



U.S. DEPARTMENT OF ENERGY  
**SOLAR DECATHLON**

2011

# Energy Efficiency 101 -- Practical Steps to a Better Performing Home

Dale Hoffmeyer - DOE

Building Technologies Program



Why is a fundamental question in every transaction to improve a home.

Common reasons why:

- ✓ looks bad -- want to replace it
- ✓ stopped working -- need to fix it
- ✓ doesn't meet our needs -- too small, bad floor plan, uncomfortable, etc.
- ✓ increase the value of my home or help me sell it

Saving energy may not be one of your reasons to improve, but it might be a key criteria when you pick a solution.

**Step 1: Why improve my home?**

# Your refrigerator stopped working. Do I repair it or replace it?

Options:

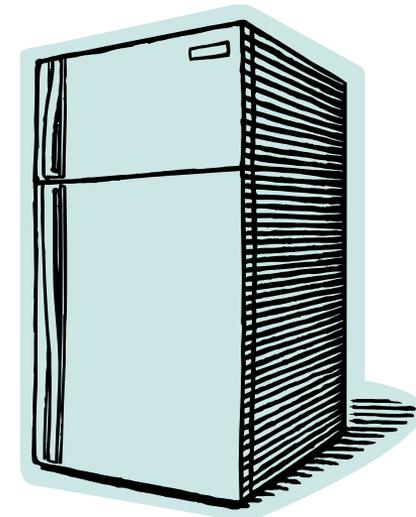
## 1. Repair

- Repair cost + \$143 per year in electricity costs

## 2. Replace

- Replacement cost + \$45 per year in electricity costs
- Over 5 years you save \$490 (enough to buy the new refrigerator)!

You can do-it-yourself using the simple savings calculator on [Energystar.gov](http://Energystar.gov).



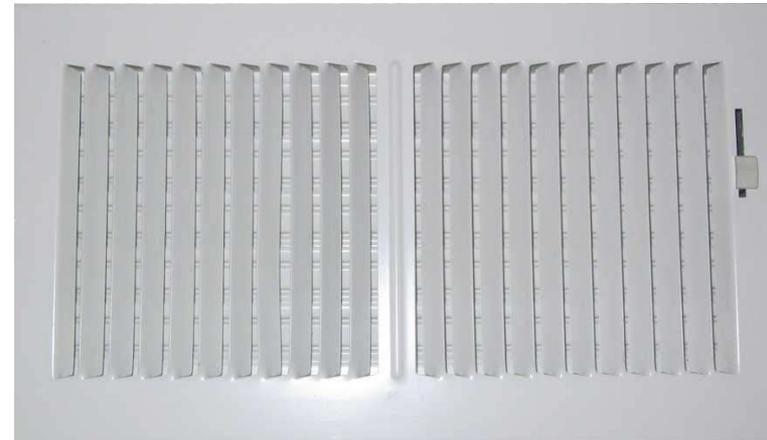
**New in 1991**



# Your bedroom on the second floor is too hot in the summer.

## Options:

1. Turn down the thermostat.
  - Increases cooling costs
2. Buy a ceiling fan.
  - Increases cooling costs
3. Buy a window air conditioner.
  - Increases cooling costs
4. Fix the leaky duct and add insulation.
  - Reduces cooling costs



## Benefits of improving the energy efficiency of your home:

- Maintains your home – your most valuable asset,
- Manages future energy costs,
- Improves comfort,
- Reduces air pollution.



## Measure and compare your performance.

- Teams at the Solar Decathlon compete in 10 contests. Several are based on energy use.
- Start by looking at your energy usage at home.



**Step 2: Review your Energy Bill**



**ENERGY STAR - Microsoft Internet Explorer**

File Edit View Favorites Tools Help

Common Home Problems  
Home Energy Yardstick  
Home Energy Audits  
Air Seal & Insulate  
Heat & Cool Efficiently  
Home Performance with ENERGY STAR  
Home Improvement FAQs  
For Contractors  
For Insulation Manufacturers

[Join ENERGY STAR](#)



## ENERGY STAR Home Energy Yardstick

# WHAT'S YOUR SCORE?

Compare your household's energy use to others across the country and get recommendations for improvement.

