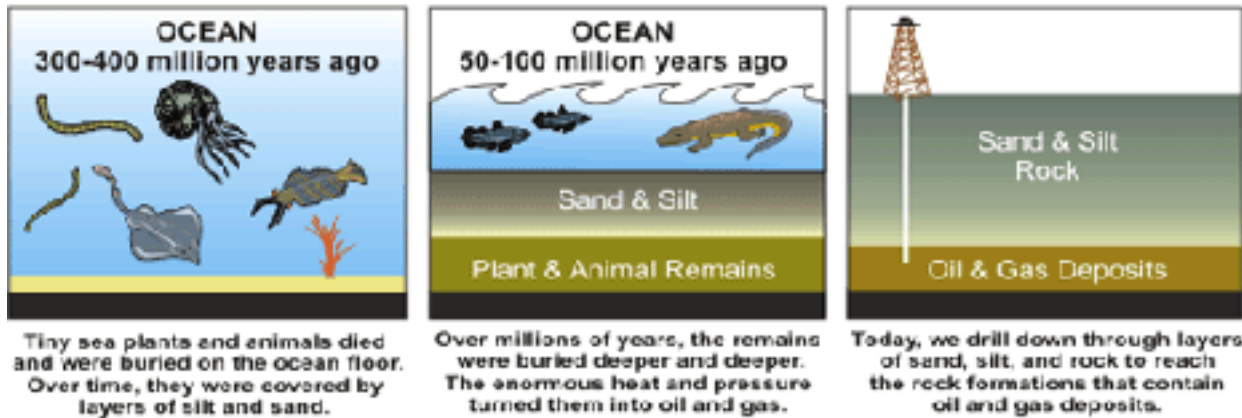


Source: Data from U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy (EERE), "Energy Consumption in Minnesota Homes," updated August 15, 2008, accessed February 9, 2011, <http://apps1.eere.energy.gov/states/residential.cfm/state=MN#sources>.

In this workshop we will focus on heating and natural gas. In Minneapolis and St. Paul, natural gas is the main fuel used for heating your home.

## What is natural gas and where does it come from?

Plants and animals that have decayed for millions of years! The decay from these plants and animals gets trapped beneath rocks. Pressure and heat change the material into coal, oil and natural gas.

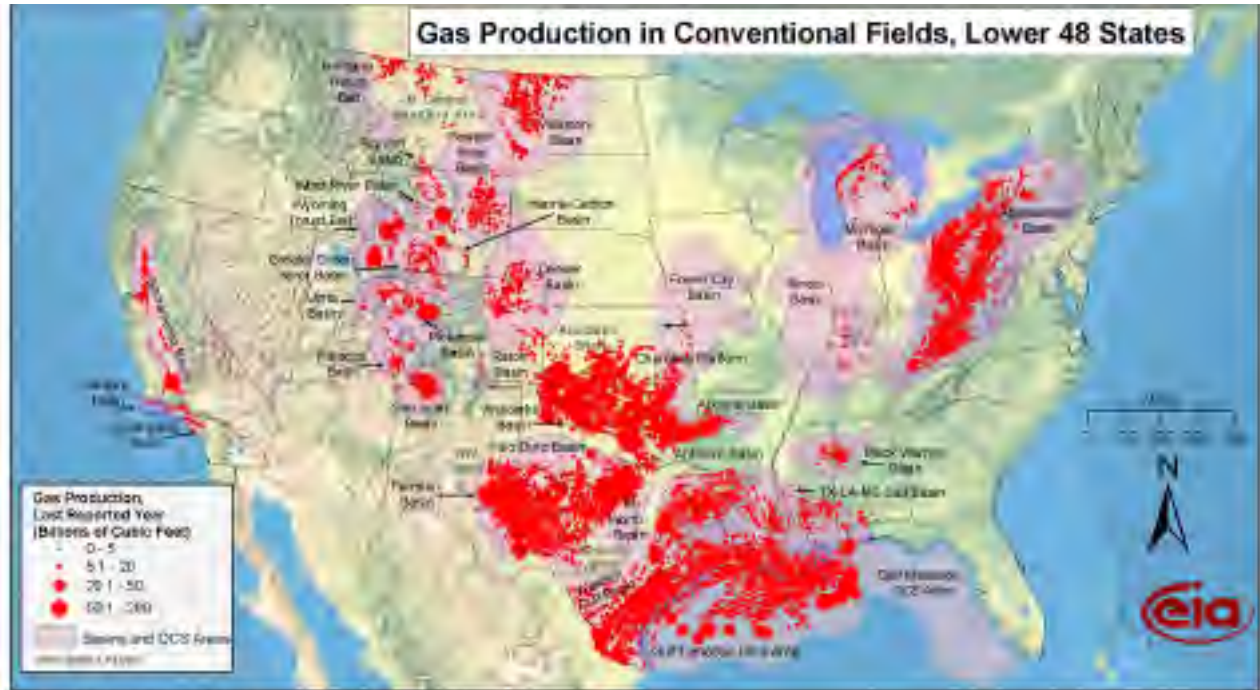


Source: Image by U.S. Energy Information Administration, "Natural Gas Explained," last Reviewed October 1, 2009, accessed February 9, 2011, [http://www.eia.doe.gov/energyexplained/index.cfm?page=natural\\_gas\\_home](http://www.eia.doe.gov/energyexplained/index.cfm?page=natural_gas_home).





About 84% of the natural gas we use comes from areas in the United States. The map shows where natural gas production is located. It is difficult to get information on how much natural gas is produced from Indian reservations. But you can get a sense of this by comparing the two maps.

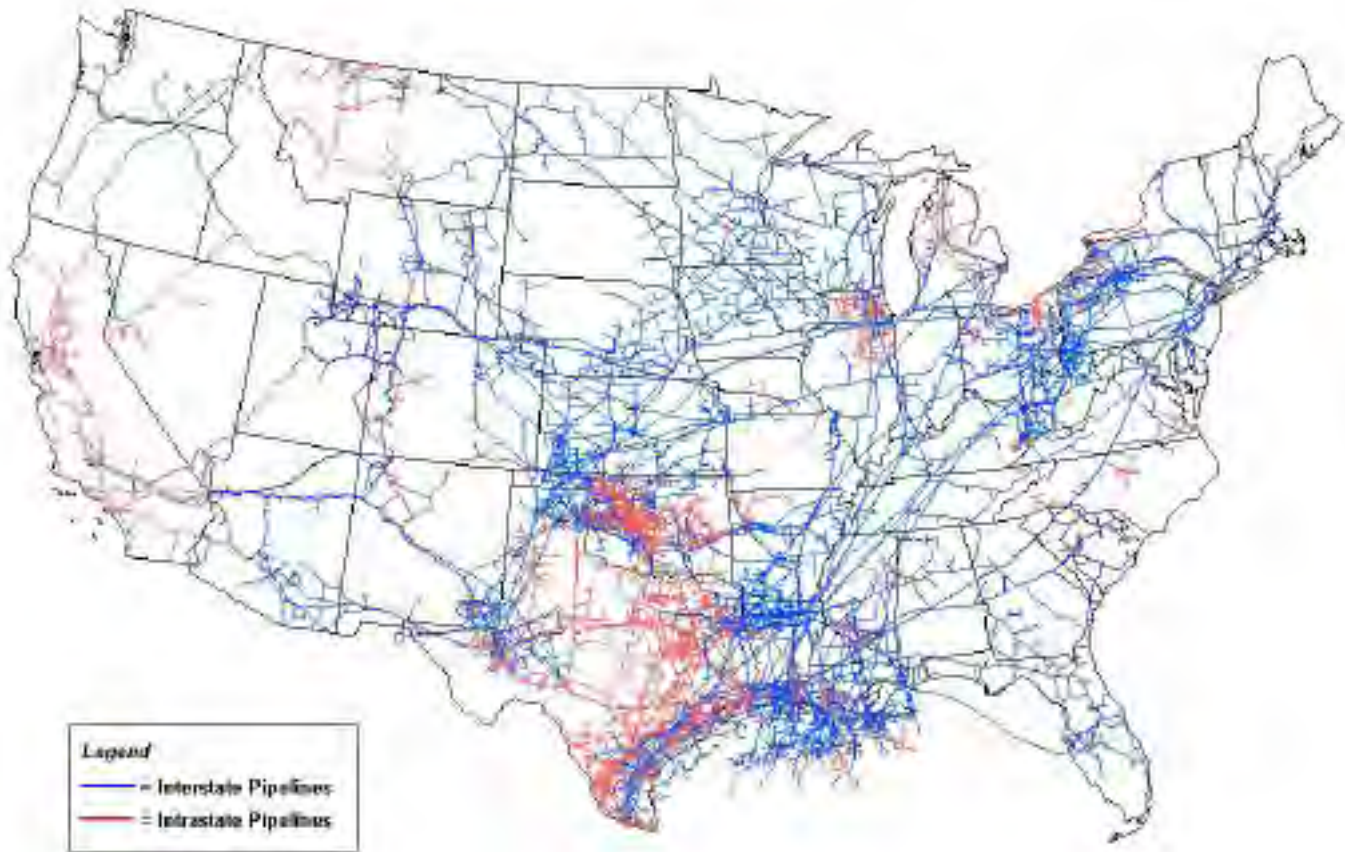


Source: Map by U.S. Energy Information Administration, "Summary Maps: Natural Gas in the Lower 48 States," updated April 8, 2009, accessed February 9, 2011, [http://www.eia.doe.gov/pub/oil\\_gas/natural\\_gas/analysis\\_publications/maps/maps.htm](http://www.eia.doe.gov/pub/oil_gas/natural_gas/analysis_publications/maps/maps.htm).



