

The Smart Way to Save Energy and Money at Home



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Save Energy and Money Today

Did you know that the typical U.S. family spends about \$1,900 a year on home utility bills? Unfortunately, a large portion of that energy is wasted. And each year, electricity generated by fossil fuels for a single home puts more carbon dioxide into the air than two average cars. And as for the road, transportation accounts for 67% of all U.S. oil consumption. The good news is that there is a lot you can do to save energy and money at home and in your car. Start making small changes today.

The key to achieving these savings in your home is a whole-house energy efficiency plan. To take a whole-house approach, view your home as an energy system with interdependent parts.

For example, your heating system is not just a furnace—it's a heat-delivery system that starts at the furnace and delivers heat throughout your home using a network of ducts. Even a top-of-the-line, energy-efficient furnace will waste a lot of fuel if the ducts, walls, attic, windows, and doors are not properly sealed and insulated. Taking a whole-house approach to saving energy ensures that dollars you invest to save energy are spent wisely.

Energy-efficient improvements not only make your home more comfortable, they can yield long-term financial rewards. Reduced utility bills more than make up for the higher price of energy-efficient appliances and improvements over their lifetimes. In addition, your home could bring in a higher price when you sell.

Fast Tips to Save Energy Today

Easy low-cost and no-cost ways to save energy.

- Install a programmable thermostat to keep your house comfortably warm in the winter and comfortably cool in the summer.
- Use compact fluorescent light bulbs with the ENERGY STAR® label.
- Air dry dishes instead of using your dishwasher's drying cycle.
- Turn off your computer and monitor when not in use.
- Plug home electronics, such as TVs and DVD players, into power strips; turn the power strips off when the equipment is not in use (TVs and DVDs in standby mode still use several watts of power).
- Lower the thermostat on your hot water heater to 120°F.
- Take short showers instead of baths.
- Wash only full loads of dishes and clothes.
- Drive sensibly. Aggressive driving (speeding, rapid acceleration and braking) wastes gasoline.
- Look for the ENERGY STAR label on home appliances and products.

Your Home's Energy Use

The first step to taking a whole-house energy efficiency approach is to find out which parts of your house use the most energy. A home energy audit will pinpoint those areas and suggest the most effective measures for cutting your energy costs. You can conduct a simple home energy audit yourself, contact your local utility, or call an independent energy auditor for a more comprehensive examination.

Other

- Check for open fireplace dampers.
- Make sure your appliances and heating and cooling systems are properly maintained. Check your owner's manuals for the recommended maintenance.
- Study your family's lighting needs and use patterns, paying special attention to high-use areas such as the living room, kitchen, and outside lighting. Look for ways to use lighting controls—like occupancy sensors, dimmers, or timers—to reduce lighting energy use, and replace standard (incandescent) light bulbs and fixtures with compact or standard fluorescent lamps.

Formulating Your Plan

After you have identified where your home is losing energy, assign priorities by asking yourself a few important questions:

- How much money do you spend on energy?
- Where are your greatest energy losses?

Energy Auditing Tips

- Check the insulation levels in your attic, exterior and basement walls, ceilings, floors, and crawl spaces. Visit www.energysavers.gov for instructions on checking your insulation levels.
- Check for holes or cracks around your walls, ceilings, windows, doors, light and plumbing fixtures, switches, and electrical outlets that can leak air into or out of your home.
- How long will it take for an investment in energy efficiency to pay for itself in energy cost savings?
- Do the energy-saving measures provide additional benefits that are important to you (for example, increased comfort from installing double-paned, efficient windows)?
- How long do you plan to own your current home?
- Can you do the job yourself or will you need to hire a contractor?
- What is your budget and how much time do you have to spend on maintenance and repair?

Once you assign priorities to your energy needs, you can form a whole house efficiency plan. Your plan will provide you with a strategy for making smart purchases and home improvements that maximize energy efficiency and save the most money.

Another option is to get the advice of a professional. Many utilities conduct energy audits for free or for a small charge. For a fee, a professional contractor will analyze how well your home's energy systems work together and compare the analysis to your utility bills. He or she will use a variety of equipment such as blower doors, infrared cameras, and surface thermometers to find leaks and drafts.

After gathering information about your home, the contractor or auditor will give you a list of recommendations for cost-effective energy improvements and enhanced comfort and safety.

A reputable contractor can also calculate the return on your investment in high-efficiency equipment compared with standard equipment.

Tips for Finding a Contractor

- Ask neighbors and friends for recommendations
- Look in the Yellow Pages
- Focus on local companies
- Look for licensed, insured contractors
- Get three bids with details in writing
- Ask about previous experience
- Check references
- Check with the Better Business Bureau

Insulation and Sealing Air Leaks

Checking your home's insulation is one of the fastest and most cost-effective ways to use a whole-house approach to reduce energy waste and make the most of your energy dollars.

A good insulating system includes a combination of products and construction techniques that protect a home from outside hot or cold temperatures, protect it against air leaks, and control moisture.

You can increase the comfort of your home while reducing your heating and cooling needs by investing in proper insulation and sealing air leaks.

Insulation

First, check the insulation in your attic, ceilings, exterior and basement walls, floors, and crawl spaces to see if it meets the levels recommended for your area. Insulation is measured in R-values—the higher the R-value, the better your walls and roof will resist the transfer of heat. DOE recommends ranges of R-values based on local heating and cooling costs and climate conditions in different areas of the nation. The map and chart on pages 6 and 7 show the DOE recommendations for your area.



State and local code minimum insulation requirements may be less than the DOE recommendations, which are based on cost effectiveness. Although insulation can be made from a variety of

materials, it usually comes in four types; each type has different characteristics.

