



# APPLIANCES

Minnesota Department of Commerce Energy Information Center

Home appliances and electronics can be big energy users. They eliminate much of the labor involved in such tasks as washing and drying clothes and cooling and cooking food. At the same time, they use significant amounts of electric and natural gas energy. Appliances can account for about one-fifth of all the energy used in the home.

Selecting and operating energy efficient:

Refrigerators

Freezers

Washers

Dryers

Ovens and Cook  
Tops

Lighting

Home Office  
Equipment

The good news is that appliance models on the market today are much more efficient than those of just ten years ago, thanks to the National Appliance Energy Conservation Act which set minimum energy standards for many appliances and specified deadlines for meeting those standards. If an appliance is more than 10 years old, replacing it will likely achieve energy savings. The same is true for consumer electronics such as computers, TVs, VCRs, telephones and other electronics—recent improvements to electronics means they use much less energy in standby mode.

## Look for the efficiency labels

The easiest way to choose an energy efficient product is to look for the efficiency labels, either an Energy Guide label or an ENERGY STAR® label or both.

Energy Guide labels, the yellow and black stickers found on many appliances and electronics, are a useful tool for consumers to compare energy efficiencies of different models. In addition to listing the estimated annual operating cost of the appliance, they show how the particular model compares in energy use to other similar models. (See Figure 1)

ENERGY STAR labels appear on appliances and electronics that meet strict energy efficiency standards. The label may be black and white with a star, or color with a globe, or the new logo which is light blue with the words ENERGY STAR (see

Page 4). Initially developed by the U.S.

Environmental Protection Agency for computers and other office equipment, the ENERGY STAR label serves as a seal of approval on more than three dozen products including refrigerators, air conditioners, DVD players, cordless phones and fax machines. An ENERGY STAR label also means quality, durability and long life. (See page 4 for a list of home appliances that are covered by the ENERGY STAR program). For more information about ENERGY STAR, call 1-888-STAR-YES (1-888-782-7937) or visit the web site [www.energystar.gov](http://www.energystar.gov).

## What is the true cost of an appliance?

Owning and operating a new appliance is like buying on the installment plan. The purchase price is only a down payment. The rest of the cost is paid to the utility company through gas and electric bills, month after month, for as long as the appliance works. These monthly energy costs add up. The chart below compares the energy costs (based on a rate of 7 cents per kWh and 65 cents per therm of natural gas) for typical major home appliances. A ten-year-old model is compared to a new appliance meeting the minimum standard and when available, to an equivalent ENERGY STAR model. ENERGY STAR appliances are the most energy efficient appliances currently available. Continuing improvements by appliance manufacturers make it likely that new models coming on the market will have even higher levels of efficiencies.



### Related Guides:

Low Cost/No Cost Ideas  
Combustion & Makeup Air

## Buying used appliances

The Energy Information Center strongly recommends buying a new rather than a used appliance. Although purchasing used appliances are substantially cheaper than new appliances, they are generally less efficient than new models of similar style and size and therefore will actually cost more to own and operate in the long run.

The money saved by reduced energy consumption is likely to justify the cost of purchasing a new appliance. This is especially true for appliances such as refrigerators, which in recent years have improved substantially in energy efficiency. If the only option is to buy a used refrigerator, look for energy efficiency features described in the sections below on individual appliances. Also, call the manufacturer and ask for the Energy Guide label for the model under consideration.

## Major Appliance Energy Cost Comparison

Appliance Type	10 yr. old	New—Minimum	ENERGY STAR
Refrigerator	\$60 (857 kWh)	\$39 (558 kWh)	\$35 (502 kWh)
Chest Freezer	\$24 (325 kWh)	\$22 (291.9 kWh)	N/A
Clothes Washer	\$74 (1051 kWh)	\$60 (852 kWh)	\$21 (294 kWh)
Clothes Dryer (Electric)	\$76 (1,080 kWh)	\$76 (1,080 kWh)	N/A
Clothes Dryer (Natural Gas)	\$23 (12 Mcf)	\$23 (12 Mcf)	N/A
Dishwasher	\$60 (860 kWh)	\$49 (700 kWh)	\$39 (555 kWh)

### Utility Rebates

Many electric and gas utilities in the state of Minnesota offer rebates for new appliances such as refrigerators, dishwashers, clothes washers and room air conditioners. Every utility determines the eligible appliance and rebate amount, but given the cost of a new appliance, it pays to do your homework and call your local utility to learn what rebates are available before you buy.

