

Easy on Energy: Tips for Using Energy Wisely in Homes

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U.S. Homes Use Large Amounts of Energy

- The U.S. has about 5 percent of the world's population but uses about 26 percent of the world's energy. Energy consumption in U.S. homes accounted for about 21 percent of the total U.S. energy consumption in 2004.¹
- Energy consumption from fossil fuel combustion is a main contributor to greenhouse gas emissions in the U.S. and the world. Carbon dioxide (CO₂) is a major contributor to greenhouse gases. Home energy use accounts for about 22 percent of the energy-related CO₂ emissions in the U.S. Overall, total U.S. emissions rose by 17 percent between 1990 and 2007².
- Reducing CO₂ emissions is key to slowing global climate change. Building design, construction, and maintenance have significant impacts on our environment. Home energy usage and CO₂ emissions are influenced by behavior, living space features, building structure, and appliance efficiency choices.

¹www.climatevision.gov, July 11, 2005, and U.S. Department of Energy (DOE)

²www.epa.gov/climatechange/emissions. 2011 U.S. Environmental Protecting Agency.



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Improve Energy Efficiency

Improving energy efficiency in homes can:

- save money,
- increase comfort,
- conserve resources and fossil fuels such as oil, coal, and natural gas,
- help reduce greenhouse gas emissions, and
- reduce dependence on foreign oil.

New energy-efficient products are available, and many existing products are more efficient than ever. The following 10 tips can help lower energy usage, and reduce energy costs and emissions over time.

1. Dial Down

Turn the thermostat down in the winter and up in summer. You will save about 2 to 3 percent on your heating bill for every one degree that you lower the thermostat setting. For example, if the thermostat is set at 73°F in the winter and you lower it by three degrees to 70°F, you will save about 9 percent, or 9 cents for every dollar, on heating costs.

A programmable thermostat, costing \$30 to \$200, schedules temperature adjustments. For example, it can automatically turn heating down at bedtime, turn it up again before people arise, and adjust for weekends. If used properly, ENERGY STAR® labeled thermostats can save up to \$100 a year.

2. Select Energy Efficiency Products



Figure 1. The ENERGY STAR label indicates a product meets the energy efficiency guidelines set.

Products have two price tags — the cost to purchase and the cost to use or operate. To choose the most economical product, compare energy efficiencies.

The ENERGY STAR label (*Figure 1*) means that a product meets the increased energy efficiency guidelines set by the U.S. Environmental Protection Agency (EPA) and the Department of Energy (DOE) for that product line. More than 40 product categories are evaluated for the ENERGY STAR label, including heating and cooling equipment, insulating and air sealing items, and windows, doors, and roofing products. Many home electronics products, appliances, and lighting and light fixtures are tested for compliance with the ENERGY STAR efficiency guidelines, too.

Depending on the cost of electricity and how the products are used and maintained, you can save energy and dollars by using ENERGY STAR products. For example, when comparing annual utility costs, an ENERGY STAR qualified:

- refrigerator can save between \$35 and \$50/year or more.
- dishwasher can save between \$20 and \$40/year.
- clothes washer can save between \$50 and \$60/year or more.
- room air conditioner can save about \$15/year.
- 40-pint dehumidifier can save \$20/year.

Over 10 years, the total saved by these examples is between \$1,400 and \$1,850. In addition to saving energy, some appliances also conserve water. The older the appliance that is being replaced, the more you will save in money and water over time.

In addition to the ENERGY STAR label, look for the yellow EnergyGuide label (*Figure 2*) on some appliances. The EnergyGuide indicates the approximate annual operating cost and efficiency for each model, and provides a scale to compare models with similar features.

3. Seal Air Duct Seams

Typical homes leak between 15 and 20 percent of the heated or cooled air into unheated and uncooled spaces such as attics, crawl spaces, walls, basements, and garages. Duct leaks alone can add hundreds of dollars per year to utility bills.