Rolls and batts—or blankets—are flexible products made from mineral fibers, such as fiberglass and rock wool.

They are available in widths suited to standard spacings of wall studs and attic or floor joists: 2x4 walls can hold R-13 or R-15 batts; 2x6 walls can have R-19 or R-21 products.

Loose-fill insulation—usually made of fiberglass, rock wool, or cellulose in the form of loose fibers or fiber pellets, it should be blown into spaces using special pneumatic equipment. The blown-in material conforms readily to building cavities and attics. Therefore, loose-fill insulation is well suited for places where it is difficult to install other types of insulation.

Rigid foam insulation—foam insulation typically is more expensive than fiber insulation. But it's very effective in buildings with space limitations and where higher R-values are needed. Foam insulation R-values range from R-4 to R-6.5 per inch of thickness, which is up to 2 times greater than most other insulating materials of the same thickness.

Foam-in-place insulation—this type can be blown into walls and reduces air leakage, if blown into cracks, such as around window and door frames.

Should I Insulate My Home?

Insulate your home when:

- You have an older home and haven't added insulation. Only 20% of homes built before 1980 are well insulated.
- You are uncomfortably cold in the winter or hot in the summer— adding insulation creates a more uniform temperature and increases comfort.
- You build a new home, addition, or install new siding or roofing.
- You pay high energy bills.
- You are bothered by noise from outside—insulation muffles sound.

Insulation Tips

- Consider factors such as your climate, building design, and budget when selecting insulation R-values for your home.
- Use higher density insulation on exterior walls, such as rigid foam boards, in cathedral ceilings and on exterior walls.
- Ventilation helps with moisture control and reducing summer cooling bills. Attic vents can be installed along the entire ceiling cavity to help ensure proper airflow from the soffit to the attic to make a home more comfortable and energy efficient. Do not ventilate your attic if you have insulation on the underside of the roof. Check with a qualified contractor.
- Recessed light fixtures can be a major source of heat loss, but you need to be careful how close you place insulation next to a fixture unless it is marked IC—designed for direct insulation

contact. Check your local building codes for recommendations. See *Lighting* for more about recessed cans.

- As specified on the product packaging, follow the product instructions on installation and wear the proper protective gear when installing insulation.

\$ Long-Term Savings Tip

- One of the most cost-effective ways to make your home more comfortable year-round is to add insulation to your attic.

Adding insulation to the attic is relatively easy and very cost effective. To find out if you have enough attic insulation, measure the thickness of the insulation. If it is less than R-30 (11 inches of fiber glass or rock wool or 8 inches of cellulose), you could probably benefit by adding more. Most U.S. homes should have between R-30 and R-60 insulation in the attic. Don't forget the attic trap or access door.

If your attic has enough insulation and your home still feels drafty and cold in the winter or too warm in the summer, chances are you need to add insulation to the exterior walls as well. This is a more expensive measure that usually requires a contractor, but it may be worth the cost if you live in a very hot or cold climate.

If you replace the exterior siding on your home, you should consider adding insulation at the same time.

You may also need to add insulation to your crawl space or basement. Check with a professional contractor.

How Much Insulation Does My Home Need?

New Construction

For new homes in most climates, you will save money and energy if you install a combination of cavity insulation and insulative sheathing. Cavity insulation can be installed at levels up to R-15 in a 2 in. x 4 in. wall and up to R-21 in a 2 in. x 6 in. wall.

The insulative sheathing, used in addition to this cavity insulation, helps to reduce the energy that would otherwise be lost through the wood frame. The table below shows the recommended combinations. For example, in Zone 5, you could use either a 2x4 wall with R-13 or a 2x6 wall with R-21. For either of those two walls, you should also use an inch of insulative sheathing that has an R-value of R-5 or R-6.

Zone	Gas	Heat Pump	Fuel Oil	Electric Furnace	Attic	Cathedral Ceiling	Wall		Floor
							Cavity	Insulation Sheathing	
1	✓	✓	✓	✓	R30 to R49	R22 to R38	R13 to R15	None	R13
2	✓	✓	✓		R30 to R60	R22 to R38	R13 to R15	None	R13
2				✓	R30 to R60	R22 to R38	R13 to R15	None	R19 - R25
3	✓	✓	✓		R30 to R60	R22 to R38	R13 to R15	None	R25
3				✓	R30 to R60	R22 to R38	R13 to R15	R2.5 to R5	R25
4	✓	✓	✓		R38 to R60	R30 to R38	R13 to R15	R2.5 to R6	R25 - R30
4				✓	R38 to R60	R30 to R38	R13 to R15	R5 to R6	R25 - R30
5	✓	✓	✓		R38 to R60	R30 to R38	R13 to R15	R2.5 to R6	R25 - R30
5				✓	R38 to R60	R30 to R60	R13 to R21	R5 to R6	R25 - R30
6	✓	✓	✓	✓	R49 to R60	R30 to R60	R13 to R21	R5 to R6	R25 - R30
7	✓	✓	✓	✓	R49 to R60	R30 to R60	R13 to R21	R5 to R6	R25 - R30
8	✓	✓	✓	✓	R49 to R60	R30 to R60	R13 to R21	R5 to R6	R25 - R30

Today, new products are on the market that provide both insulation and structural support and should be considered for new home construction or additions. Structural insulated panels, known as SIPs, and masonry products like insulating concrete forms are among these. Some homebuilders are even using an old technique borrowed from the pioneers: building walls using straw bales.

Radiant barriers (in hot climates), reflective insulation, and foundation insulation should all be considered for new home construction. Check with your contractor for more information about these options.