### Appliance operation and maintenance

Buying an efficient appliance is the first step in reducing appliance energy use and costs; equally important is the next step—maintaining and operating the appliance to ensure maximum efficiency. Read the owner's manual that comes with the appliance and carefully follow the manufacturer's recommendations. If the owner's manual cannot be found, contact the manufacturer and ask that a manual be sent. Set aside one week in the year to perform thorough maintenance on all appliances in the home—or make an appointment for those you can't service (such as heating, cooling & water heating).

### Repairs

When an appliance needs repair and it is covered by a warranty, be sure to use an authorized service dealer, otherwise repair costs may not be reimbursed. If the warranty period has elapsed, but the problem began while the appliance was still under warranty, reimbursement may still be possible—be sure to check. Also, when having an appliance repaired, routinely have the service person check and replace worn gaskets and belts.

### Refrigerators & Freezers

Refrigerators particularly have benefited from recent advancements in energy efficiency: the average refrigerator manufactured today is at least two to three times as efficient as the average model of 10 or more years ago. The older a refrigerator is, the more energy savings will be achieved with the purchase of an ENERGY STAR model. An ENERGY STAR refrigerator can save an average of about 350 kWh/year compared to a functioning 10-year-old-model and 700 kWh/year compared to a functioning 20-year-old model.

#### Choosing a refrigerator and freezer

Begin by determining the appropriate size for household needs. Too large a refrigerator, besides costing more than a smaller model, wastes space and energy. Too small a model leads to extra trips to the store.

Manual defrost refrigerators use less electricity than automatic defrost models, but they are not widely available in all sizes. Manual defrost models also must be defrosted on a regular basis to maintain their efficiency. Features such as automatic icemakers and through-the-door dispensers can increase energy consumption and frequency of repairs.

Considering a second refrigerator? Generally it is much less expensive to buy and operate one refrigerator than two smaller refrigerators, especially if the second refrigerator is an old model.

Manual defrost freezers are more common than automatic defrost models and generally do a better job of storing food. Since the freezer is opened less frequently than a refrigerator, frost builds up more slowly. Chest freezers are typically 15-20

## The Cost of Small Appliances

Appliance Type	Avg. Monthly kWh	Monthly Cost*
Hair dryer (used once a day)	2	\$0.14
Power tools	3	\$0.21
Vacuum cleaner (used 1 hr a week)	4	\$0.28
Waterbed heater	100	\$7.00
Electric blanket	14	\$0.98
Dehumidifier (depends on kW size & hours of operation)	(size X hours of use)	up to \$20.00
Portable humidifier	25 - 60	\$1.75-\$4.20
Auto engine block heater	(size X hours of use)	up to \$25.00
Toaster (used once a day)	3	\$0.21
Coffee makers (depends on kW size & hours of operation)	(size X hours of use)	up to \$4.00
VCR (used 10 hrs a week)	2	\$0.14
Personal computer (used 40 hours a week)	20	\$1.40
Television (color, used 50 hours a week)	41	\$2.87
Stereo system	9	\$0.63

\* -- At \$.07 per kWh

The list above was compiled to give homeowners a general idea about the amount of energy consumed by household appliances. Obviously, your exact consumption will vary depending upon power consumption and usage. Here's how to calculate the specific amount of energy an appliance consumes:

$(\text{Wattage} \times \text{Hours Used Per Month}) / 1,000 = \text{Monthly kWh consumption}$ . To convert this number to monthly cost, multiply the result by the kWh price you pay for electricity.

You can usually find the wattage of most appliances stamped on the bottom or back of the appliance, or on its "nameplate." The wattage listed is the maximum power drawn by the appliance. Since many appliances have a range of settings (for example, the setting on a hair dryer), the actual amount of power consumed will depend on the setting that is used.

percent more efficient than upright freezers because they are better insulated and cold air doesn't spill out when they are opened.

### Installation

Air must circulate freely around refrigerator and freezer condenser coils so they can give off heat. The unit also will fail to lose heat properly if it is located in direct sunlight or next to the dishwasher, stove or oven.

Although refrigerators and freezers should be located in a somewhat cooler area, during the winter they should be in heated space—at least 60 degrees F. for best operation. Never locate an automatic defrost freezer in an unheated space.

### Operation and maintenance

Consult the owner's manual for specific operation and maintenance instructions. Remember, keeping

the refrigerator in good condition, and cleaning the food compartments as well as the refrigerator coils, are major factors in the efficient operation of a refrigerator.