### What you need to know to get started

- **Your energy use and costs for the last year:** You'll need your last 12 months of utility bills OR a 12-month summary statement from your utility company.
- **Energy sources for your home:** natural gas, electricity, fuel oil, propane and/or kerosene?
- **The square footage of your home.**

#### Your Home

What is your zip code?

How many people live in your home?

What is the square footage of your home, including the basement?

[More information](#)

#### Your Fuel Types

In addition to electricity, home use? Select all that apply.

Natural Gas

Fuel Oil

#### Your Energy Use

Would you like to use **annual** or **monthly** billing information to enter your data?

Annual  
 Monthly

Select the Start Date for the year covered:

Am I using more or less energy than the average home similar to mine?



ENERGY STAR Home Energy Yardstick

## YOUR SCORE

EPA's Home Energy Yardstick compares a household's energy use to similar homes and gives it a score between 0 and 10 (10 being the most energy efficient).

Yardstick Score: 3.3\*



**Home and Energy Use for:**

**Address:** 123 Energy Drive, Falls Church VA  
**Zip Code:** 22048  
**People living in your home:** 2  
**Square Footage:** 2200  
**Energy Use from 01-Nov-2007 to 31-Oct-2008**

Use (Natural Gas)	Bill Amount (Natural Gas)	Use (Electricity)	Bill Amount (Electricity)
845 CCF or Therms	\$0	11,458 kWh	\$0

**How To Improve a Low Score**

- ✓ Seal air leaks (or drafts).
- ✓ Add more insulation in the attic.
- ✓ If the HVAC equipment is more than 10 years old, consider replacing with models that have earned the ENERGY STAR.
- ✓ Purchase lighting, appliances, home electronics, and other products that have earned the ENERGY STAR.
- ✓ Hire a professional to evaluate the home's energy efficiency.
- ✓ Visit [energystar.gov/homeadvisor](http://energystar.gov/homeadvisor) for more ways to improve efficiency and comfort.

\* How you operate or use your home may lower your score. Activities and Equipment that often impact a household's score include: a home office or home business, swimming pool, spa, sauna, pottery kiln, or well pump, as well as a thermostat setting above 72°F for heating or below 70°F for cooling.



## Get expert help to assess your home.

- Teams at the Solar Decathlon are made up of many experts including architects, engineers, and building scientists.
- When you're ready to improve, seek a professional that can help evaluate your home and recommend options for improving.



**Step 3: Evaluate your options for improving**



# Energy Savers

Search Energy Savers

[Search Help](#)

HOME

TIPS

**YOUR HOME**

RENEWABLE ENERGY

YOUR VEHICLE

YOUR WORKPLACE

REBATES, TAX CREDITS, & FINANCING

PRODUCTS & SERVICES

INFORMATION RESOURCES

[EERE](#) » [Energy Savers](#) » [Your Home](#)

[Facebook](#) [Printable Version](#) [Share](#)

Apartments

Appliances & Electronics

Designing & Remodeling

Electricity

Energy Assessments

Do-it-Yourself

Professional

Insulation & Air Sealing

Landscaping

Lighting & Daylighting

Space Heating & Cooling

Water Heating

Windows, Doors & Skylights

## Home Energy Assessments

A home energy assessment, also known as a home energy audit, is the first step to assess how much energy your home consumes and to evaluate what measures you can take to make your home more energy efficient. An assessment will show you problems that may, when corrected, save you significant amounts of money over time.



Learn about the steps and benefits of a comprehensive home energy assessment in this video. [Text version](#)

[? Ask a Question](#)

### LEARN MORE

#### Financing & Incentives

[DOE Weatherization Assistance Program](#)  
Office of Energy Efficiency and Renewable Energy

[Find Federal Tax Credits for Energy Efficiency](#)  
Energy Savers

#### Federal Government Resources

[Home Performance with ENERGY STAR](#)  
ENERGY STAR

### READING LIST

[Related Publications](#)

### FEATURES



Find Appliance Rebates in Your State

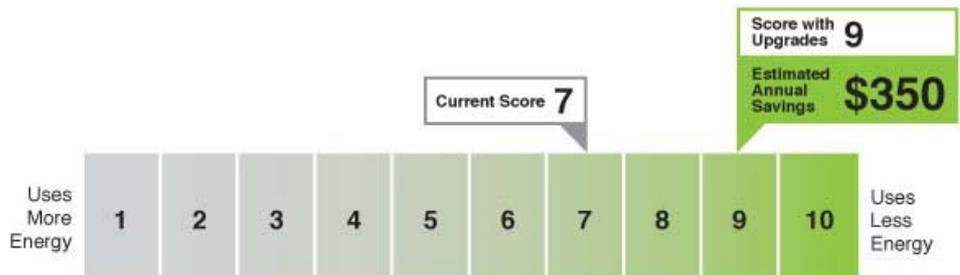
FIND WHAT YOU NEEDED?