Seal air handling duct seams or holes so the conditioned air can get to the proper place. Sealing and insulating duct systems can improve a heating and cooling system's efficiency by as much as 20 percent, and result in savings of up to \$150 annually, according to the DOE. Ask a professional heating and cooling contractor who

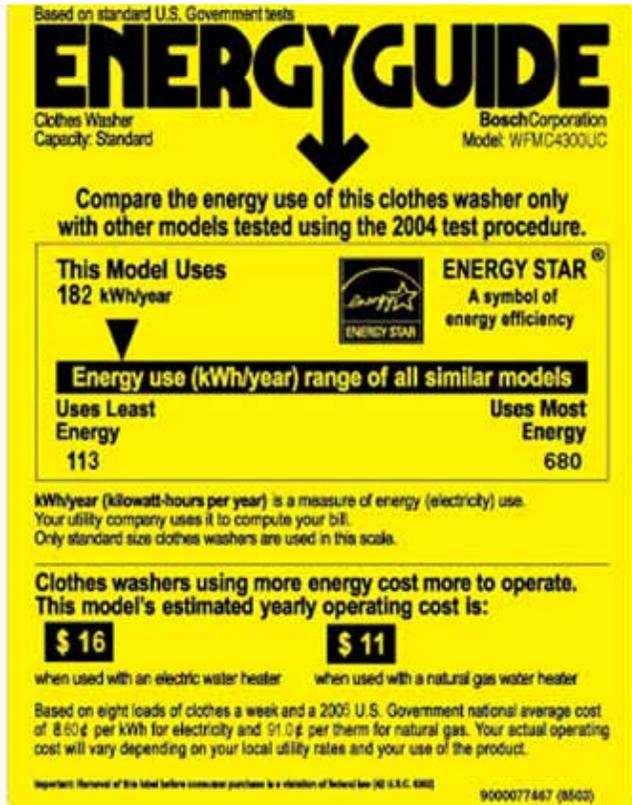


Figure 2. The EnergyGuide label helps consumers compare energy savings between similar models.

is trained to inspect and test for duct leakage to evaluate ductwork.

Exposed duct seams are easy to seal. Use mastic or foil-based duct tape (not regular duct tape) to seal joints or seams and cover gaps or holes. Mastic, a paste found at some wholesale and retail heating and cooling businesses, can be brushed onto the seams. *Ducts in more difficult spaces should be sealed and insulated by qualified professionals using appropriate sealing materials.* Check with your local utility company or weatherization program to see if they provide this service and if you are eligible.

If you insulate ducts in unconditioned areas that have water pipes, use pipe insulation, wraps, or electric heating tape to prevent pipes and drains from freezing. For more information, go to www.energystar.gov/ducts.

4. Select Energy Efficient Windows

Windows in cold climates can account for about 25 percent of an average home's heating load. In cold weather, close curtains and shades at night. In hot weather, and especially on the east and west sides of homes, close curtains and shades during the day and when away. Install awnings or plant trees to block the summer sun,

and windbreaks to block winter winds. Replace cracked windowpanes and repair glazing.

Replace single-pane windows with double-pane windows that have high-performance (more energy efficient) glass, or add high-performance storm windows (Table I). Installing storm windows can reduce heat loss by as much as 50 percent. High-performance windows with insulated frames create warmer interior glass surfaces, which reduces frost and condensation on interior surfaces.

Table I. Energy Efficient Window Comparison

Glass Comparisons	U-value	Solar Heat Gain Coefficient	Visible light transmittance
Single glass	1.1	0.87	0.90
Standard insulated glass	0.50	0.76	0.81
Low-e insulated with Argon gas	0.34 - 0.23	0.58	0.76

Sources: Krigger and Dorsi, 2009; U.S. DOE

Selecting Windows

Look for the ENERGY STAR label. ENERGY STAR windows must be rated by the National Fenestration Rating Council (NFRC). The NFRC label is found on windows made by participating manufacturers (Figure 3). The label can be used to compare energy ratings, including the U-value or factor, solar heat gain coefficient (SHGC), and visible light transmittance (VT). The NFRC label also may give the air leakage (AL) and condensation resistance (CR).



Figure 3. Examples of NFRC labels found on windows made by participating manufacturers.

Lower U-values, or insulating values, for windows mean they insulate better. Select the lowest U-value you can afford or a whole window U-value of 0.35 or lower (0.35 to 0.12). Compare whole window values. The SHGC tells how well the product blocks heat caused by sunlight and ranges from 0 to 1 (highest). Generally, a SHGC between 0.30 and 0.60 is suggested for this region. Look for an air leakage rating of 0.30 cubic foot/minute or less.

Correct installation is essential for any window style. Poor installation may lead to poor performance, including air leaks and water moving into the inner wall cavity causing damage to wood and siding. If in doubt about the installation methods, contact the manufacturer. For more tips on windows, go to www.eren.doe.gov/consumerinfo/energy_savers/windows.html or www.efficientwindows.org/factsheets/Nebraska.pdf.