Source: Map by U.S. Department of the Interior, National Native American Graves Protection and Repatriation Act (NAGPRA), "Indian Reservations in the Continental United States," accessed February 9, 2011, <http://www.nps.gov/nagpra/DOCUMENTS/ResMAP.HTM>.

## How is natural gas delivered to my home?



U.S. Natural Gas Pipeline Network, 2009 Map by U.S. Energy Information Administration, "About U.S. Natural Gas Pipelines – Transporting Natural Gas," accessed February 9, 2011, [http://www.eia.doe.gov/pub/oil\\_gas/natural\\_gas/analysis\\_publications/ngpipeline/ngpipelines\\_map.html](http://www.eia.doe.gov/pub/oil_gas/natural_gas/analysis_publications/ngpipeline/ngpipelines_map.html).

Natural gas is extracted from the earth and oceans through drilling. The gas is pushed through very large pipelines. This map shows the pipelines that are needed to carry the natural gas from the place where it is extracted to the area where it will be used.



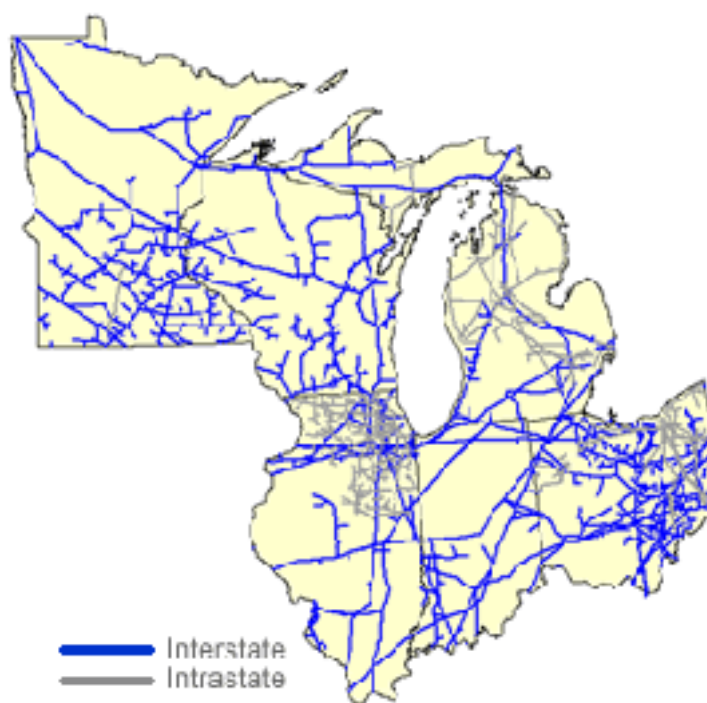


In the Midwest, most of our natural gas comes from Texas, Oklahoma, Kansas, Louisiana and Canada. Once extracted, the natural gas is shipped via pipeline to Minnesota. There, suppliers and local gas distribution companies like Xcel Energy or CenterPoint Energy purchase the natural gas from the producers. You buy your natural gas from one of these private distribution companies:

- CenterPoint Energy
- Greater Minnesota Gas
- Great Plains Natural Gas
- Interstate Power (Alliant)
- Minnesota Energy Resources
- Xcel Energy

In Minnesota, there are also 31 municipal utilities that provide natural gas.

You can see our regional natural gas pipelines in the figure below.



**Midwest Region Natural Gas Pipeline Network** Map by U.S. Energy Information Administration, "About U.S. Natural Gas Pipelines – Transporting Natural Gas: Natural Gas Pipelines in the Midwest Region," accessed February 9, 2011, [http://www.eia.doe.gov/pub/oil\\_gas/natural\\_gas/analysis\\_publications/ng-pipeline/midwest.html](http://www.eia.doe.gov/pub/oil_gas/natural_gas/analysis_publications/ng-pipeline/midwest.html).

**THE PRICE OF ENERGY IS CONSTANTLY INCREASING, WHICH AFFECTS INDIAN FAMILY INCOME.**

This is called the **Home Energy Burden**. American Indian families should not needlessly pay for wasted energy. This takes income away from more important things.

The **Home Energy Burden** is the portion of your family's income that is spent on energy. Families with lower incomes tend to use a greater portion of their income for energy. In the United States, the average family spends 5 percent of their income on energy, but low income households spent 16 percent of their budget on energy services.

In Minnesota, the severely cold winters and lack of good mass transportation options in certain areas means that what families spend on energy can be even higher. Families that live in older houses sometimes also spend more on energy because these houses are less insulated.

If you live in an older house, this can result in a particularly high **Home Energy Burden**: In Minnesota, during the 2005-2006 winter heating season, low income households exceeded the affordable level of energy costs by a total of \$388 million. A large part of this can be linked to the older, highly inefficient housing stock that is prevalent in low income towns and neighborhoods.



Source: Data from Fisher Sheehan & Colton, "Minnesota On the Brink 2009: The Home Energy Affordability Gap," Home Energy Affordability Gap State Fact Sheets, April 2010, accessed January 24, 2011, [http://www.homeenergyaffordabilitygap.com/05\\_Current\\_State\\_Data2.html](http://www.homeenergyaffordabilitygap.com/05_Current_State_Data2.html).

## How much do I pay for natural gas?

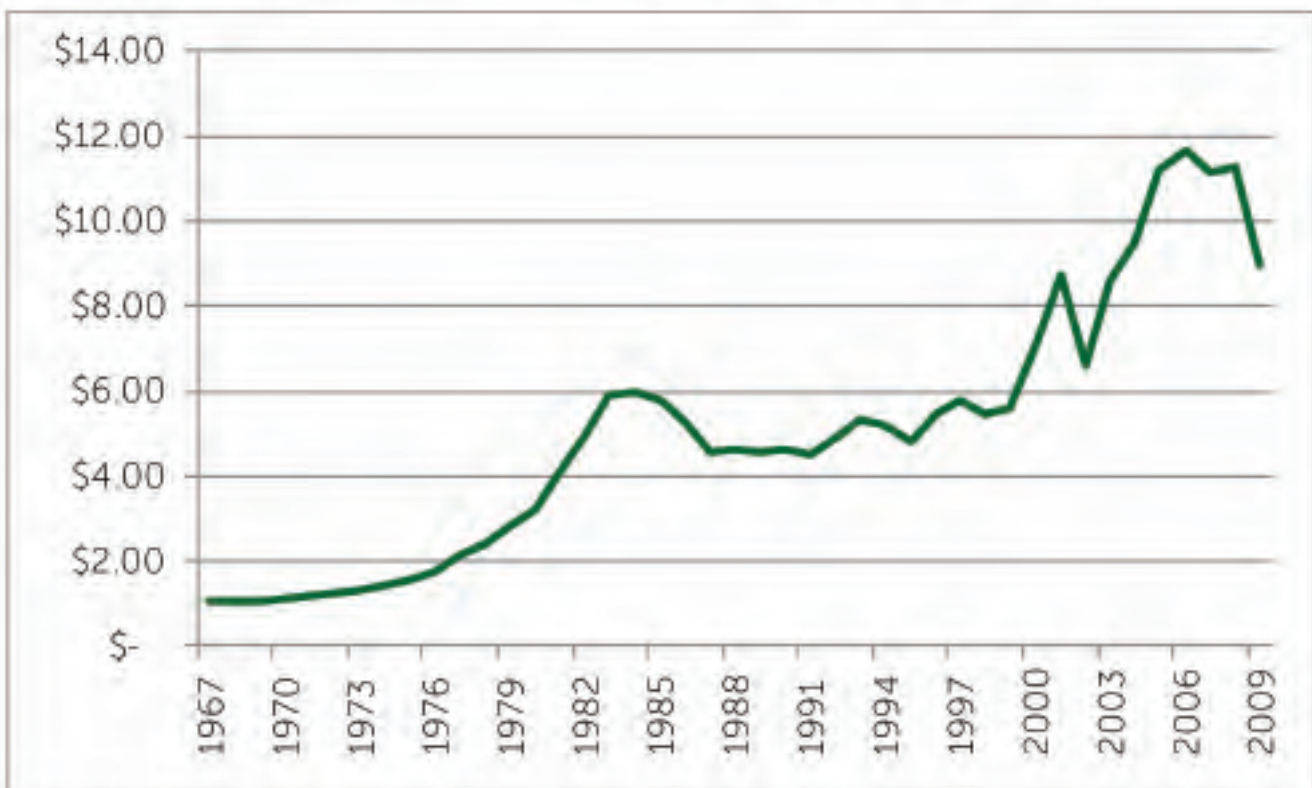
When you pay your utility bill and you use natural gas, you are generally paying three different types of costs:

- **Transmission costs:** What it costs to move natural gas from the place it was produced to our area through the large pipelines.
- **Distribution costs:** The cost of bringing the gas from our area to your home.
- **The gas itself:** The cost of the gas which is called the “commodity price.”

The price that you pay for natural gas to heat your home is constantly changing. There are several reasons for this, including changes in supply of natural gas throughout the year. Also, since most natural gas is used for heating, there is high demand in winter, resulting in higher prices. Over time, the cost of energy has also been constantly rising.

This is because natural gas fluctuates in price depending on the time of year. In the summer months when the demand for heat is low, the per-unit price you pay increases. This is due to fixed customer charges. Fixed customer charges cover things like gas line maintenance, meter reading, and billing. In the winter months when demand increases, the per-unit cost goes down.