The temperature inside the refrigerator should be about 38°F, or a little lower; the freezer compartment should be about 0 to 5° F. Place thermometers in each compartment; if the temperature varies significantly from the thermostat settings, the refrigerator or freezer probably needs attention. On manual defrost models, do not allow more than a quarter-inch of ice build up in the freezer or freezer compartment before defrosting.

If a second refrigerator is needed only a few days a year, turn it off when it's not in use. Be sure to chain the door shut or turn the door to the wall to make sure children can't climb in.



## Home ENERGY STAR Products

### Appliances

Clothes Washers  
Dehumidifiers  
Dishwashers  
Refrigerators

### Heating & Cooling

Air & water source  
(geothermal) heat pumps  
Boilers  
Central & room air conditioners  
Dehumidifiers  
Furnaces  
Programmable Thermostats  
Ventilating Fans

### Home Electronics

Answering Machines & Cordless Phones  
DVD & Home Audio  
Set-Top Boxes  
TV's & VCR's

### Lighting

Ceiling Fans  
Compact Fluorescent Light Bulbs (CFLs)  
Residential Light Fixtures

### Office Equipment

Computers  
Copiers  
Fax Machines  
Monitors  
Multifunction Devices  
Printers  
Scanners

Many automatic defrost refrigerators have small heaters built into the walls to prevent moisture from collecting on the walls when humidity is high. Some models have a switch that allows the heaters to be turned off; during periods of low humidity, when there is little frost build-up, turn the switch off to reduce energy use.

Make sure refrigerator and freezer doors shut tightly. Test by closing the door or doors on a piece of paper and then try to remove the paper. If the paper pulls out easily, heat is leaking into the appliance and new seals are needed. Since new seals are not cheap, this may be a good time to evaluate whether to buy a new refrigerator or freezer.

### Cleaning

The coils on freezers also should be cleaned regularly with a vacuum or brush. Condenser coils are located in the back of older refrigerators and at the bottom of most new ones. Be sure to unplug the refrigerator when cleaning the coils.

### Laundry Equipment

An ENERGY STAR clothes washer will make a big difference in energy savings. Compared to a standard washer, ENERGY STAR qualified models will use half the energy. The difference between the most and least efficient top loading models, for example, is over 1500 kWh per year. An additional benefit is reduced energy costs for clothes drying because ENERGY STAR washers spin the clothes much dryer.

### Choosing an efficient washer

Because up to 90 percent of the energy needed to wash clothes is used to heat water, it is important to look for a water efficient clothes washer. Most full-sized ENERGY STAR qualified washers use 18-25 gallons of water per load, compared to the 40 gallons used by a standard machine. The best way to compare the overall efficiency of ENERGY STAR qualified clothes washers is the listed Modified Energy Factor, or MEF (see the listings at <http://www.energystar.gov/>). The MEF measures the energy used during the washing process, including machine energy, water heating energy, and dryer energy. The higher the MEF, the more efficient the clothes washer.

Look for models with multiple settings for water level and water temperature. Consider a front

loading machine with a horizontal axis of motion. Some front loaders use only 15 gallons of water per cycle. Front loading machines are also gentler on washable items, as there is no central agitator.

### Washer operation

Most laundry loads can be washed in cold or warm water, significantly reducing the amount of energy used. CAUTION: "cold water" as used in manufacturer's literature and by makers of detergents means 70° F. In Minnesota, the temperature of the cold water going into the machine can be below 50° F, which is too cold to clean clothes properly and the warm water setting may have to be used.

### Choosing an efficient dryer

Energy Guide labels are not required on clothes dryers. The one sure way to save money on dryer energy is to buy an ENERGY STAR labeled washer that spins out most of the excess moisture. To buy the most efficient dryer, look for energy-efficient features such as an automatic temperature control, a moisture sensor control, a cool-down cycle and a no-heat cycle. These features can be found on both gas and electric dryers. The dryer may have several selections based on type of fabrics being dried; regardless of the number of these options, dryers have either two or three heat settings.

All new gas dryers now sold in Minnesota have electronic ignition. Some propane clothes dryers may still have pilot lights. Since pilot lights increase annual gas consumption, save money by selecting a dryer with electronic ignition.

Moisture sensors automatically turn the dryer off as soon as the clothes are dry and typically cut energy use by 10 to 15 percent. With a timer only, the dryer may run longer than necessary. Look for a dryer with an alarm announcing the end of the drying cycle and a post-heat tumbling cycle to prevent wrinkling.