5. Caulk and Weatherstrip

About one-third of the air that moves through homes comes in or exits through holes and cracks in ceilings, walls, floors, and foundations. Tightening up houses is important; however, if your home is already tight and you have combustion appliances and equipment, make sure you have enough incoming air for combustion. Install carbon monoxide alarms in your home.

Caulk and weatherstrip doors and windows. Caulk where the interior and exterior wall materials meet around door and window *frames*. Do not caulk movable parts. Caulk around any exterior penetration such as utility entrances, pipes, and vents. Caulk foundation cracks. Inside, caulk cracks in the ceiling and between rooms that may leak air into the attic or garage. In the basement, caulk at the sill plate and exterior foundation.

Use the correct caulk for the materials. There are caulks made for use with metals, masonry, wood, plastics, and combinations of materials. Read the labels and select for the materials, use, and quality. If the hole or crack is wider than about 1/4 inch, use rope caulk or a suitable material first and then caulk. If you use a foam, read the label carefully — know where it is to be used, how it reacts to temperatures and moisture, whether it expands, the color, and the materials for which it is suited.

Weatherstripping comes in various forms for specific uses such as for door bottoms and sides, sections of windows, and around attic hatches. Select a durable product and inspect it yearly. You may pay a little more for quality, but you will not replace it as often. For more information, see G1642 *Caulking* and G1681 *Weatherstripping* at www.ianrpubs.unl.edu.

6. Increase Heating and Cooling Efficiency

Maintaining the heating and cooling system will increase efficiency, and is critical. Have systems serviced annually and maintain clean filter systems as specified in the manufacturer's information. To operate efficiently, heating and cooling units must be sized correctly for the space. For example, an oversized cooling system wastes energy, costs more to buy and to operate over its lifetime, and will not dehumidify or provide comfort like it should.

When selecting heating and cooling equipment, look for numbers higher than the ENERGY STAR minimum to obtain even more energy efficiency. Taking into consideration increasing energy costs, *buy the highest rating you can afford*.

Look for the ENERGY STAR logo and EnergyGuide labels to compare efficiencies. In addition, compare the energy efficiency ratings of similar models of equipment. The higher the rating, the more efficient the model, and the greater the energy savings. The list below explains rating terms.

- **Annual Fuel Utilization Efficiency (AFUE)**, seen on gas heating equipment, is a measure of heating equipment efficiency. Look for higher ratings, which indicate more efficient equipment.
- **Coefficient Of Performance (COP)**, seen on heat pumps, is a measure of efficiency in the heating mode and is the ratio of total heating capacity (Btu*) to electrical input (watts).
- **Heating Seasonal Performance Factor (HSPF)** rates the efficient operation of the heating portion of the heat pump over one heating season. It indicates how many Btus of heat are provided per watt-hour of electricity consumed.
- **Energy Efficiency Ratio (EER)** is a measure of efficiency of air conditioners and heat pumps in the cooling mode. It represents the ratio of total cooling capacity (Btu/h) to electrical energy input (watts).
- **Seasonal Energy Efficiency Ratio (SEER)** represents the total cooling of a central air-conditioner or heat pump in Btu during the normal cooling season as compared to the total electric energy input (in watt-hours) consumed during the same period.

*British Thermal Units per hour (Btu/h) are a measure of the quantity of heat needed to raise the temperature of one pound of water one degree Fahrenheit (F°).

Note that heat pumps use a backup heating system to work with the heat pump when temperatures drop very low.

When shopping for a room sized or window air conditioner, look for the ENERGY STAR label, which indicates a minimum EER of 8.5 to 10.8 *depending* on the capacity and style. This means a model is at least 10 percent more efficient than the standard. Place window air conditioners (AC) in windows on the north side or in shaded areas. Shading the AC unit can increase its efficiency by as much as 10 percent. Insulate or store window air conditioners in the winter.

ENERGY STAR qualified gas furnace models have AFUE ratings of 90 percent up to 97 percent, making them 15 percent more efficient than standard models. ENERGY STAR qualified boilers and oil furnaces must have an AFUE of 85 percent and up. Look for the higher AFUE ratings.

7. Plant Trees

Plant deciduous trees (leaves fall in autumn) on the east and west sides of the home to protect against summer sun. Shade trees can reduce surrounding air temperatures as much as 9°F. Air temperatures directly under trees can be as much as 25°F cooler than air temperatures above nearby blacktop, according to DOE and National Park Service. Plant windbreaks of coniferous trees (those with needles and cones) on the north and west sides to protect against winter winds.