### The Rising Cost of Natural Gas



Source: Data from U.S. Energy Information Administration, “Natural Gas: Annual Minnesota Price of Natural Gas Delivered to Residential Customers,” released January 28, 2011, accessed February 9, 2011, <http://www.eia.doe.gov/dnav/ng/hist/n3010mn3A.htm>.

## How does the gas company know how much natural gas I use?

A gas meter at your home is used to measure the volume of gas you use. You will find the meter outside your home. It is VERY important to make sure you keep the meter free from debris in the summer or ice in the winter. In earlier years, a person came to read your meter. Today, it is common for your gas utility to read your meter remotely.



A typical gas meter. Source: Image accessed February 9, 2011, [http://commons.wikimedia.org/wiki/File:Gas\\_meter.JPG](http://commons.wikimedia.org/wiki/File:Gas_meter.JPG).



Your meter measures how much natural gas you use by volume in units called hundred cubic feet or “ccf”. Your meter measures how many hundred cubic feet (ccf) of natural gas you use every month.



A typical gas meter indicator. Source: Image accessed February 9, 2011, [http://commons.wikimedia.org/wiki/File:Gas\\_meter\\_indicator.jpg](http://commons.wikimedia.org/wiki/File:Gas_meter_indicator.jpg)

The gas meter on the picture has two dials. Your gas meter may look different and have several dials, but they all do the same thing: measure how much natural gas you use. To read your meter, look at the numbers on the dials. Some meters like the one in the picture will show you the meter reading, others only have dials and you need to record the numbers on each dial to get your record of use. After you record the numbers, subtract your last reading from your current reading.

For example, let's say your last reading was 7803 and your current reading is 8036.

$$8036 \text{ ccf} - 7839 \text{ ccf} = 197 \text{ ccf}$$

You used 197 ccf since your last meter reading.

You can keep a log of your meter reading to keep track of how much natural gas you are using on a month-to-month basis. You can compare your reading with the bill the utility sends you to make sure your bill is accurate!





## What can you do to reduce your energy use?

There are many ways people try to stay warm in the winter. Some of these can be helpful, but it is **IMPORTANT** to know how to use them **SAFELY!**

### Electric Blankets

Some people use an electric blanket to stay warm at night and turn the thermostat down a few degrees. If you are going to use an electric blanket, **PLEASE** follow these safety guidelines:

- Only use an electric blanket that has been safety tested by Underwriters Laboratories.
- Do **NOT** use electric blankets that are more than 10 years old.
- Read and follow the instruction manual.
- Follow the safety instructions. Sometimes you should not use electric blankets with some kinds of sheets and pillows.
- Keep the temperature setting low.
- Make sure to turn it off in the morning. If you leave it on, you are still wasting energy!
- **NEVER** dry clean your electric blanket. It is safest to wash electric blankets on a gentle cycle and hang to air dry.
- Store flat.
- Don't keep stuffed animals on the bed.
- **DO NOT** use if you have diabetes or insensitivity to heat.
- Make sure the cord is not crimped or pinched.



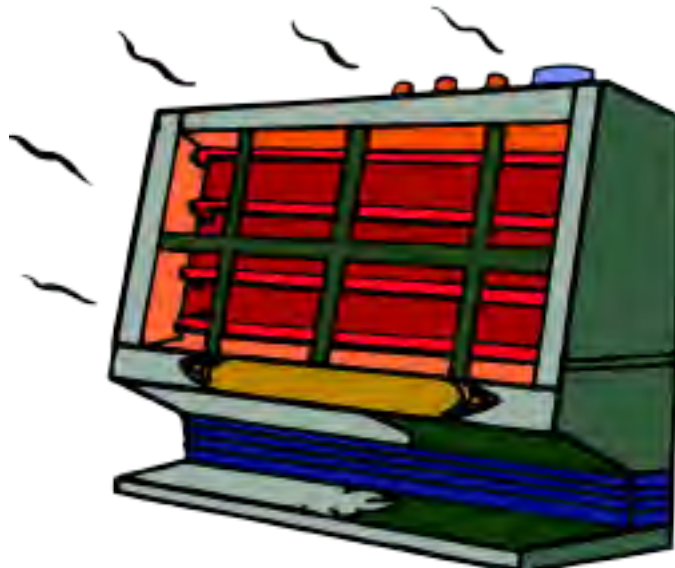
A typical electric blanket. Source: Image by Wikimedia Commons user Qurren, accessed February 9, 2011, [http://commons.wikimedia.org/wiki/File:Electric\\_blanket\\_Sharp\\_HB-C11S.jpg](http://commons.wikimedia.org/wiki/File:Electric_blanket_Sharp_HB-C11S.jpg). Underwriters Laboratory logo image above, source: Image accessed February 9, 2011, [http://commons.wikimedia.org/wiki/File:Logo\\_underwriters\\_laboratories.gif](http://commons.wikimedia.org/wiki/File:Logo_underwriters_laboratories.gif).

## Space heaters

Many people use space heaters to heat only one room in their house. PLEASE BE CAREFUL when using a space heater. They are a leading cause of fire-related deaths in the United States.

Space heaters also use A LOT of energy, and may actually increase your energy costs! If you are going to use a space heater, follow these safety guidelines:

- Only use a space heater that has been tested and certified by Underwriters Laboratories.
- Only use a space heater that has a tip-over safety switch. This safety switch ensures that if the space heater is tipped over, it will immediately turn off. This is VERY IMPORTANT if you have children at home.
- Make sure your space heater has a thermostat that you can control. This allows you to turn the heater higher and lower depending on what you want.
- Use a space heater that is the proper size for the room. If you get a very small space heater for a large room, it will be on constantly. This is NOT SAFE and it WASTES ENERGY. You will see this on your electric bill.
- Place the space heater on a level surface, and away from busy hallways or foot traffic.
- NEVER use with an extension cord with a space heater.



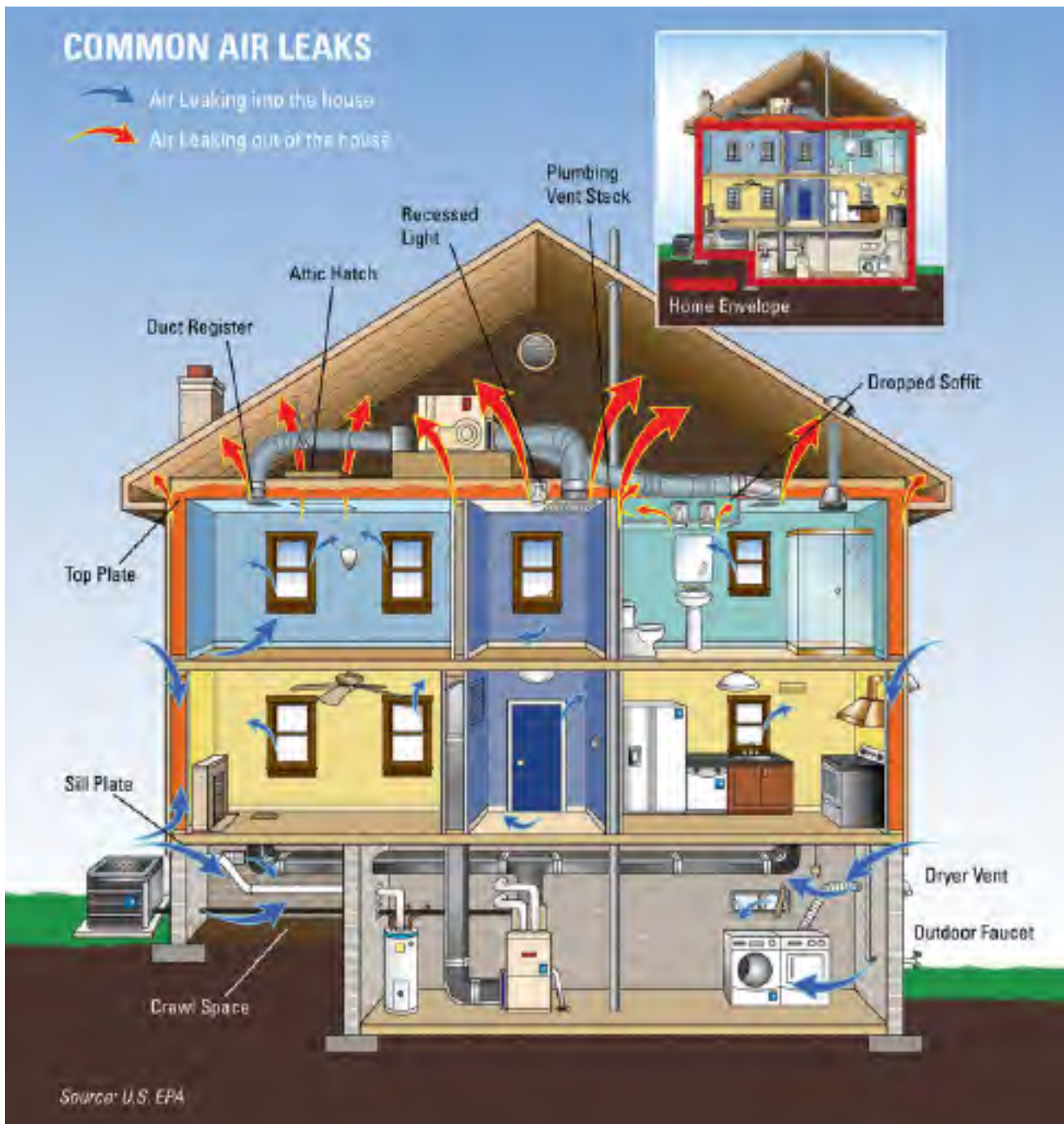
A typical space heater. Image used with permission from Microsoft.