Sources of Air Leaks in Your Home



Areas that leak air into and out of your home cost you lots of money. Check the areas listed below.

- 1 Dropped ceiling
- 2 Recessed light
- 3 Attic entrance
- 4 Sill plates
- 5 Water and furnace flues
- 6 All ducts
- 7 Door frames
- 8 Chimney flashing
- 9 Window frames
- 10 Electrical outlets and switches
- 11 Plumbing and utility access

Sealing Air Leaks

Warm air leaking into your home during the summer and out of your home during the winter can waste a lot of your energy dollars. One of the quickest dollar-saving tasks you can do is caulk, seal, and weatherstrip all seams, cracks, and openings to the outside. You can save on your heating and cooling bill by reducing the air leaks in your home.

Tips for Sealing Air Leaks

- First, test your home for air tightness. On a windy day, carefully hold a lit incense stick or a smoke pen next to your windows, doors, electrical boxes, plumbing fixtures, electrical

outlets, ceiling fixtures, attic hatches, and other locations where there is a possible air path to the outside. If the smoke stream travels horizontally, you have located an air leak that may need caulking, sealing, or weatherstripping.

- Caulk and weatherstrip doors and windows that leak air.
- Caulk and seal air leaks where plumbing, ducting, or electrical wiring penetrates through walls, floors, ceilings, and soffits over cabinets.
- Install foam gaskets behind outlet and switch plates on walls.
- Look for dirty spots in your insulation, which often indicate holes where air leaks into and out of your house. You can seal the holes with low-expansion spray foam made for this purpose.
- Look for dirty spots on your ceiling paint and carpet, which may indicate air leaks at interior wall/ceiling joints and wall/floor joists. These joints can be caulked.
- Install storm windows over single-pane windows or replace them with more efficient windows, such as double-pane. See Windows on page 18 for more information.
- When the fireplace is not in use, keep the flue damper tightly closed. A chimney is designed specifically for smoke to escape, so until you close it, warm air escapes—24 hours a day!
- For new construction, reduce exterior wall leaks by installing house wrap, taping the joints of exterior sheathing, and comprehensively caulking and sealing the exterior walls.

- Use foam sealant around larger gaps around windows, baseboards, and other places where warm air may be leaking out.
- Kitchen exhaust fan covers can keep air from leaking in when the exhaust fan is not in use. The covers typically attach via magnets for ease of replacement.
- Replacing existing door bottoms and thresholds with ones that have pliable sealing gaskets is a great way to eliminate conditioned air leaking out from underneath the doors.
- Fireplace flues are made from metal, and over time repeated heating and cooling can cause the metal to warp or break, creating a channel for hot or cold air loss. Inflatable chimney balloons are designed to fit beneath your fireplace flue during periods of non-use.

They are made from several layers of durable plastic and can be removed easily and reused hundreds of times. Should you forget to remove the balloon before making a fire, the balloon will automatically deflate within seconds of coming into contact with heat.

Heating and Cooling

Heating and cooling your home uses more energy and drains more energy dollars than any other system in your home. Typically, 46% of your utility bill goes for heating and cooling. What's more, heating and cooling systems in the United States together emit 150 million tons of carbon dioxide into the atmosphere each year, adding to global climate change. They also generate about 12% of the nation's

sulfur dioxide and 4% of the nitrogen oxides, the chief ingredients in acid rain.

No matter what kind of heating, ventilation, and air-conditioning system you have in your house, you can save money and increase your comfort by properly maintaining and upgrading your equipment.

But remember, an energy-efficient furnace alone will not have as great an impact on your energy bills as using the whole-house approach. By combining proper equipment maintenance and upgrades with appropriate insulation, air sealing, and thermostat settings, you can cut your energy use for heating and cooling, and reduce environmental emissions, from 20% to 50%.

Heating and Cooling Tips

- Set your thermostat as low as is comfortable in the winter and as high as is comfortable in the summer.
- 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.
- Bleed trapped air from hot-water radiators once or twice a season;
- Place heat-resistant radiator reflectors between exterior walls and the radiators.

- Turn off kitchen, bath, and other exhaust fans within 20 minutes after you are done cooking or bathing; when replacing exhaust fans, consider installing high-efficiency, low-noise models.
- During the heating season, keep the draperies and shades on your south-facing windows open during the day to allow the sunlight to enter your home and closed at night to reduce the chill you may feel from cold windows.
- During the cooling season, keep the window coverings closed during the day to prevent solar gain.

\$ Long-Term Savings Tips

- Select energy-efficient products when you buy new heating and cooling equipment. Your contractor should be able to give you energy fact sheets for different types, models, and designs to help you compare energy usage. For furnaces, look for high Annual Fuel Utilization Efficiency (AFUE) ratings. The national minimum is 78% AFUE, but there are ENERGY STAR models on the market that exceed 90% AFUE.
- For air conditioners, look for a high Seasonal Energy Efficiency Ratio (SEER). The current minimum is 13 SEER for central air conditioners. ENERGY STAR models are 14 SEER or more.

Air Ducts

One of the most important systems in your home, though it's hidden beneath your feet and over your head, may be wasting a lot of your energy dollars. Your home's duct system, a branching network of tubes in the walls, floors, and ceilings, carries the air from your

home's furnace and central air conditioner to each room. Ducts are made of sheet metal, fiberglass, or other materials.

Unfortunately, many duct systems are poorly insulated or not insulated properly. Ducts that leak heated air into unheated spaces can add hundreds of dollars a year to your heating and cooling bills. Insulating ducts that are in unconditioned spaces is usually very cost effective. If you are buying a new duct system, consider one that comes with insulation already installed.