### Dryer operation

It is important to remember that the clothes dryer exhaust removes air from the home and can be a factor in reducing the amount of combustion air available for furnaces and other fuel-burning appliances. If the dryer uses natural gas, it too will require combustion air. A shortage of combustion air can cause backdrafting of dangerous gases into the home, so it is important to ensure

an adequate combustion air supply. (See Combustion & Makeup Air guide)

The most important way to save energy and money with clothes dryers is to shorten the drying time. Set the dryer moisture sensor and automatic temperature control to keep drying time to a minimum and to prevent over-drying. Over-drying not only wastes energy, it also shortens fabric life, causes wrinkles and generates static.

### Tips:

- Two small loads will consume more energy than one large load; be careful not to overload the dryer, however, since this causes wrinkling and uneven drying.
- Clean the lint screen between each load. Lint restricts air movement, which can mean longer dry times per load.
- Twice a year, disconnect the exhaust duct and clear out the lint. Always use smooth metal ducting for the dryer exhaust. Flexible exhaust hoses increase operation time and trap lint, increasing fire risk. Tape all seams in the metal ducting.
- Check the dryer exhaust vent periodically to make sure it operates properly and doesn't leak. The flapper on the outside should open and close freely; if it remains open, it allows heated air to escape from the house during the winter. Check the flapper once a month and remove lint buildup.
- Always vent all dryers outside to prevent moisture damage to the home and to keep laundry contaminants out of the household air.

## Dishwashers

Dishwashers, like clothes washers, use energy for heating water as well as to actually run the dishwasher. An efficient automatic dishwasher, when used properly, normally uses less hot water than washing dishes by hand. The savings in water heating often make up for the power consumed by the dishwasher.

### Choosing a dishwasher

Dishwashers carry the Energy Guide label, which compares energy use of the particular model with energy use of similar models. Efficiency of new models has improved 20 percent during the past

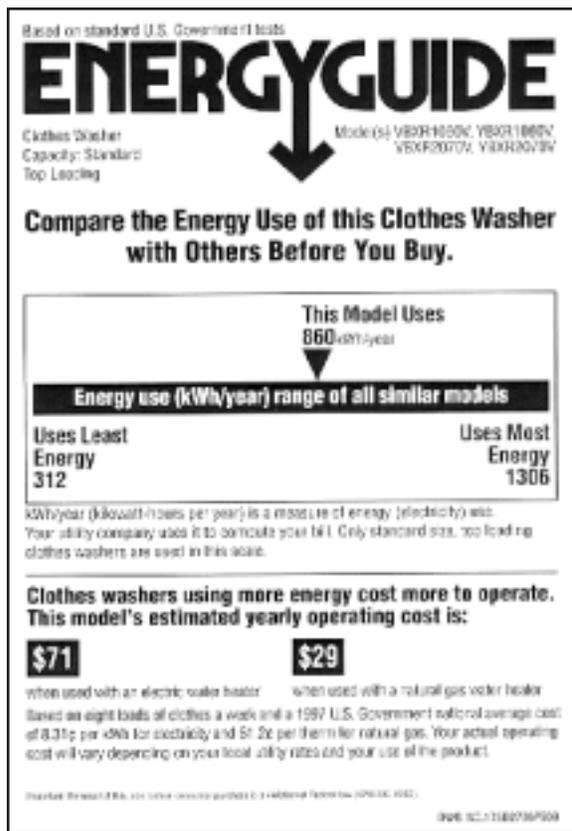


Figure 1.

several years. An ENERGY STAR labeled dishwasher will save even more compared to a standard model.

The majority of the dishwasher's energy use goes to heat water and not to run the machine, so it pays to look for features that reduce hot water use. Dishwashers do not need water heated to 140° F. to dissolve detergent and cut grease. A setting of 120° F. is the highest temperature needed for household use. This setting reduces water heating costs six to ten percent compared to a 140° setting.

Other useful features are short cycle and air-dry selectors. Short cycles use less hot water and are suitable when dishes are only slightly soiled. An air-dry selector automatically shuts off the heat during the drying cycle, cutting electricity use by up to 20 percent.