## Common air leaks in your home

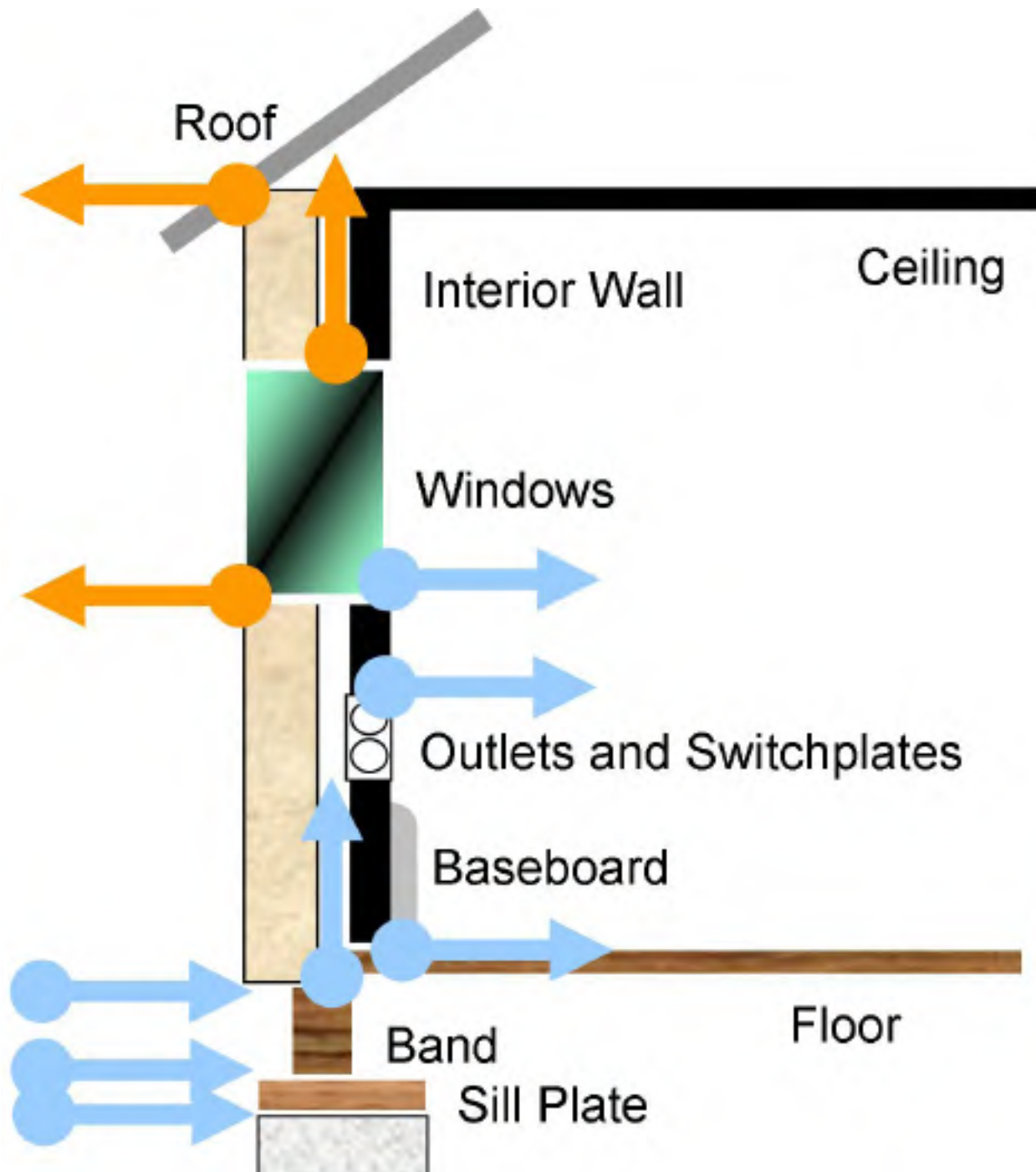
Any crack or hole in your house allows warm air to escape. In the winter these cracks let the cold air leak in and the warm air to escape. In the summer it is the opposite. The warm air from the hot summer days leaks in and if you have an air conditioner, the cool air escapes. This increases the amount of energy needed to heat and cool our homes.

This home diagram shows the common air leaks in a typical home. Older homes are have many more cracks and holes than newer homes. Chances are if you are living in an older home, there are MANY easy things you can do to begin weatherizing your home.



**Common home air leaks.** Source: Image by U.S. Environmental Protection Agency Energy Star, "Air Seal and Insulate with ENERGY STAR," accessed January 24, 2011, [http://www.energystar.gov/index.cfm?c=home\\_sealing.hm\\_improvement\\_sealing](http://www.energystar.gov/index.cfm?c=home_sealing.hm_improvement_sealing).

## More common air leaks in your home



**More common home air leaks.** Source: Image by Center for Energy and Environmental Policy, University of Delaware, "Knowledge of Power: A Household Guide to Saving Energy," July 2009.





## Weatherizing your home

The MOST effective way for you to reduce your energy bill is to WEATHERIZE your home.

### What is weatherization?

Sealing leaks in your home. Weatherizing your home means sealing your house to reduce the amount of outside air that comes into your house. This is especially important in the COLD Minnesota winters!

Insulating your home. You can also weatherize your home by stopping the heat inside your home from escaping. This reduces your need to buy more energy to replace the heat that has escaped.

**Safety alert: If you have indoor air problems such as mold or pest issues, it's important to take care of these before you do a lot of weatherizing—otherwise you could trap these health hazards in your home even more.**



Image by U.S. Environmental Protection Agency Energy Star, "Seal and Insulate with ENERGY STAR," accessed January 24, 2011, [http://www.energystar.gov/ia/partners/publications/pubdocs/Seal\\_and\\_Insulate.pdf](http://www.energystar.gov/ia/partners/publications/pubdocs/Seal_and_Insulate.pdf).

Here are some steps you can take to weatherize your home:

- **Find where you are wasting energy**  
Wasted energy doesn't help us to improve our comfort or quality of life. In order to fix these problems, we need to figure out where we waste energy.
- **Eliminate sources of wasted energy**  
Once we find where the energy is being wasted, we can fix the problems so that we are only purchasing the energy that we want to use. Weatherizing and fixing air leaks is one way to stop energy waste.



Do-It-Yourself Energy Audit

# The Do-it-yourself energy (DIY) audit



The DIY Audit is one you and your family can do without any special equipment. All you need are some basic, everyday tools!

Here is a list of what you'll be looking for in your home:

<b>Basement</b> <ul style="list-style-type: none"><li><input type="checkbox"/> Holes in the walls for pipes, ducts, vents and wires</li><li><input type="checkbox"/> Cracks in foundation</li><li><input type="checkbox"/> Still plate and band joist</li></ul> <b>Walls</b> <ul style="list-style-type: none"><li><input type="checkbox"/> Cracks in wall</li><li><input type="checkbox"/> Baseboards</li><li><input type="checkbox"/> Electrical outlets and switchplates</li></ul> <b>Doors</b> <ul style="list-style-type: none"><li><input type="checkbox"/> Mail slot or pet door</li><li><input type="checkbox"/> Cracks in door</li><li><input type="checkbox"/> Weatherstripping</li><li><input type="checkbox"/> Door sweep</li><li><input type="checkbox"/> Threshold</li></ul> <b>Windows</b> <ul style="list-style-type: none"><li><input type="checkbox"/> Frame tightness—all sides, around panes</li><li><input type="checkbox"/> Weatherstripping</li><li><input type="checkbox"/> Window pane condition</li><li><input type="checkbox"/> Storm windows</li><li><input type="checkbox"/> Remove window air conditioner</li></ul>	<b>Heating system</b> <ul style="list-style-type: none"><li><input type="checkbox"/> Thermostat: Turned down? Programmable?</li><li><input type="checkbox"/> Yearly furnace inspection scheduled</li><li><input type="checkbox"/> Change filters monthly</li><li><input type="checkbox"/> Clean heat vents</li><li><input type="checkbox"/> Bleed radiators</li><li><input type="checkbox"/> Insulation on hot water pipes</li><li><input type="checkbox"/> Holes where pipes enter</li></ul> <b>Hot water heater</b> <ul style="list-style-type: none"><li><input type="checkbox"/> Insulation on hot water pipes</li><li><input type="checkbox"/> Insulation on water heater</li><li><input type="checkbox"/> Water heater thermostat at 120 degrees</li><li><input type="checkbox"/> Age of water heater</li><li><input type="checkbox"/> Low-flow showerheads and sink aerators</li></ul> <b>Attic</b> <ul style="list-style-type: none"><li><input type="checkbox"/> Attic door—Does it: Close tightly? Have weatherstripping and insulation?</li><li><input type="checkbox"/> Cracks in chimney</li><li><input type="checkbox"/> Spaces around chimney</li><li><input type="checkbox"/> Holes from ducts, vents or wires</li><li><input type="checkbox"/> Attic floor sealed?</li><li><input type="checkbox"/> Insulation condition</li></ul>
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## Basement

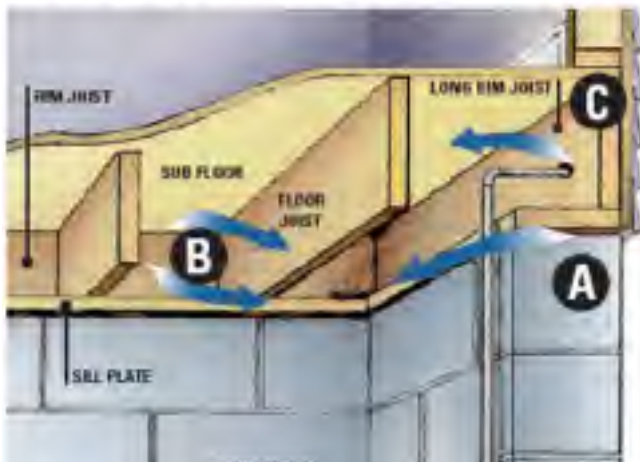


Did you know that the basement is the area in your home where most of the air leak is happening? To find where these leaks are, get a flashlight and do the following:

### Check the band-joists and sill plate.

In the basement you will see there are long framing boards. These are called FLOOR JOISTS. In between the FLOOR JOISTS there are BAND JOISTS. Also find your SILL PLATE. The sill plate is the wooden plate that sits underneath the joists but runs along the top of the foundation. Check to see if you have insulation in these areas. Many older homes do not. If you do not, it is usually very easy and inexpensive to insulate.