Sealing your ducts to prevent leaks is even more important if the ducts are located in an unconditioned area such as an attic or vented crawl space. If the supply ducts are leaking, heated or cooled air can be forced out of unsealed joints and lost. In addition, unconditioned air can be drawn into return ducts through unsealed joints.

In the summer, hot attic air can be drawn in, increasing the load on the air conditioner. In the winter, your furnace will have to work longer to keep your house comfortable. Either way, your energy losses cost you money.

Although minor duct repairs are easy to make, ducts in unconditioned spaces should be sealed and insulated by qualified professionals using appropriate sealing materials. Here are a few simple tips to help with minor duct repairs.

Duct Tips

- Check your ducts for air leaks. First, look for sections that should be joined but have separated and then look for obvious holes.
- If you use tape to seal your ducts, avoid cloth-backed, rubber adhesive duct tape, which tends to fail quickly. Researchers

recommend other products to seal ducts: mastic, butyl tape, foil tape, or other heat- approved tapes. Look for tape with the Underwriters Laboratories logo.

- Remember that insulating ducts in the basement will make the basement colder. If both the ducts and the basement walls are uninsulated, consider insulating both. Water pipes and drains in unconditioned spaces could freeze and burst in the space if the heat ducts are fully insulated, because there would be no heat source to prevent the space from freezing in cold weather. However, using an electric heating tape wrap on the pipes can prevent this. Check with a professional contractor.
- If your basement has been converted to a living area, hire a professional to install both supply and return registers in the basement rooms.
- Be sure a well-sealed vapor barrier exists on the outside of the insulation on cooling ducts to prevent moisture buildup.
- When doing ductwork, be sure to get professional help.

Install a Carbon Monoxide Detector

Carbon monoxide (CO) detectors are highly recommended in homes with fuel-burning appliances, such as natural gas furnaces, stoves, ovens, and water heaters, and fuel-burning space heaters. An alarm signals homeowners if CO reaches potentially dangerous levels.

- Ducts that don't work properly can create serious, life-threatening carbon monoxide (CO) problems in the home. Install a

CO monitor to alert you to harmful CO levels if you have a fuel-burning furnace, stove or other appliance, or an attached garage.

\$ Long-Term Savings Tip

- You can lose up to 60% of your heated air before it reaches the register if your ducts aren't insulated and travel through unheated spaces such as the attic or crawlspace. Get a qualified professional to help you insulate and repair ducts.

Heat Pumps

Heat pumps are the most efficient form of electric heating in moderate climates, providing three times more heating than the equivalent amount of energy they consume in electricity. There are three types of heat pumps: air-to-air, water source, and ground source.

They collect heat from the air, water, or ground outside your home and concentrate it for use inside. Heat pumps do double duty as a central air conditioner. They can also cool your home by collecting the heat inside your house and effectively pumping it outside. A heat pump can trim the amount of electricity you use for heating by as much as 30% to 40%.

Heat Pump Tips

- Do not set back the heat pump's thermostat manually if it causes the electric resistance heating to come on. This type of heating, which is often used as a backup to the heat pump, is more expensive.

- Clean or change filters once a month or as needed, and maintain the system according to manufacturer's instructions.

\$ Long-Term Savings Tip

- If you use electricity to heat your home and live in a moderate climate, consider installing an energy- efficient heat pump system.

Solar Heating and Cooling

Using passive solar design techniques to heat and cool your home can be both environmentally friendly and cost effective. Passive solar heating techniques include placing larger, insulated windows on south-facing walls and locating thermal mass, such as a concrete slab floor or a heat-absorbing wall, close to the windows. In many cases, your heating costs could be more than 50% lower than the cost of heating the same house that does not include passive solar design.

Passive solar design can also help reduce your cooling costs. Passive solar cooling techniques include carefully designed overhangs, windows with reflective coatings, and reflective coatings on exterior walls and the roof.

A passive solar house requires careful design and site orientation, which depend on the local climate. So, if you are considering passive solar design for new construction or a major remodeling, you should consult an architect familiar with passive solar techniques.

Solar Tips

- Keep all south-facing glass clean.

- Make sure that objects do not block the sunlight shining on concrete slab floors or heat-absorbing walls.

Natural Gas and Oil Heating

If you plan to buy a new heating system, ask your local utility or state energy office for information about the latest technologies available to consumers. They can advise you about more efficient systems on the market today. For example, many newer models incorporate designs for burners and heat exchangers that result in higher efficiencies during operation and reduce heat loss when the equipment is off. Consider a sealed combustion furnace; they are both safer and more efficient.

\$ Long-Term Savings Tip

- Install a new energy-efficient furnace to save money over the long term. Look for the ENERGY STAR and EnergyGuide labels.

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.

Programmable Thermostats

You can save as much as 10% a year on your heating and cooling bills by simply turning your thermostat back 10% to 15% for 8 hours. You can do this automatically by installing an automatic setback or programmable thermostat.

Using a programmable thermostat, you can adjust the times you turn on the heating or air-conditioning according to a preset schedule. As a result, the equipment doesn't operate as much when you are asleep or when the house, or a part of it, is not occupied.

Programmable thermostats can store and repeat multiple daily settings (six or more temperature settings a day) that you can manually override without affecting the rest of the daily or weekly program. When shopping for a programmable thermostat, be sure to look for the ENERGY STAR label.

Air Conditioners

Buying a bigger room air-conditioning unit won't necessarily make you feel more comfortable during the hot summer months. In fact, a room air conditioner that's too big for the area it is supposed to cool will perform less efficiently and less effectively than a smaller, properly sized unit.