Is my home more or less efficient than the average home like mine and what can I do to improve it?

# HOME ENERGY SCORE

Address **12345 Honeysuckle Lane Unit 3 Smithville, AR 99999** Total Energy **140 MBTUs / year** Climate Zone   
Home Size **2,200 square feet**  
Air Conditioning **Yes**



Top 20% of similarly sized homes score here or better

## TIPS TO SAVE ENERGY AT HOME

Home Energy Score | HES Session # XXXXXXXX | Page 2

Most home owners can reduce their energy bills and increase the comfort and safety of their home by changing some basic habits and doing more routine maintenance. Here are some easy ways to save energy and money. Savings from these measures are not included in the Home Energy Score.

### Refrigerator/Freezer

- If your extra refrigerator is only used once in a while, unplug it and prop the door open when it's empty.
- If your extra refrigerator doesn't have much in it, consider replacing it with a smaller Energy Star model.

### Laundry

- Use cold water to wash your clothes. Most detergents clean just as effectively and clothes don't fade as fast.
- Hang your clothes on a line to dry, when appropriate.
- If you use a clothes dryer, set the timer to Autodry so the dryer stops when your clothes are dry. This saves energy and is better for your clothes.
- Clean the dryer lint trap before

### Heating and Cooling

- Install a programmable thermostat.
- During the winter, lower the thermostat setting at night and when the house is empty.
- During the summer, raise the thermostat setting at night and when the house is empty.
- Avoid the desire to turn the thermostat temperature way up or way down to make the house warmer or colder. It doesn't heat or cool the house any faster but it uses more energy.
- Use ceiling fans alone or with air conditioning. Remember to turn them off when you leave.
- Change your furnace filter every two months (during summer too, if you have central air conditioning). Do it more frequently if you have pets or see that the filters are more than a little dirty.
- Bleed the air out of the radiators within a month of turning the boiler on each winter. Don't block vents and radiators with furniture.
- Install reflectors behind the radiators on

### Curtains and Blinds

- On summer days, close window shades and curtains on the south and west side of the house. On winter days, open them.
- On winter nights, close all window shades and curtains.

### Lights

- When you leave a room, turn lights off.
- Replace incandescent bulbs with compact florescent lights (CFLs).

### Computers and Other Electronics

- Use the energy saver settings on computers and other electronics so they go to sleep when you are not using them.
- Plug groups of electronics together into one power strip. Turn off the whole powerstrip off when they are not in use.

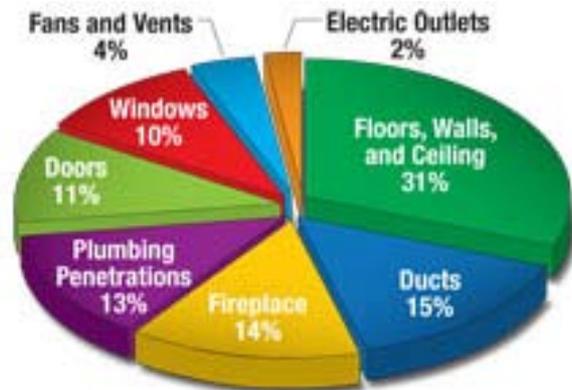
Estimated savings reflect the recommended improvements are 2 adults and 1 child live in the home. To learn more about how to save home energy score, visit:



456789

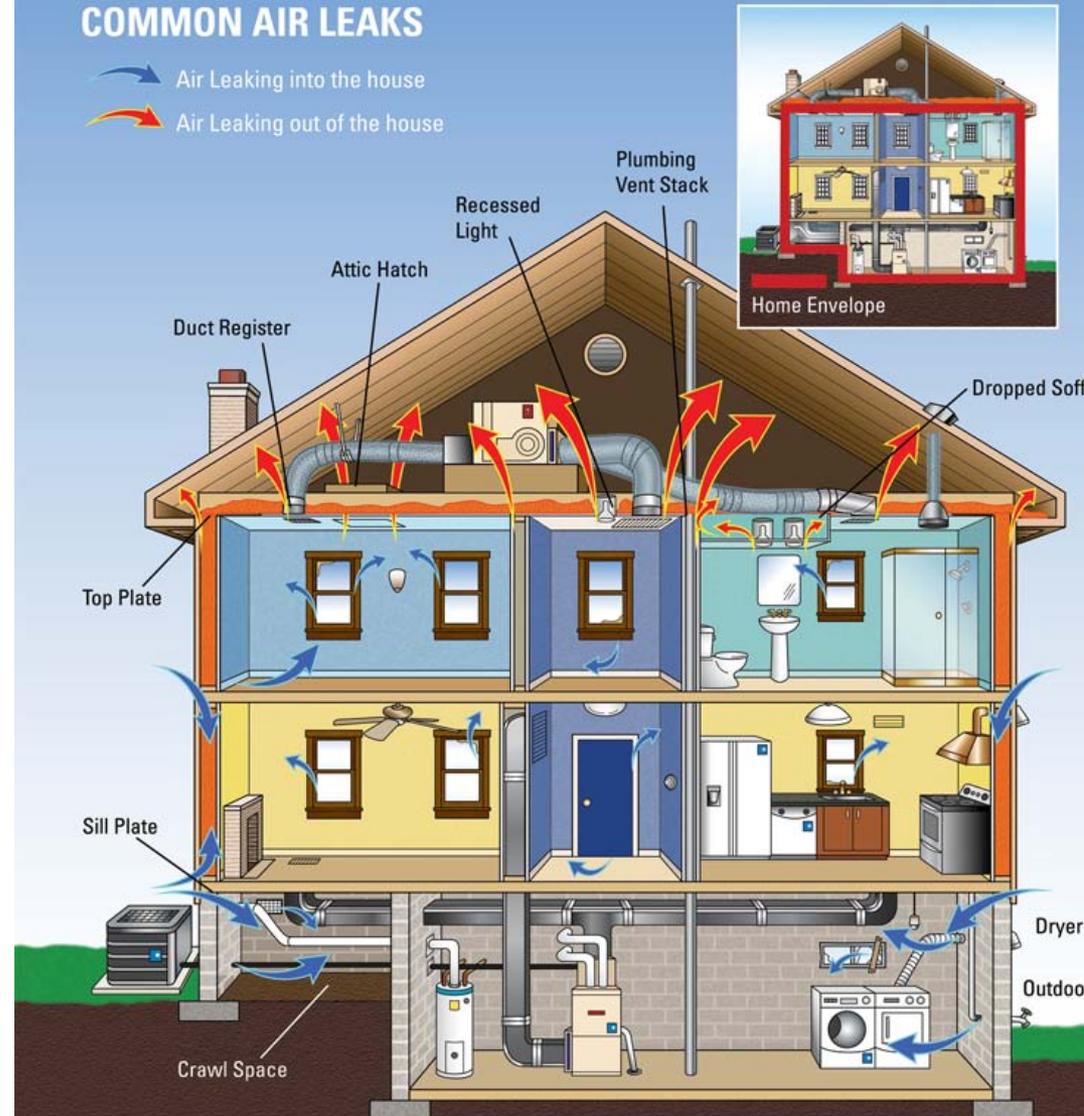
# How Does the Air Escape?

- About one-third of this air infiltrates through openings in your ceilings, walls, and floors.



## COMMON AIR LEAKS

-  Air Leaking into the house
-  Air Leaking out of the house



# Should I Insulate My Home?

- Is your home built before 1980?
  - Only 20% of homes built before 1980 are well insulated.
- Are you uncomfortably cold in the winter or hot in the summer?
  - Adding insulation creates a more uniform temperature and increases comfort.
- Do you pay high energy bills?
- Are you bothered by outside noise?
  - Insulation muffles sound.
- Is your attic insulation at or below the attic floor joists?





# Heating and Cooling Tips

## Hot Winter Tip

Using a programmable thermostat, you can automatically turn down your heat at night or when you are not at home.