### Areas to Foam or Caulk



- A** Along the gap between the sill plate and the foundation
- B** At the bottom and top of the rim joist on each end of the house
- C** All electrical, water, or gas penetrations and any venting ducts that pass to the outside

**What you can do:** You can go to your hardware store and buy fiberglass insulation. For our area, check for insulation that has at LEAST an R 15 label. Installing insulation in these areas will prevent cold air from entering the frame of your home and penetrating heated rooms above. You can also buy expanding foam sealant to fill in any holes you find in these areas, and use siliconized acrylic caulk to seal cracks and seams.



Top, source: Image by U.S. Environmental Protection Agency Energy Star, "A Do-It Yourself Guide to Sealing and Insulating with Energy Star," August 2007, accessed January 24, 2011, [http://www.energystar.gov/ia/partners/publications/pubdocs/DIY\\_Guide\\_May\\_2008.pdf](http://www.energystar.gov/ia/partners/publications/pubdocs/DIY_Guide_May_2008.pdf).  
Bottom right, source: Image by The Family Handyman, "Insulate Basement Rim Joists," accessed January 24, 2011, <http://www.familyhandyman.com/DIY-Projects/Saving-Money/Energy-Efficiency/insulate-basement-rim-joists/Step-By-Step>.

## Check basement walls and ceiling.

Check your basement walls and ceiling for the holes where pipes, ducts, vents and wires enter the basement. Are they sealed?



Also, check the condition of your basement walls and ceiling. Do you see any cracks where cold air might leak in, or warm air leak out?

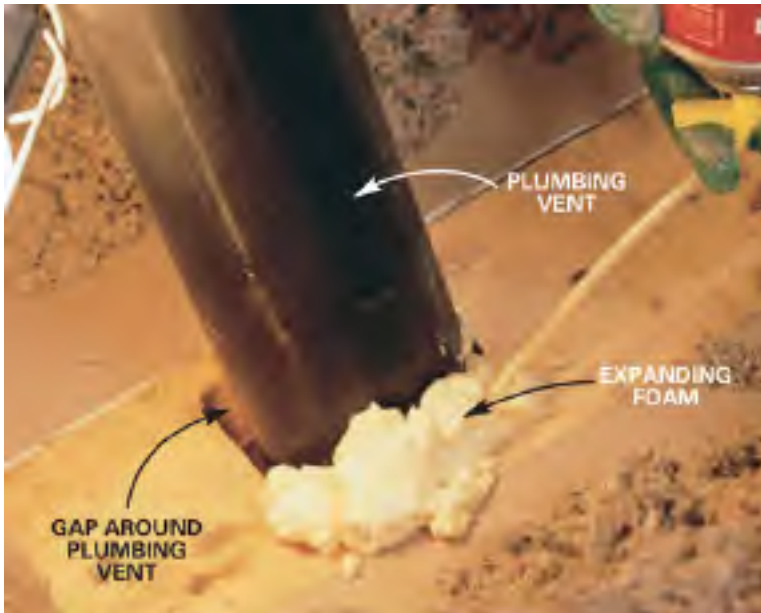


Source: Image by Flickr Creative Commons user Napoleon\_70, accessed January 24, 2011, <http://www.flickr.com/photos/buyme-lunch/4024807886>.



Source: Image by Wikimedia Commons user Achim Hering, accessed January 24, 2011, [http://commons.wikimedia.org/wiki/File:Fancoil\\_unit\\_underside\\_of\\_firestop.jpg](http://commons.wikimedia.org/wiki/File:Fancoil_unit_underside_of_firestop.jpg).

**What you can do:** You can easily seal holes where pipes, ducts, vents and wires enter with expanding foam sealant. Sealing these holes will also prevent insects and rodents from finding their way into your home. You can also seal cracks in your walls with siliconized acrylic caulk.



Source: Image by The Family Handyman, "How to Seal Attic Air Leaks," accessed January 24, 2011, <http://www.familyhandyman.com/DIY-Projects/Saving-Money/Energy-Efficiency/how-to-seal-attic-air-leaks/Step-By-Step>.

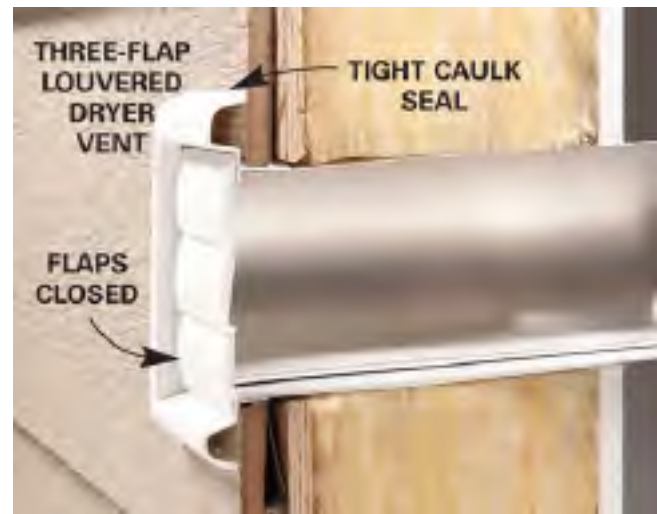
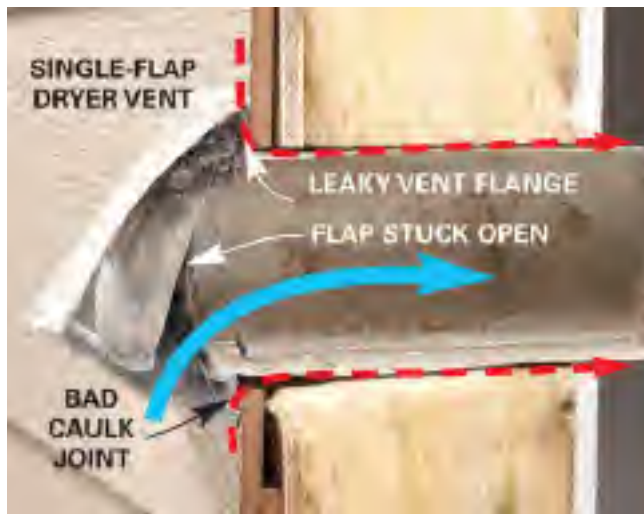


Source: Image by Flickr Creative Commons user Sustainable 19125, accessed February 9, 2011, <http://www.flickr.com/photos/sustainable19125/4304021237/>.



## Check for air vents in the basement.

If you have a dryer in your basement, or other appliance that needs to release air outside, there will be a vent that leads to the outdoors. There can be cracks and holes around where these vents exit the basement, and the flap that holds the vent shut when not in use can become stuck open. What is the condition of the air vents in your basement?



Source: Images by The Family Handyman, "Insulate Basement Rim Joists," accessed February 18, 2011, <http://www.familyhandyman.com/DIY-Projects/Saving-Money/Energy-Efficiency/air-leak-testing--sealing>.

**What you can do:** You can seal larger holes and cracks around the vent with expanding foam sealant, and seal narrower cracks and seams with siliconized acrylic caulk. If your exterior vent flap is stuck open, clean and vacuum it to get it unstuck, applying WD-40 or a similar lubricant if needed.

# Walls



## Check walls and baseboard for cracks.

Use a flashlight to inspect your walls. Make sure to check the corners and where walls meet the ceiling and the floor. Are there any cracks?

Can you slide a dollar bill between the baseboard and the wall or floor? If a dollar bill can fit, there is a gap where air can be leaking.



Source: Image by Flickr Creative Commons user arbitraryuser, accessed January 24, 2011, <http://www.flickr.com/photos/arbitraryuser/4502452039/>.



Source: Image by Center for Energy and Environmental Policy, University of Delaware, "Knowledge of Power: A Household Guide to Saving Energy," July 2009.

**What you can do:** You can easily seal wall and baseboard cracks using paintable siliconized acrylic caulk. The caulk will say "paintable" on the side of the tube. After laying a thin bead of caulk across the crack, use a paper towel to smooth the caulk. Most paintable caulks can be painted after two hours.



Source: Image by The Family Handyman, "How to Install Baseboard Molding, Even on Crooked Walls," accessed January 24, 2011, <http://www.familyhandyman.com/DIY-Projects/Trim/Trim-Carpentry/how-to-install-baseboard-molding-even-on-crooked-walls/Step-By-Step>.