### Tips:

- Wash only full loads. Running two half loads can take twice as much energy as a full load.
- Don't waste water or time by pre-rinsing dishes. Most new dishwashers require only that food is scraped off and liquids emptied. If pre-rinsing is necessary, use cold water. Use short cycles with

## The Laundry

Always vent the dryer outside to prevent moisture damage to the home and to keep contaminants out of the air.

## The Fridge

Keeping the refrigerator clean and in good condition is a major factor in its efficient operation.

## Hanging out

Of course, the most efficient drying practice is to hang clothes on an outdoor line whenever it is not raining or cold. The clothes and linens will be fresher and will even last longer—ever wondered where dryer lint comes from? It is an accumulation of countless tiny pieces of fabric broken off as the clothes tumble in the dryer. Additionally, ultraviolet rays of the sun kill germs just as well as bleach, and with no water pollution.

## When going on vacation

When leaving the house for a week or more, reduce appliance energy costs by taking a few simple steps. These include:

Unplug TV sets, microwaves and all other appliances that aren't too difficult to re-program. Even when an appliance is not being used, if it's plugged in it will consume energy. Especially note any appliances and electronics with an LED clock display, such as coffee makers, that will not be needed.

If you will be gone for several months or more, empty the refrigerator and set it on its warmest setting (but do not turn it "off").

Turn off all incandescent light bulbs and place compact fluorescent light bulbs (CFLs) on a timer to help discourage break-ins.

dishes that are less soiled.

## Installation

The Department recommends that dishwashers be located away from the refrigerator or freezer. Dishwashers produce moisture and heat, which cause the refrigerator and freezer to use more energy.

## Cook Tops & Ovens

The kitchen range consists of a cook top and an oven. Because many modern kitchens have separate cook tops and ovens, this guide refers to the combination as a "range." It also uses the term "gas" for both natural gas and propane.

### Choosing a new range, cook top, or oven

Electronic ignition replaces the pilot light on a gas range and cuts gas use by about 40 percent. All new natural gas ranges are now required to have electronic ignition. Propane ranges also are available with electronic ignition.

### Electric cook tops

The most common electric burners in America are exposed coils, but a variety of new styles are available.

Radiant elements under ceramic glass are easier to clean than exposed coil cook tops, but they are slower to heat up. It is important to use flat pans with this type of surface.

Electric induction cook tops use magnetism to heat the pan. They may be a separate cook top or part of a range. They cut electric consumption substantially—by as much as half—and control temperature more easily than conventional electric cook tops do. They also are safer because they are cooler and less likely to cause burns, and their flat surface makes them easier to clean. Induction cook tops have some disadvantages, however. They can only be used with steel and iron pans, and they are more expensive than regular cook tops. The extra expense may not be justified by their energy savings.

Halogen cook tops use halogen lamps to heat a smooth glass surface. They provide heat quickly and are more efficient than regular cook tops, but they also are more expensive.

## Ovens

Convection ovens circulate hot air with a fan, providing for more even temperatures in the oven. Because of this even heat, temperatures often can be lowered and cooking times shortened thereby reducing energy use. The more even temperatures also allow for more items to be cooked at the same time.

Self-cleaning ovens are up to 20 percent more energy efficient because they have more insulation. If the self-cleaning function is used more than once a month, however, more energy will be used than the insulation saves.

Microwave ovens use up to two-thirds less electricity than conventional ovens, but they require special cooking utensils and are not suitable for cooking all types of food. They are not a substitute for an oven for major meal preparation. Some microwave ovens have features that save additional energy, such as variable power settings and controls to turn off the oven when the food is cooked.

### Efficient operation of cook tops and ovens

Cook tops and ovens are generally not very efficient at cooking small quantities of food. Microwave ovens, toaster ovens, pressure cookers and crock-pots use less energy than cook tops or ovens.

### Tips:

- On gas ranges, keep the flame away from the bottom of the pot. On electric ranges, use pots and pans with flat bottoms. They provide the best contact with electric cook tops.
- The element can be turned off a few minutes ahead of time and the hot element will continue to cook the food.
- Keep oven preheating to a minimum. Preheating is often unnecessary. Keep the oven door closed except when the food must be treated or moved. Up to 50 percent of the heat escapes each time the oven door opens. Food takes longer to cook and the loss of heat can affect browning and baking results. Use timers instead.
- Don't cover oven racks with foil; this reduces heat flow and increases cooking time. Also, don't

line the bottom of the oven with foil. The foil blocks the secondary air supply to the burners, which can increase carbon monoxide production.