8. Check Insulation

Insulation may be inadequate in your home. R-value is a measure of resistance to heat flowing through an insulation material. In Nebraska, the recommended value for attics is R 49-60; walls, R 13-21; floors, R 25-30; and slab edge, R 6-10.

9. Switch Out Light Bulbs

Lighting accounts for about 11 percent of total home energy use. ENERGY STAR qualified compact fluorescent lightbulbs (CFL) use about two-third less energy than standard lightbulbs, generate 75 percent less heat, and lasts 6 to 12 times longer than traditional incandescent light bulbs (*Table II*). Using new lighting technologies can reduce lighting energy use in homes by 50 to 75 percent. Replacing one traditional incandescent bulb with a ENERGY STAR compact fluorescent bulb will save about \$30 per bulb in energy costs over its lifetime. Although the bulbs cost more up front, they save over the long run.

CFLs now come in “warm” light colors. Read labels carefully to buy the bulb right for the purpose and

fixture. CFLs contain a very small amount of mercury sealed within the glass tubing. Handle and dispose of them carefully. Some retailers offer free recycling services.

If every U.S. household changed out just five high-use light fixtures/bulbs with ENERGY STAR fixtures/bulbs, more than \$65 would be saved by each household every year in energy costs, and the U.S. would generate about one trillion fewer pounds of greenhouse gases. That is a \$6 billion energy savings for U.S. households, equivalent to the annual output of more than 21 power plants, according to the EPA and DOE.

Make the most of natural daylight, use task lighting rather than general lighting, and turn off unnecessary lights. If bi-level switching or dimmers are available, use the lowest setting that meets your need.

A newer, very efficient light source is LED (light emitting diode). LED and organic light emitting diode technologies are creating advances in solid-state lighting (SSL), and may mean SSL will compete as a significant low-energy use light source for the home. Solar powered exterior and porch lighting are also available.

Table II. Cost per year to operate for same amount of lumens or light.

<i>Incandescent Bulb</i>	<i>Fluorescent Bulb</i>
1 bulb costs about \$4.80/year	1 bulb costs about \$1.20/year
10 bulbs cost \$48.00/year	10 bulbs cost \$12.00/year

10. When “Off” is “On”

When computers, printers, TVs or other appliances are not being used, turn them completely off or use a power strip to disconnect the item. About 40 percent of the electricity used to power home electronics is used while the products are turned “off” but are “ready on” or powering other features like built in clocks.

Electronics in the sleep mode can use up to 20 percent of electricity needed when they are fully on. Five to 10 percent of residential electricity goes to devices that draw power when they are off or in standby mode if not completely off. Video games are a major offender.

Electronics that have the ENERGY STAR label use as much as 50 percent less energy to perform these functions. Select ENERGY STAR appliances and electronics with power management capabilities to eliminate energy waste. For example, printers with automatic “power down” features can reduce electricity use by more than 65 percent. ENERGY STAR qualified office products use about one-half as much electricity as standard equipment.

Summary

Managing the heat loss and gain in homes through caulking, weatherstripping, insulating, sealing air ducts, and selecting high performance windows can save energy and dollars. Selecting ENERGY STAR qualified appliances, heating and cooling equipment, lighting, and electronics adds to the savings. Turning off “ready-on” products when not in use saves energy and lowers energy costs, too.

Resources

Air-Source Heat Pumps — www.energysavers.gov/your_home/space_heating_cooling/index.cfm/mytopic=12620

Climate Vision — www.climatevision.gov

Consumer Information — (800) 342-5468 or www.eere.energy.gov/consumer

Energy Efficiency and Renewable Energy Clearinghouse — Phone: (800) 363-3732; Fax: (703) 893-0400
www1.eere.energy.gov/consumer/tips/pdfs/energy_savers.pdf

Energy Fact Sheets — www.eere.energy.gov/office_eere/factsheets.html or www1.eere.energy.gov/buildings/ssl/factsheets.html

Energy Savers — Tips on Saving Energy and Money at Home — www1.eere.energy.gov/consumer/tips/pdfs/energy_savers.pdf

ENERGY STAR — (888) 782-7937 www.energystar.gov

Geothermal Heat Pumps — www.energysavers.gov/your_home/space_heating_cooling/index.cfm/mytopic=12650

U.S. DOE Energy Efficiency and Renewable Energy. Building American. Resources for Energy Efficient Homes — www1.eere.energy.gov/buildings/building_america/related_links.html#home_construct

U.S. EPA ENERGY STAR Programs — www.energystar.gov

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