Sizing is equally important for central air-conditioning systems, which need to be sized by professionals. If you have a central air system in your home, set the fan to shut off at the same time as the cooling unit (compressor). In other words, don't use the system's central fan to provide circulation, but instead use circulating fans in individual rooms.

Cooling Tips

- Whole-house fans help cool your home by pulling cool air through the house and exhausting warm air through the attic.
- Set your thermostat as high as comfortably possible in the summer. The smaller the difference between the indoor and outdoor temperatures, the lower your overall cooling bill will be.
- Avoid setting your thermostat at a colder setting than normal when you turn on your air conditioner. It will not cool your home any faster and could result in excessive cooling and, therefore, unnecessary expense.
- Consider using an interior fan in conjunction with your window air conditioner to spread the cooled air more effectively through your home without greatly increasing your power use.
- Avoid placing lamps or TV sets near your air-conditioning thermostat. The thermostat senses heat from these appliances, which can cause the air conditioner to run longer than necessary.
- Plant trees or shrubs to shade air conditioning units but not to block the airflow. Place your room air conditioner on the north side of the house. A unit operating in the shade uses as much as 10% less electricity than the same one operating in the sun.

\$ Long-Term Savings Tips

- If your air conditioner is old, consider purchasing a new, energy-efficient model. You could save up to 50% on your utility bill for cooling. Look for the ENERGY STAR and EnergyGuide labels. The shopping guide in the back of this booklet will help you find the right size unit for your needs.

- Consider installing a whole-house fan or evaporative cooler if appropriate for your climate. Check out www.energysavers.gov for more information on efficient cooling.

Landscaping

Landscaping is a natural and beautiful way to keep your home cool in summer and reduce your energy bills.

A well-placed tree, shrub, or vine can deliver effective shade, act as a windbreak, and reduce your energy bills. Carefully positioned trees can save up to 25% of the energy a typical household uses for energy. Research shows that summer daytime air temperatures can be 3° to 6° cooler in tree-shaded neighborhoods than in treeless areas.

A lattice or trellis with climbing vines, or a planter box with trailing vines, shades the home's perimeter while admitting cooling breezes to the shaded area.

Water Heating

Water heating is the third largest energy expense in your home. It typically accounts for about 13%–17% of your utility bill.

There are four ways to cut your water heating bills: use less hot water, turn down the thermostat on your water heater, insulate your water heater, or buy a new, more efficient model.

Water Heating Tips

- Install aerating, low-flow faucets and showerheads.

- Repair leaky faucets promptly; a leaky faucet wastes gallons of water in a short period of time.
- Lower the thermostat on your water heater; water heaters sometimes come from the factory with high temperature settings, but a setting of 120°F provides comfortable hot water for most uses.
- Insulate your electric hot-water storage tank, but be careful not to cover the thermostat. Follow the manufacturer's recommendations.
- Insulate your natural gas or oil hot-water storage tank, but be careful not to cover the water heater's top, bottom, thermostat, or burner compartment. Follow the manufacturer's recommendations; when in doubt, get professional help.
- Insulate the first 6 feet of the hot and cold water pipes connected to the water heater.
- If you are in the market for a new dishwasher or clothes washer, consider buying an efficient, water-saving ENERGY STAR model to reduce hot water use.
- Install heat traps on the hot and cold pipes at the water heater to prevent heat loss. Some new water heaters have built-in heat traps.



- Drain a quart of water from your water tank every 3 months to remove sediment that impedes heat transfer and lowers the efficiency of your heater. The type of water tank you have determines the steps to take, so follow the manufacturer's advice.
- Although most water heaters last 10–15 years, it's best to start shopping now for a new one if yours is more than 7 years old. Doing some research before your heater fails will enable you to select one that most appropriately meets your needs.

\$ Long-Term Savings Tips

- Buy a new energy-efficient water heater. While it may cost more initially than a standard water heater, the energy savings will continue during the lifetime of the appliance. Look for the ENERGY STAR and EnergyGuide labels.
- Look for the ENERGY STAR label on efficient water heaters in the following categories: high efficiency gas non-condensing, gas condensing, electric heat pump, gas tankless, and solar.
- Consider installing a drain water waste heat recovery system. A recent DOE study showed energy savings of 25% to about 30% for water heating using such a system.
- Consider natural gas on-demand or tankless water heaters. Researchers have found savings can be up to 30% compared with a standard natural gas storage tank water heater.
- Heat pump water heaters can be very cost-effective in some areas.

Solar Water Heaters

If you heat water with electricity, have high electric rates, and have an unshaded, south-facing location (such as a roof) on your property, consider installing an ENERGY STAR qualified solar water heater. The solar units are environmentally friendly and can now be installed on your roof to blend with the architecture of your house.

Activity	Gallons per Use
Clothes washing	32
Showering	20
Bathing	20
Automatic dishwashing	12
Preparing food	5
Hand dishwashing	4

More than 1.5 million homes and businesses in the United States have invested in solar water heating systems, and surveys indicate that more than 94% of these customers consider the systems a good investment. Solar water heating systems are also good for the environment.

Solar water heaters avoid the greenhouse gas emissions associated with electricity production. During a 20-year period, one solar water heater can avoid more than 50 tons of carbon dioxide emissions. When shopping for a solar water heater, look for the ENERGY STAR label and for systems certified by the Solar Rating and Certification Corporation or the Florida Solar Energy Center.

\$ Long-Term Savings Tip

- Visit the Database of State Incentives for Renewables & Efficiency Web site (www.dsireusa.org) to see if you might qualify for tax credits or rebates for buying a solar water heater.