- For efficient microwaving, keep the inside surface clean so that the microwaves can reach food effectively. Defrosting food in a microwave may be convenient, but defrosting at room temperature is free.

### Ventilation equipment

Ventilation is necessary to remove cooking fumes, grease, moisture and smoke. Hood or cook top exhaust fans should vent directly to the outside.

An important caution: Check the size of the exhaust fan and make sure that there is adequate make-up air. When a ventilation fan operates, it draws air from inside the house to the outside and creates or contributes to a slight vacuum in the house. The resulting negative pressure can be serious. If the negative pressure is strong enough, it can cause the furnace and other fuel-burning appliances to backdraft dangerous gases into the home. All exhaust fans, including clothes dryers, must have an adequate supply of combustion or “make-up” air. For information on combustion air, call the Energy Information Center.

If the range, oven or cook top is on an inside wall and can't be directly vented to the outside, a remote exhaust vent with a damper located on a nearby outside wall is the next best option. This system can work with other household exhaust fans and fresh air intakes to improve indoor air quality. Recirculating ventilation hoods are only partially effective for removing certain cooking pollutants, but will not removing moisture or gases. To discuss further options for ventilation, call the Energy Information Center.

### Computers & Office Equipment

More and more people are using computers and other office equipment at home. In fact, for many Americans, home is also their place of work. Casual use of a personal computer at home does not use large amounts of electricity; however, large computer monitors, laser printers, and home copy machines used in a true home office workday can be significant energy consumers.

### Selecting and using efficient equipment

Look for and buy computers, monitors, printers, scanners and fax machines with the ENERGY STAR label; these products feature an automatic standby-or “sleep”-mode that saves energy when they are not in use. Also consider purchasing an ENERGY STAR multi-functional device, or MFD. These integrated systems that combine printing, scanning, faxing, and copying are generally more energy efficient than having separate units. In many instances, ENERGY STAR equipment does not cost more money than standard equipment.

It is important to remember that the ENERGY STAR label does not indicate the amount of energy the equipment consumes when it is use, and this varies considerably. If a computer monitor is sporting a screen saver that never shuts off, you are wasting money, but you are not alone! Nearly half of all computers in the nation have been found to have their ENERGY STAR monitor power management disabled. Using this built-in feature will increase the life of your monitor and save about 200 kWh per year (for assistance in enabling this feature see <http://www.energystar.gov/powermanagement>).

### Home Electronics

Home electronic products use energy even when they are off to power features like clock displays and remote controls. The DOE and EPA estimate that this is the annual output of 12 power plants and costs U.S. consumers over \$1 billion each year. In Minnesota, this amounts to \$17 million. Products that have earned the ENERGY STAR use half the energy to perform these functions with no loss in performance.

The average home has 2 TVs, a VCR, a DVD player and 3 telephones. Replacing these items with ENERGY STAR models would save over 20 billion pounds of greenhouse gas emissions. Visit the ENERGY STAR Web site (see <http://www.energystar.gov>) for a list of qualified products and features to look for when purchasing cordless phones, televisions, VCRs, DVD players, and other home entertainment products.

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This information will be made available, upon request, in alternative formats such as large print, Braille, cassette tape, CD-ROM.

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## **Additional Resources**

**American Council for an Energy-Efficient Economy (ACEEE);** <http://www.aceee.org> (click on “consumer resources”):

ACEEE promotes energy efficiency as a means of promoting both economic prosperity and environmental protection. The Web site contains lots of useful information for consumers including the excellent “Consumer Guide to Home Energy Savings” and a listing of the most energy efficient appliances.

**Consortium for Energy Efficiency (CEE);** <http://www.cee1.org> (click on “residential” or “consumer information”):

CEE works with utilities, manufacturers and energy organizations to develop programs that will increase the use, availability and acceptance of highly energy efficient products. The Web site describes this effort, and provides specifications for high-energy efficiency products and links to manufacturers.

**ENERGY STAR;** <http://www.energystar.gov> (click on “appliances, lighting, heating and cooling, and more”):

ENERGY STAR is a major effort of the federal government to protect the environment through superior energy efficiency. This major Web site provides details on energy efficiency for all manner of energy uses and products including listings of qualified products.

**Minnesota Department of Commerce, State Energy Office Energy Information;** <http://www.commerce.state.mn.us> (click on “Energy Info Center”):

Download the complete Home Energy Guide series from our Web site, or call us for our CD-ROM 651-2965175 (twin cities); 1-800-657-3710 (elsewhere in Minnesota).