## Cool Summer Tip

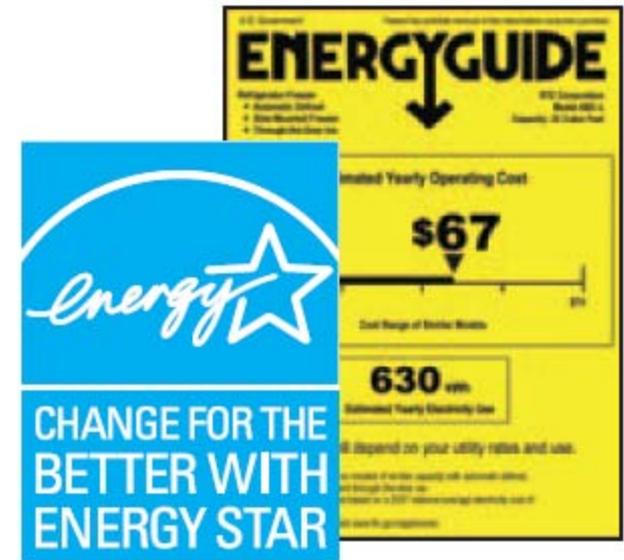
In the summer, you can save money by automatically turning your air-conditioning up at night or when you are at work.

- Clean or replace filters on furnaces once a month or as needed.
- Clean warm-air registers, baseboard heaters, and radiators as needed; make sure they're not blocked by furniture, carpeting, or drapes.



# ENERGY STAR Products

- An opportunity to save energy with every purchasing decision
- More than 60 types of products
  - Lighting
  - Heating and cooling
  - Appliances
  - Office equipment
  - Home electronics
  - Battery charging systems
  - Commercial food service



State Appliance Rebate Program



# Guides for Homeowners

## Major Appliance Shopping Guide

This easy-to-read guide may help you understand how appliances are rated for efficiency, what the ratings mean, and what to look for while shopping for new appliances.



Appliances	Rating	Special Considerations
<b>Natural Gas and Oil Systems</b> 	Look for the FTC (Federal Trade Commission) EnergyGuide label with an AFUE (Annual Fuel Utilization Efficiency) rating for natural gas- and oil-fired furnaces and boilers. The AFUE measures the seasonal or annual efficiency. ENERGY STAR furnaces have a 90 AFUE or higher.	Bigger is not always better! Too large a system costs more and operates inefficiently. Have a professional assess your needs and recommend the type and size of system you should purchase.
<b>Air-Source Heat Pumps</b> 	Look for the EnergyGuide label that lists the SEER (Seasonal Energy Efficiency Ratio) and HSPF (Heating Seasonal Performance Factor) for heat pumps. The SEER measures the energy efficiency during the cooling season and HSPF measures the efficiency during the heating season. The ENERGY STAR minimum efficiency level is 13 SEER or higher.	If you live in a cool climate, look for a heat pump with a high HSPF. ENERGY STAR heat pumps are about 20% more efficient than standard models. Contact a professional for advice on purchasing a heat pump.
<b>Central Air</b> 	Look for the EnergyGuide label with	Air conditioners that bear the ENERGY

## Seal Small Gaps

Use expanding foam or caulk to seal the openings around plumbing vent pipes and electrical wires (see photos 9 and 10). Be sure to wear gloves and be careful not to get expanding foam on your clothes, as the foam is very sticky and nearly impossible to remove once it sets. When the foam or caulk is dry, cover the area again with insulation.

### 9. FILL HOLES WITH CAULK



### 10. STUFF GAPS WITH INSULATION



If your plumbing pipe is wider, you may need to stuff some insulation into the space to serve as a backing foam. Once the fiberglass insulation is in place, follow the directions on the caulk around the pipe.