## Electrical outlets and switch plates



Check electrical outlets and switch plates for leaks.  
Feel them—do they feel cold?



Source: Images by The Family Handyman, "Air Leak Testing & Sealing," accessed January 24, 2011, <http://www.familyhandyman.com/DIY-Projects/Saving-Money/Energy-Efficiency/air-leak-testing--sealing>.

**What you can do:** To insulate outlets you can get pre-cut foam outlet and switchplate sealers to insulate all of these holes in your home. These are inexpensive, easy to install, and available at the hardware store. And while you're at it, why not child proof your home: Did you know that baby safety plugs also help to keep air from coming in through unused plugs? These are at almost all hardware or department stores.



## Doors



Check the following for each exterior door in your home (front, back, garage, patio, basement, etc):

Can you see light coming through the edges when the door is closed?

Does your door have a mail slot or pet door?

Do you have weatherstripping around the door?

- Is it in good condition?
- Does it go around the entire door opening (each side and top)?
- Has it been painted?
- Does it crack when you push against it?

Do you have a Door Sweep at the bottom of the door?

- Is it in good condition?
- Is the rubber broken or cracked?
- Does it make contact with the sill plate when you close the door?

Is the threshold at the bottom of your door in good condition?

- Can you slide a dollar bill under it?



Source: Image by Center for Energy and Environmental Policy, University of Delaware, "Knowledge of Power: A Household Guide to Saving Energy," July 2009.



**What you can do:** If you use a pet door, make sure that it closes properly and is weatherstripped. If you have a pet door that is no longer being used, seal the opening with caulk or expanding foam sealant.

If your door-sweep is cracked or missing, it can be easily replaced. In order to get a proper fit, it must be cut with a hack-saw before it is screwed onto the door.

If your weatherstripping is old, missing, cracked or painted, it can be easily replaced. Tubular, foam and felt weatherstripping are available at hardware stores. Follow the package instructions for a quick and easy do-it-yourself project.

Seal any threshold spaces with paintable or clear-drying siliconized caulk.



Source: Images by The Family Handyman, "How to Soundproof a Home Office," accessed January 24, 2011, <http://www.familyhandyman.com/DIY-Projects/Indoor-Projects/Home-Office/Home-Office-Ideas/how-to-soundproof-a-home-office>.



# Windows



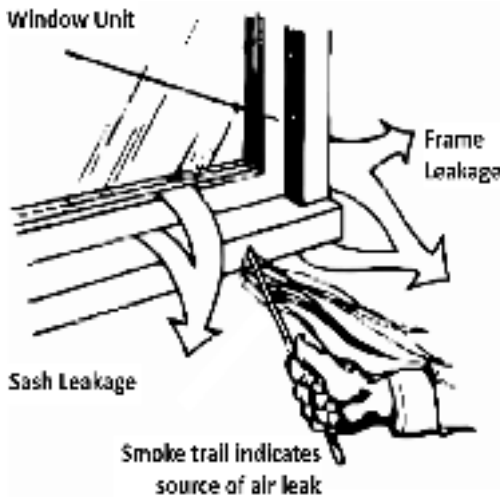
Check each window in your home for the following:

## Frame

Can you slide a dollar bill between the window frame and wall?

## Weatherstripping

Is it in good condition?  
Is it missing?



## Double-hung Windows

Can you slide a dollar bill between the windows near the lock?  
Can you slide a dollar bill below the window at the base?  
Does the top window stay up or slide down?

## Glass Window Panes

Are any cracked or broken?  
Are they loose? Do they rattle when it's windy?

## Storm Windows

Are your storm windows closed?  
Are they missing or broken?  
Can you feel an air leak?  
Use a dollar bill to help find air leaks.



## Window Air Conditioner

Do you have a window air conditioner?

## Leaking Air

Light a candle or an incense stick and bring it next to your windows. Does the flame or smoke move?  
This means air is leaking.

Top, source: Image by Center for Energy and Environmental Policy, University of Delaware, "Knowledge of Power: A Household Guide to Saving Energy," July 2009. Middle, source: Image by Minnesota Department of Commerce Energy Information Center, "Caulking and Weatherstripping," accessed February 10, 2011, [http://www.state.mn.us/portal/mn/jsp/content.do?action=doc\\_categorylinklist&subchannel=null&programid=536917338&sc3=null&sc2=null&id=-536893808&agency=Energy](http://www.state.mn.us/portal/mn/jsp/content.do?action=doc_categorylinklist&subchannel=null&programid=536917338&sc3=null&sc2=null&id=-536893808&agency=Energy). Bottom, source: Image by Flickr Creative Commons user revbean, accessed January 24, 2011, <http://www.flickr.com/photos/bean/3034308829/>. Text added by CEED at IATP.



**What you can do:** To deal with leaking air around the windows, you can:

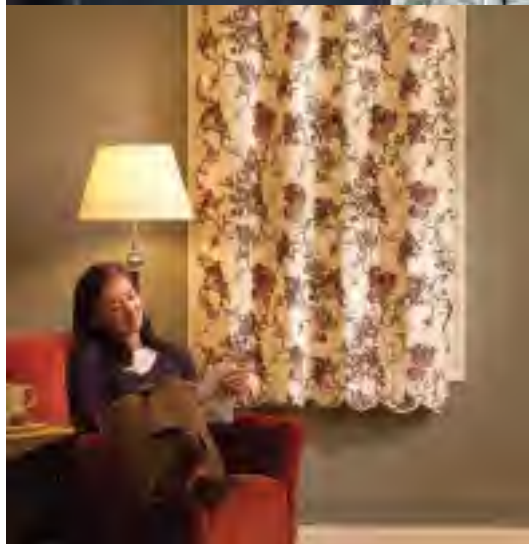
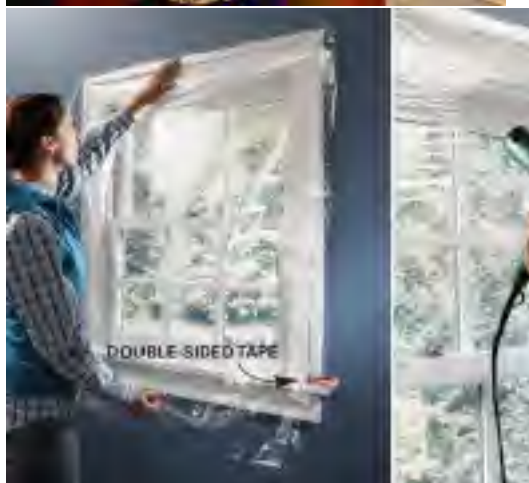
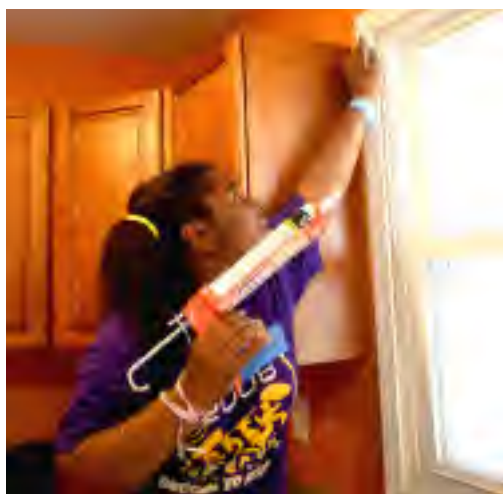
Use paintable siliconized acrylic caulk or pieces of rope caulk to seal cracks. Take special note of tops and bottoms of window frames.

Apply Window weatherstripping around the window. Weatherstripping is available at hardware stores to help you to seal air leaks. Vinyl v-strip weatherstripping can be placed in double-hung windows, and foam weatherstripping can be used in window sashes.

Use a window insulation kit and cover your windows with plastic. This prevents air leaks from cracked glass and leaky window frames. These sheets of plastic are easy to install and can be more cost-effective than replacing windows.

If you use a window air conditioner, remove it or wrap it tightly with plastic before the heating season begins. Window air conditioners will allow cold air to enter your home during the winter.

You can hang heavy fabric drapes on your windows. These drapes act like an extra layer of insulation.



Top, source: Image by Flickr Creative Commons user St. Bernard Project, accessed February 18, 2011, <http://www.flickr.com/photos/stbernardproject/4933163281/>. Middle, source: Image by The Family Handyman, "Air Leak Testing & Sealing," accessed January 24, 2011, <http://www.familyhandyman.com/DIY-Projects/Saving-Money/Energy-Efficiency/air-leak-testing--sealing>. Bottom, source: Image by The Family Handyman, "9 Home Energy Conservation Tips for the Winter," accessed January 24, 2011, <http://www.familyhandyman.com/DIY-Projects/Saving-Money/Energy-Efficiency/9-home-energy-conservation-tips-for-the-winter>.

## Heating system



One of the most important gadgets you have in your home is the thermostat. The thermostat regulates the temperature in your home, and adjusts how much energy you use.

In your DIY Audit make sure to check your thermostat.

Do you have a programmable thermostat?



Source: Image by Flickr Creative Commons user dfrancis (David Francis), accessed January 24, 2011, <http://www.flickr.com/photos/dfrancis/103858046/>.

Do you turn the heat down when you leave the house or go to bed?

**What you can do:** If you do not have a programmable thermostat it may be worth it to purchase one. A programmable thermostat can be set to turn your heat up and down at certain times. Let's say your family leaves to go to work or school at 7:00 a.m. You can program your thermostat to automatically go to 65 degrees at 7:00 a.m. You can also program it to a lower temperature at night. You can save about 1 percent on your heating bill per degree if the setback period is eight hours long.