Windows

Windows can be one of your home's most attractive features.

Windows provide views, daylighting, ventilation, and solar heating in the winter. Unfortunately, they can also account for 10% to 25% of your heating bill. During the summer, your air conditioner must work harder to cool hot air from sunny windows. Install ENERGY STAR windows and use curtains and shade to give your air conditioner and energy bill a break. If you live in the Sun Belt, look into low-e windows, which can cut the cooling load by 10% to 15%.

If your home has single-pane windows, as many U.S. homes do, consider replacing them with new double-pane windows with high-performance glass (e.g., low-e or spectrally selective).

In colder climates, select windows that are gas filled with low emissivity (low-e) coatings on the glass to reduce heat loss. In warmer climates, select windows with spectrally selective coatings to reduce heat gain. If you are building a new home, you can offset some of the cost of installing more efficient windows because they allow you to buy smaller, less expensive heating and cooling equipment.

If you decide not to replace your windows, the simpler, less costly measures listed here can improve their performance.

- You can use a heavy-duty, clear plastic sheet on a frame or tape clear plastic film to the inside of your window frames during the cold winter months. Remember, the plastic must be sealed tightly to the frame to help reduce infiltration.
- Install tight-fitting, insulating window shades on windows that feel drafty after weatherizing.
- Close your curtains and shades at night; open them during the day.
- Keep windows on the south side of your house clean to let in the winter sun.
- Install exterior or interior storm windows; storm windows can reduce heat loss through the windows by 25% to 50%. Storm windows should have weatherstripping at all movable joints; be made of strong, durable materials; and have interlocking or overlapping joints. Low-e storm windows save even more energy.

Efficient windows may have two or more panes of glass, warm-edge spacers between the window panes, improved framing materials, and low-e coating(s), which are microscopically thin coatings that help keep heat inside during the winter and outside during the summer.

- Repair and weatherize your current storm windows, if necessary.

Warm-Climate Window Tips

- Install white window shades, drapes, or blinds to reflect heat away from the house.

- Close curtains on south- and west-facing windows during the day.
- Install awnings on south- and west-facing windows.
- Apply sun-control or other reflective films on south-facing windows to reduce solar gain.

\$ Long-Term Savings Tip

- Installing, high-performance windows will improve your home's energy performance. While it may take many years for new windows to pay off in energy savings, the benefits of added comfort and improved aesthetics and functionality may make the investment worth it to you. Many window technologies are available that are worth considering.

Shopping Tips for Windows

- Look for the ENERGY STAR label.
- Check with local utilities to see what rebates or other financial incentives are available for window replacement.
- High-performance windows have at least two panes of glass and a low-e (low emissivity) coating.
- Remember, the lower the U-factor, the better the insulation. In colder climates, focus on finding a low U-factor.
- Low solar heat gain coefficients (SHGCs) reduce heat gain. In warm climates, look for a low SHGC.

- In temperate climates with both heating and cooling seasons, select windows with both low U-factors and low SHGCs to maximize energy savings.
- Look for whole-unit U-factors and SHGCs, rather than center-of-glass, or COG, U-factors and SHGCs. Whole-unit numbers more accurately reflect the energy performance of the entire product.
- Have your windows installed by trained professionals. Be sure they're installed according to manufacturer's instructions; otherwise, your warranty may be void.

Lighting

Making improvements to your lighting is one of the fastest ways to cut your energy bills. An average household dedicates 10% of its energy budget to lighting. Using new lighting technologies can reduce lighting energy use in your home by 50% to 75%. Advances in lighting controls offer further energy savings by reducing the amount of time lights are on but not being used.

Indoor Lighting

Use linear fluorescent tubes and energy efficient compact fluorescent light bulbs (CFLs) in fixtures throughout your home to provide high-quality and high-efficiency lighting. Fluorescent lamps are much more efficient than incandescent (standard) bulbs and last about 6 to 12 times longer.

Today's CFLs offer brightness and color rendition that is comparable to incandescent bulbs. Although linear fluorescent and CFLs cost a bit more than incandescent bulbs initially, over their lifetime they

are cheaper because of how little electricity they use. CFL lighting fixtures are now available that are compatible with dimmers and operate like incandescent fixtures.

Indoor Lighting Tips

- Be sure to buy ENERGY STAR qualified CFLs.
 - They will save you about \$30 or more in electricity costs over each bulb's lifetime.
 - Producing about 75% less heat, they are safer to operate and can cut home cooling costs.

The best fixtures to use qualified CFLs in are usually found in your family and living rooms, kitchen, dining room, bedrooms, and outdoors.

Consider purchasing ENERGY STAR qualified fixtures. They are available in many styles including table, desk and floor lamps — and hard-wired options for front porches, dining rooms, bathroom vanity fixtures, and more.

- ENERGY STAR qualified fixtures distribute light more efficiently and evenly than standard fixtures and they deliver convenient features such as dimming on some indoor models.
- Controls such as timers and photo cells save electricity by turning lights off when not in use. Dimmers save electricity when used to lower light levels. Be sure to select products that are compatible with CFL bulbs; not all products work with CFLs.
- When remodeling, look for recessed downlights, or “cans”, that are rated for contact with insulation (IC rated).

- Take advantage of daylight by using light-colored, loose-weave curtains on your windows to allow daylight to penetrate the room while preserving privacy. Also, decorate with lighter colors that reflect daylight.
- If you have torchiere fixtures with halogen lamps, consider replacing them with compact fluorescent torchieres. Compact fluorescent torchieres use 60% to 80% less energy and do not get as hot as halogen torchieres.