1.11 SEALING ATTIC AIR LEAKS

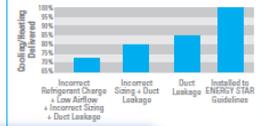


## Get an ENERGY STAR Quality Installation

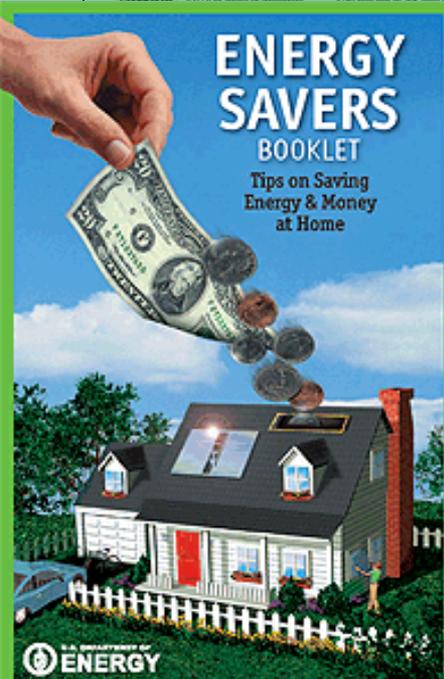
Replacing your old heating and cooling equipment with new, energy-efficient models is a great start. But to make sure that you get the best performance, the new equipment must be properly installed. In fact, improper installation can reduce system efficiency by up to 30 percent—costing you more on your utility bills and possibly shortening the equipment's life.

Make sure to ask your contractor if his or her work meets ENERGY STAR Quality Installation guidelines. These guidelines, based on the Air Conditioning Contractors of America's (ACCA) quality installation specification, require:

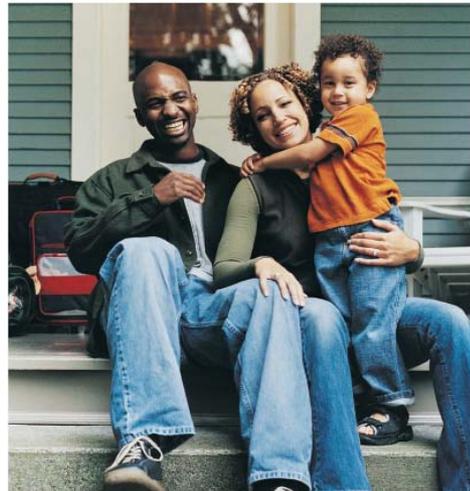
### Quality Installations Deliver Your Equipment's Full Potential. Many Installations Do Not



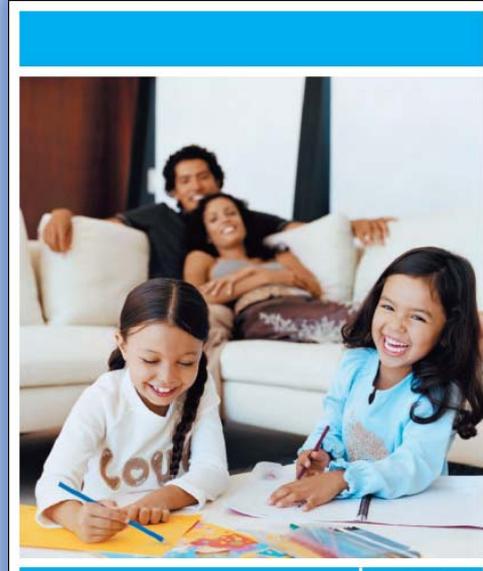
Proper Sizing of Equipment



Other factors that can affect your energy bill include the size of your home, the weather, and the age of your equipment. For more information, visit [www.energysavers.gov](http://www.energysavers.gov).



A DO-IT-YOURSELF GUIDE TO SEALING AND INSULATING WITH ENERGY STAR®  
SEALING AIR LEAKS AND ADDING ATTIC INSULATION



A Guide to Energy-Efficient Heating and Cooling



To get the best performance, a system that is too big is always a bad idea. Frequent on/off cycling and short cycling can shorten the life of your equipment. For cooled air to all the rooms in your home, you need to have the right size system. Then seal them up. In some cases, you may need to replace or

# Home Performance with ENERGY STAR



## A whole-house approach to energy efficiency

- Utility bill savings of 20% or more
- Fewer drafts and more comfortable rooms
- Work performed by specially training contractors
- Third-party quality assurance to make sure work gets down right
- Reduced greenhouse gas emissions protects the environment.