## Furnace

In your DIY Audit, make note of how often you maintain your furnace.

Do you have your furnace inspected each year?

Do you change your furnace filter once per month in the heating season? Do you keep your heat vents clean?

**What you can do:** To make sure that your furnace is in top shape, schedule a furnace inspection.

Make sure to have your furnace inspected every year. Clean or change your furnace filters once per month during the heating season. This will allow your furnace to operate efficiently.

You should also make sure to keep your heat vents clean. Regularly clean the vents with a damp cloth or vacuum heating registers, ductwork, vents and baseboard heaters regularly. This is very important to make sure there is a CLEAN and efficient flow of air in heating system. It is also a good way to keep your indoor air healthy for your family.



Source: Courtesy of the Department of Energy, National Renewable Energy Laboratory, Credit – Strand Brothers LLC, accessed January 24, 2011, <http://www.nrel.gov/data/pix/searchpix.php?getrec=15076>.



Source: Image by The Family Handyman, "How to Change a Furnace Filter," accessed January 24, 2011, <http://www.familyhandyman.com/DIY-Projects/Heating---Cooling/Furnace-Repair/how-to-change-a-furnace-filter/Step-By-Step#step1>.



## Radiators



Source: Image by Wikimedia Commons user SimonP, accessed January 24, 2011, [http://commons.wikimedia.org/wiki/File:Household\\_radiator.jpg](http://commons.wikimedia.org/wiki/File:Household_radiator.jpg).



If you have a radiator, ask yourself the following questions:

Do you regularly bleed your radiator?

Are your hot water pipes insulated in unheated rooms (basement, utility closet)?

Are the holes where the pipes come out sealed?

**What you can do:** Radiators can have air trapped in the pipes, which affects the circulation of the hot water used to heat your home. If you have radiator heat, these pipes should be “bled” twice per year. Place a bucket under the bleeding valve and open until all of the air is removed and water begins to drip out.



Source: Image by The Family Handyman, “Affordable Wet Basement Solutions,” accessed January 24, 2011, <http://www.familyhandyman.com/DIY-Projects/Indoor-Projects/Basement/Basement-Waterproofing/affordable-wet-basement-solutions>.



Source: Image by The Family Handyman, “How to Bleed a Hot Water Radiator and Clear a Steam Radiator Vent,” accessed January 24, 2011, <http://www.familyhandyman.com/DIY-Projects/Heating---Cooling/Furnace-Repair/how-to-bleed-a-hot-water-radiator-and-clear-a-steam-radiator-vent/Step-By-Step>.

If the pipes leading from your boiler are not insulated, valuable heat is being lost. You can easily seal these pipes with pipe insulation that you can purchase from your hardware store.

Baseboard heaters and radiators use pipes throughout your home. These pipes travel from room to room through holes drilled in the walls or floor. Check to make sure that these holes are sealed. If not, use an expanding foam sealant to fill.

## Hot water heater



For your DIY Audit, check your hot water heater and ask:



Are your hot water pipes insulated in unheated rooms (basement, utility closet)?

Is your water heater insulated?

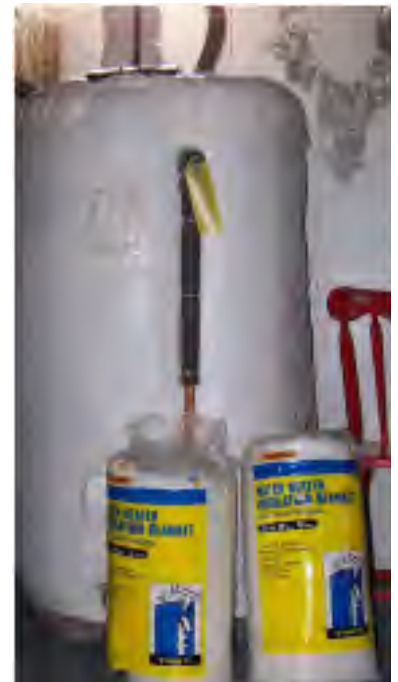
Is your water heater thermostat set at 120 degrees?

Is your hot water heater more than fifteen years old?

Do you have low-flow showerheads and sink aerators on your faucets?

Source: Image by Flickr Creative Commons user bryankennedy (Bryan Kennedy), accessed January 24, 2011, <http://www.flickr.com/photos/bryankennedy/3398881731>.

**What you can do:** If your hot water heater is more than a few years old, it is very likely there is a good amount of heat loss and it needs to be insulated. Insulating reduce the amount of heat loss 25–40 percent! It is easy to insulate your hot water heater. Simply go to the hardware store and purchase a hot water heater blankets. They are inexpensive. Make sure to follow the package safety instructions. When insulating your hot water heater, leave access so that you can reach your thermostat and maintenance panel.



Source: Image by Center for Energy and Environmental Policy, University of Delaware, "Knowledge of Power: A Household Guide to Saving Energy," July 2009.



Source: Image by The Family Handyman, "How to Adjust Hot Water Heater Temperature," accessed January 24, 2011, <http://www.familyhandyman.com/DIY-Projects/Home-Safety/DIY-Tips-For-Home-Safety/how-to-adjust-hot-water-heater-temperature/Step-By-Step>.

**Safety Alert:** If your hot water heater is fueled by natural gas, special care must be taken to ensure that you do not block the ventilation duct and pilot light with insulation.

You can also set the hot water heater thermostat. Water temperature set above 120° is too hot to use and requires adding cold water to prevent burns in the sink and bathtub. Each 10° reduction in water temperature will save 3–5 percent on your water heating costs!



## Water pipes



The water is delivered from your hot water heater to your faucet when you need it. As the water flows to your faucet it can lose heat. To prevent this heat loss, insulate your pipes with foam pipe insulation. This is one of the easiest home efficiency measures that someone can install.

You can also install low flow showerheads and sink aerators to reduce the amount of hot water you use without sacrificing comfort. The less hot water you use, the less energy you need to heat the water.



Source: Image by Flickr Creative Commons user johncarljohnson (jj), accessed January 24, 2011, <http://www.flickr.com/photos/johncarljohnson/320144652/>.



Source: Courtesy of the Department of Energy, National Renewable Energy Laboratory, Credit – Dennis Schroeder, accessed January 24, 2011, <http://www.nrel.gov/data/pix/searchpix.php?getrec=18031>. Text added by CEED at IATP.

## Attic



For your DIY Audit, get your flashlight and check the attic for the following:



Source: Courtesy of the Department of Energy, National Renewable Energy Laboratory, accessed January 24, 2011, <http://www.nrel.gov/data/pix/Jpegs/15095.jpg>.

Does the attic door close completely?

Is there weatherstripping and/or insulation on the attic door?

Are there cracks in the chimney?

Is there space between the chimney and the attic floor or ceiling?

Are holes where pipes, ducts, vents, and wires enter the attic sealed with expanding foam sealant?

Is the attic floor sealed with expanding foam sealant around the roof edge?

Is insulation thin or missing?

**What you can do:** You can seal holes created by pipes, ducts and wires that penetrate the attic with an expanding foam sealant. This will prevent heated air from escaping from your home into the attic during the winter.

Make sure to also seal cracks you find around chimney and any spaces between the chimney and the attic floor or ceiling.

If your attic hatch doesn't close tightly and allows air to flow through, weatherstrip your attic door to ensure a tight seal. Install insulation on the attic side of the door to block heat loss from your living spaces.

Source:



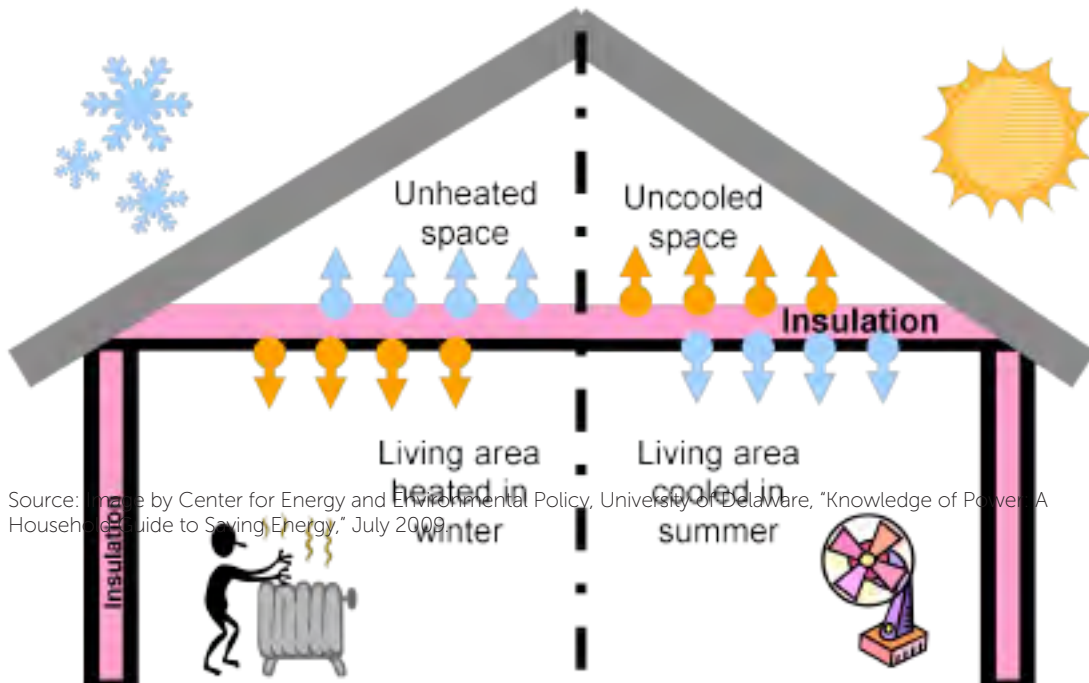
Source, left: Image by The Family Handyman, "How to Seal Attic Air Leaks," accessed January 24, 2011, <http://www.familyhandyman.com/DIY-Projects/Saving-Money/Energy-Efficiency/how-to-seal-attic-air-leaks/Step-By-Step>. Source, middle: Image by The Family Handyman, "Insulating Walls," accessed January 24, 2011, <http://www.familyhandyman.com/DIY-Projects/Wall---Ceiling/Insulation/insulating-walls>. Source, right: Image by The Family Handyman, "Air Leak Testing & Sealing," accessed January 24, 2011, <http://www.familyhandyman.com/DIY-Projects/Saving-Money/Energy-Efficiency/air-leak-testing--sealing>.