Outdoor Lighting

Many homeowners use outdoor lighting for decoration and security. When shopping for outdoor lights, you will find a variety of products, from low-voltage pathway lighting to motion-detector floodlights.

Light emitting diodes, or LEDs, thrive in outdoor environments because of their durability and performance in cold weather. Look for ENERGY STAR LED products such as pathway lights, step lights, and porch lights for outdoor use.

Outdoor Lighting Tips

- Because outdoor lights are usually left on a long time, using CFLs in these fixtures will save a lot of energy. Most bare spiral CFLs can be used in enclosed fixtures that protect them from the weather.
- CFLs are also available as flood lights. These models have been tested to withstand the rain and snow so they can be used in exposed fixtures. Most though, cannot be used with motion detectors.

- Look for ENERGY STAR qualified fixtures that are designed for outdoor use and come with features like automatic daylight shut-off and motion sensors.

Light emitting diodes, or LEDs, offer better light quality than incandescent bulbs, last 25 times as long, and use even less energy than CFLs. Look for ENERGY STAR qualified LED products at home improvement centers and lighting showrooms.

Appliances

Appliances account for about 17% of your household's energy consumption, with refrigerators, clothes washers, and clothes dryers at the top of the consumption list.

When you're shopping for appliances, think of two price tags. The first one covers the purchase price—think of it as a down payment. The second price tag is the cost of operating the appliance during its lifetime.

You'll be paying on that second price tag every month with your utility bill for the next 10 to 20 years, depending on the appliance. Refrigerators last an average of 14 years; clothes washers about 11 years; dishwashers about 10 years; and room air conditioners last 9 years.

When you do shop for a new appliance, look for the ENERGY STAR label. ENERGY STAR products usually exceed minimum federal standards by a substantial amount.

To help you figure out whether an appliance is energy efficient, the federal government requires most appliances to display the bright yellow and black EnergyGuide label.

Although these labels will not tell you which appliance is the most efficient, they will tell you the annual energy consumption and operating cost for each appliance so you can compare them yourself. The American Council for an Energy- Efficient Economy lists the energy performance of top-rated energy- saving appliances on its web site: www.aceee.org.

Dishwashers

Most of the energy used by a dishwasher is for water heating. The EnergyGuide label estimates how much power is needed per year to run the appliance and to heat the water based on the yearly cost of natural gas and electric water heating.

Dishwasher Tips

- Check the manual that came with your dishwasher for the manufacturer's recommendations on water temperature; many have internal heating elements that allow you to set the water heater in your home to a lower temperature (120°F).
- Scrape, don't rinse, off large food pieces and bones. Soaking or prewashing is generally only recommended in cases of burned-on or dried-on food.
- Be sure your dishwasher is full, but not overloaded, when you run it.

- Avoid using the “rinse hold” on your machine for just a few soiled dishes. It uses 3 to 7 gallons of hot water each time you use it.
- Let your dishes air dry; if you don’t have an automatic air-dry switch, turn off the control knob after the final rinse and prop the door open slightly so the dishes will dry faster.

\$ Long-Term Savings Tip

- When shopping for a new dishwasher, look for the ENERGY STAR label to find a dishwasher that uses less water and 41% less energy than required by federal standards.

Refrigerators

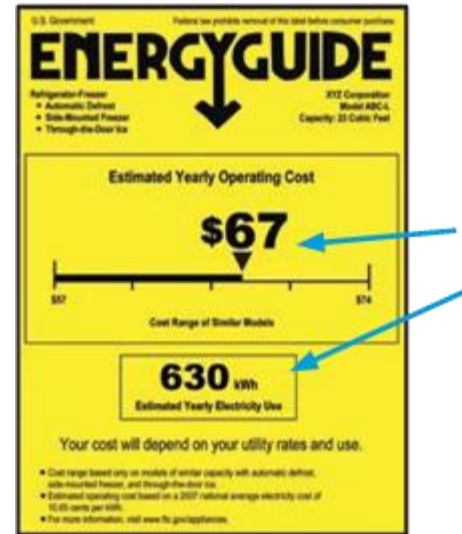
The EnergyGuide label on new refrigerators tells you how much electricity in kilowatt-hours (kWh) a particular model uses in one year. The smaller the number, the less energy the refrigerator uses and the less it will cost you to operate.

In addition to the EnergyGuide label, don’t forget to look for the ENERGY STAR label. A new refrigerator with an ENERGY STAR label uses at least 20% less energy than required by current federal standards and 40% less energy than the conventional models sold in 2001.

How to Read the EnergyGuide Label

The EnergyGuide label gives you two important pieces of information you can use to compare different brands and models when shopping for a new refrigerator:

- Estimated yearly operating cost based on the national average cost of electricity.
- Estimated energy consumption on a scale showing a range for similar models.



Refrigerator/Freezer Energy Tips

- Look for a refrigerator with automatic moisture control. Models with this feature have been engineered to prevent moisture accumulation on the cabinet exterior without the addition of a heater. This is not the same thing as an “anti-sweat” heater. Models with an anti-sweat heater will consume 5% to 10% more energy than models without this feature.
- Don’t keep your refrigerator or freezer too cold. Recommended temperatures are 37° to 40°F for the fresh food compartment of the refrigerator and 5°F for the freezer section. If you have a separate freezer for long-term storage, it should be kept at 0°F.
- To check refrigerator temperature, place an appliance thermometer in a glass of water in the center of the refrigerator. Read it after 24 hours. To check the freezer temperature, place a thermometer between frozen packages. Read it after 24 hours.