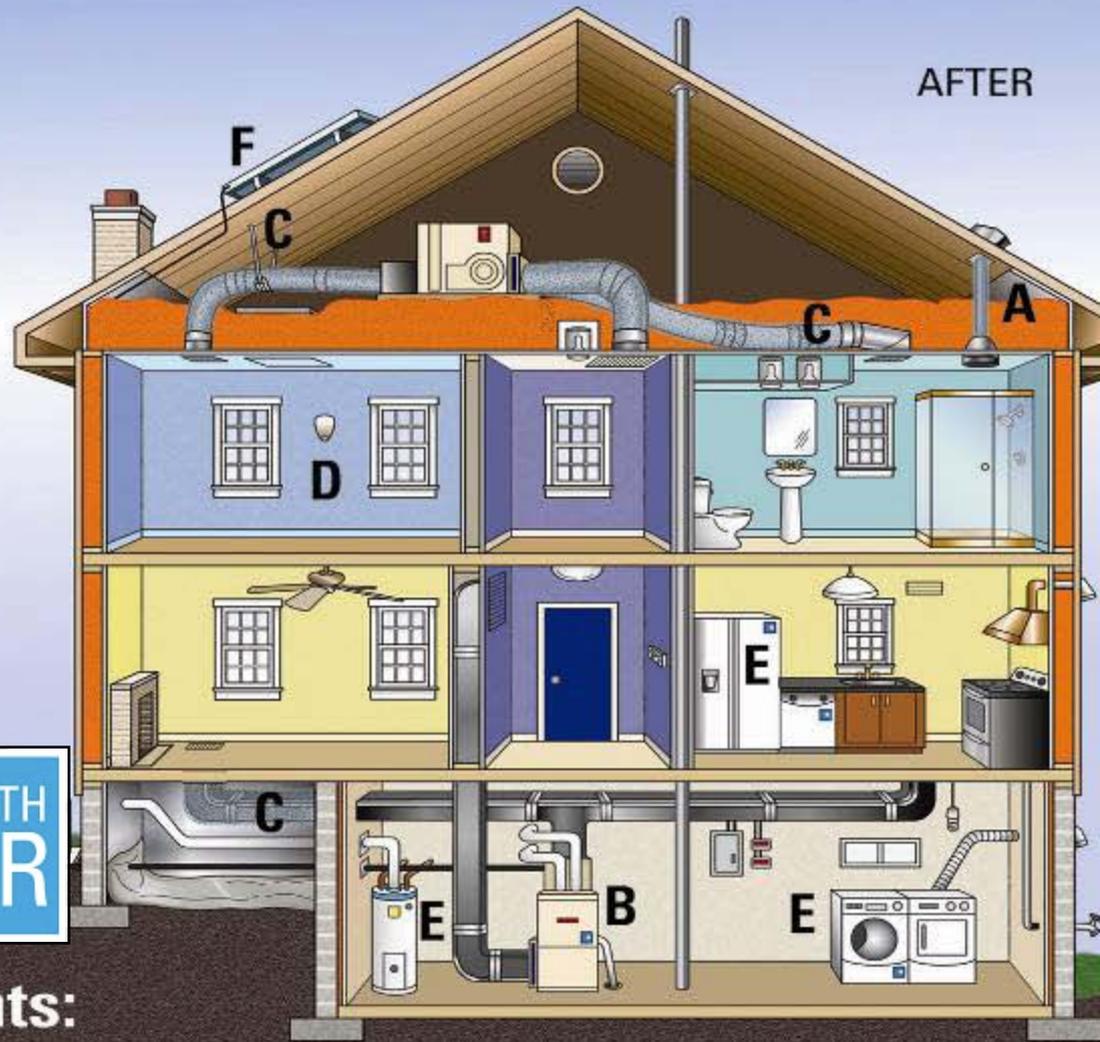
## Typical home improvements

- ✓ Sealing air leaks
- ✓ Adding insulation
- ✓ Upgrading heating and cooling systems
- ✓ Replacing lighting and appliances
- ✓ Installing high-performance windows

BEFORE



AFTER



## Typical Home Improvements:

- A** Sealing Air Leaks and Adding Insulation
- B** Improving Heating and Cooling Systems
- C** Sealing Ductwork

- D** Replacing Windows
- E** Upgrading Lighting, Appliances, and Water Heating Equipment
- F** Installing Renewable Energy Systems



# FEDERAL TAX CREDITS FOR ENERGY EFFICIENT PRODUCTS

[WWW.ENERGYSAVERS.GOV/TAXCREDITS](http://WWW.ENERGYSAVERS.GOV/TAXCREDITS)