# Insulating your home



Source: Courtesy of the Department of Energy, National Renewable Energy Laboratory, accessed January 24, 2011, <http://www.nrel.gov/data/pix/Jpegs/17952.jpg>.

If you can, it is very important for you to keep the insulation on your home well maintained. After several years, insulation can deteriorate and lose its value in keeping your home insulated from the cold air. The strength of the insulation and its ability to keep your home warm or cool is called the thermal resistance or R-Value. A higher R-Value insulation does a better job of keeping your home at the desired indoor temperature. Minnesota code recommends 14" of insulation in your attic to meet the thermal resistance of R-49.

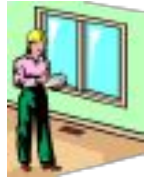


Source: Image by Center for Energy and Environmental Policy, University of Delaware, "Knowledge of Power: A Household Guide to Saving Energy," July 2009.



# Professional Energy Audit

## Professional “instrumented” home energy audit



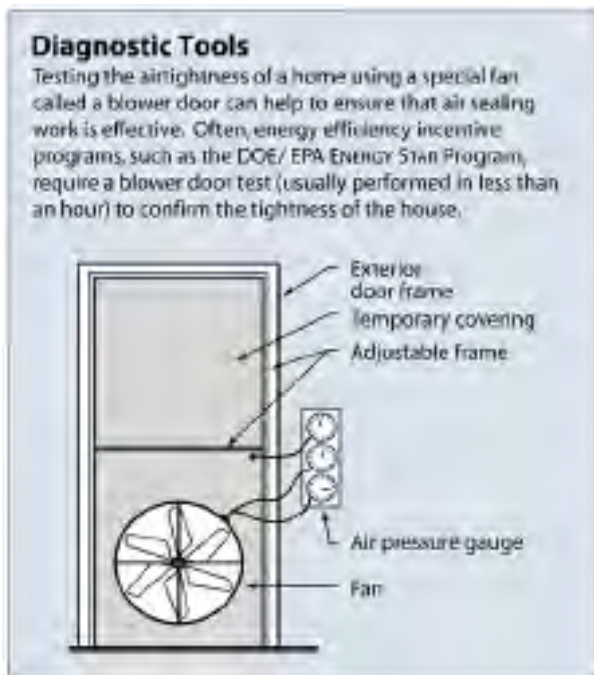
A professional instrumented home energy audit can help you identify problems that are unseen with the naked eye, such as:

- The condition of the insulation in your walls
- How efficiently your heating system is working
- Cracks too small to be seen that could still be letting in air
- Anything that might have been missed without special equipment

A professional energy auditor helps you prioritize weatherization actions, and can provide guidance on finding resources for big fixes such as a furnace or window replacement. It may be possible for you to receive a reduced rate on a professional energy audit through your utility company or through the Weatherization Assistance Program (see Your Local Resources section).

What to expect in a professional energy audit:

**Blower Door Test:** A blower door fits into an exterior door of the house and uses a powerful fan to depressurize the home. By creating a lower pressure inside the house than what is outside, air is pulled in, allowing the auditor to see and measure more clearly where air is leaking in the house.



Source: Image by U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy (EERE), “Energy Savers: Blower Door Tests,” accessed February 10, 2011, [http://www.energysavers.gov/your\\_home/energy\\_audits/index.cfm/my-topic=11190](http://www.energysavers.gov/your_home/energy_audits/index.cfm/my-topic=11190).



Source: Courtesy of the Department of Energy, National Renewable Energy Laboratory, Credit – Warren Gretz, accessed January 24, 2011, <http://www.nrel.gov/data/pix/searchpix.php?getrec=04894>.





Source: United Tribes News photo Dennis J Neumann.

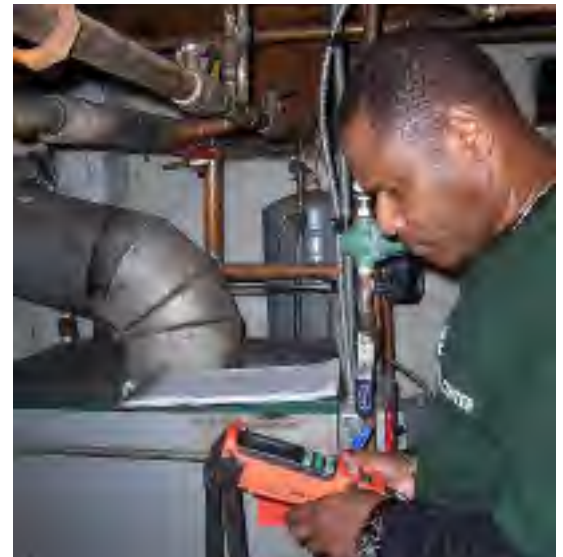
**Infra-Red Inspection:** While the blower door is operating, the energy auditor then uses an infra-red camera to see the leaks. The camera is able to detect cooler temperature air leaking in through cracks in the building as dark colors on the camera's screen. The infra-red camera is also able to determine if insulation in walls has slumped or is missing, and if windows and doors are contributing sources of air leaks.



Source: Image by Center for Energy and Environmental Policy, University of Delaware, "Knowledge of Power: A Household Guide to Saving Energy," July 2009.

**Heating System Assessment:** The heating system in each home is evaluated for efficiency and safety using a Bacharach carbon monoxide analyzer and draft gauge. The draft gauge measures the pressure within air intake to determine that the furnace is drawing in air and venting at an appropriate rate. These tools can assist the auditor in establishing the efficiency of a furnace, any safety hazard in the home, and if the heating system needs to be repaired or replaced.

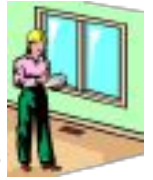
**Safety Alert:** If carbon monoxide is detected, it's usually an indication that the heating system is not operating and consuming fuel efficiently. Carbon monoxide is a hazardous air pollutant and the leading cause of poisoning-related deaths in the United States.



Source: Image by Flickr Creative Commons user Community Environmental Center, accessed January 24, 2011, <http://www.flickr.com/photos/communityenvironmental-center/4034593995>.



**Visual Inspection:** In addition to using this equipment, the energy auditor will also visually inspect your home, evaluate the condition of your weatherstripping, insulation, windows and doors.



Source: Image by Flickr Creative Commons user Community Environmental Center, accessed January 24, 2011, <http://www.flickr.com/photos/communityenvironmental-center/4034593995>.



**Energy Audit Report:** Once your audit is complete, the auditor will prepare a report with recommended weatherization measures and costs. This report will help you to prioritize your expenses and the impacts of the recommendations on your energy use and utility bills. Assistance or incentives may be available for some of the bigger fixes.

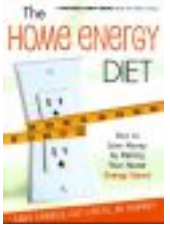
Source: Courtesy of the Department of Energy, National Renewable Energy Laboratory, Credit – Joe Konrade, accessed January 24, 2011, <http://www.nrel.gov/data/pix/searchpix.php?getrec=09664>.

## Learn more!

### Books



Amann, Jennifer Thorne, Alex Wilson, and Katie Ackerly. 2007. *Consumer Guide to Home Energy Savings*. Gabriola Island, British Columbia: New Society Publishers.



Scheckel, Paul. 2005. *The Home Energy Diet*. Gabriola Island, British Columbia: New Society Publishers.

### Internet Resources: General

- U.S. Department of Energy  
<http://www.energy.gov/energytips.htm>
- U.S. Department of Energy: Energy Efficiency and Renewable Energy  
<http://www.eere.energy.gov/>
- Energy Savers—Save Money and Energy at Home  
<http://www.energysavers.gov/>
- Energy Star  
<http://www.energystar.gov/>
- Energy Savers Booklet: Tips on Saving Energy & Money at Home  
[http://www1.eere.energy.gov/consumer/tips/pdfs/energy\\_savers.pdf](http://www1.eere.energy.gov/consumer/tips/pdfs/energy_savers.pdf)
- U.S. Energy Information Administration  
<http://www.eia.gov/>
- U.S. Environmental Protection Agency Climate Change page  
<http://www.epa.gov/climatechange/index.html>
- Database of State Incentives for Renewables and Efficiency (DSIRE)  
<http://www.dsireusa.org/>
- Am. Council for an Energy Efficient Economy, *Consumer Guide to Home Energy Savings*  
<http://www.aceee.org/consumerguide/>
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