- Regularly defrost manual-defrost refrigerators and freezers; frost buildup decreases the energy efficiency of the unit. Don't allow frost to build up more than one-quarter of an inch.
- Make sure your refrigerator door seals are airtight. Test them by closing the door over a piece of paper or a dollar bill so it is half in and half out of the refrigerator. If you can pull the paper or bill out easily, the latch may need adjustment, the seal may need replacing, or you might consider buying a new unit.
- Cover liquids and wrap foods stored in the refrigerator. Uncovered foods release moisture and make the compressor work harder.

\$ Long-Term Savings Tip

- Look for the ENERGY STAR label when buying a new refrigerator. Select a new refrigerator that is the right size for your household. Top freezer models are more energy efficient than side-by-side models. Features like icemakers and water dispensers, while convenient, will increase energy use.

ENERGY STAR Refrigerators Are Cool! Refrigerators with the freezer on the top are more efficient than those with freezers on the side.

Other Energy-Saving Kitchen Tips

- Be sure to place the faucet lever on the kitchen sink in the cold position when using small amounts of water; placing the lever in the hot position uses energy to heat the water even though it may never reach the faucet.

- If you need to purchase a natural gas oven or range, look for one with an automatic, electric ignition system. An electric ignition saves natural gas because a pilot light is not burning continuously.
- In natural gas appliances, look for blue flames; yellow flames indicate the gas is burning inefficiently and an adjustment may be needed. Consult the manufacturer or your local utility.
- Keep range-top burners and reflectors clean; they will reflect the heat better, and you will save energy.
- Use a covered kettle or pan to boil water; it's faster and it uses less energy.
- Match the size of the pan to the heating element.
- Use small electric pans or toaster ovens for small meals rather than your large stove or oven. A toaster oven uses a third to half as much energy as a full-sized oven.
- Use pressure cookers and microwave ovens whenever it is convenient to do so. They will save energy by significantly reducing cooking time.

Laundry

About 90% of the energy used for washing clothes in a conventional top-load washer is for heating the water. There are two ways to reduce the amount of energy used for washing clothes—use less water and use cooler water. Unless you're dealing with oily stains, the warm or cold water setting on your machine will generally do a good job of cleaning your clothes. Switching your temperature setting from hot to warm can cut a load's energy use in half.

Laundry Tips

- Wash your clothes in cold water using cold-water detergents whenever possible.
- Wash and dry full loads. If you are washing a small load, use the appropriate water-level setting.
- Dry towels and heavier cottons in a separate load from lighter-weight clothes.
- Don't over-dry your clothes. If your machine has a moisture sensor, use it.
- Clean the lint filter in the dryer after every load to improve air circulation.
- Use the cool-down cycle to allow the clothes to finish drying with the residual heat in the dryer.
- Periodically inspect your dryer vent to ensure it is not blocked. This will save energy and may prevent a fire. Manufacturers recommend using rigid venting material, not plastic vents that may collapse and cause blockages.
- Consider air-drying clothes on clothes lines or drying racks. Air-drying is recommended by clothing manufacturers for some fabrics.

\$ Long-Term Savings Tips

- Look for the ENERGY STAR and EnergyGuide labels. ENERGY STAR clothes washers clean clothes using 50% less energy than standard washers. Most full-sized ENERGY STAR washers use 15 gallons of water per load, compared to the 32.5 gallons used by a

new standard machine. ENERGY STAR models also spin the clothes better, resulting in less drying time.

- When shopping for a new clothes dryer, look for one with a moisture sensor that automatically shuts off the machine when your clothes are dry. Not only will this save energy, it will save the wear and tear on your clothes caused by over-drying.
- ENERGY STAR does not label clothes dryers because most of them use similar amounts of energy, which means there is little difference in energy use between models.

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.

Natural Gas and Oil Systems

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.

Air-Source Heat Pumps

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.

Central Air Conditioners

Look for the EnergyGuide label with a SEER for central air conditioners. The ENERGY STAR minimum efficiency level is 13 SEER. Air conditioners that bear the ENERGY STAR label may be 25% more efficient than standard models. Contact a professional for advice on sizing a central air system.

Room Air Conditioners

Look for the EnergyGuide label with an EER (Energy Efficiency Ratio) for room air conditioners. The higher the EER, the more efficient the unit is. ENERGY STAR units are among the most energy-efficient products.

Two major factors should guide your purchase: correct size and energy efficiency. If the room is very sunny, increase capacity by 10%. If the unit is for a kitchen, increase the capacity by 4,000 Btu per hour.

Programmable Thermostats

For minimum ENERGY STAR efficiency, thermostats should have at least two programs, four temperature settings each, a hold feature that allows users to temporarily override settings, and the ability to maintain room temperature within 2°F of desired temperature.

Look for a the ENERGY STAR label and a thermostat that allows you to easily use two separate programs, one that can be programmed to reach the desired temperature at a specific time, and a hold feature that temporarily overrides the setting without deleting the preset programs.

Water Heaters

Look for the EnergyGuide label that tells how much energy the water heater uses in one year. Also, look for the FHR (first hour rating) of the water heater, which measures the maximum hot water the heater will deliver in the first hour of use. ENERGY STAR labeled water heaters available January 2009. If you typically need a lot of hot water at once, the FHR will be important to you. Sizing is important—call your local utility for advice.

Windows

Look for the NFRC (National Fenestration Rating Council) label that provides U-values and SHGC (solar heat gain coefficient) values. The lower the U-value, the better the insulation. Look at the Climate Region Map on the ENERGY STAR label to be sure that the window, door, or skylight you have selected is appropriate for where you live.

Refrigerators and Freezers

Look for the EnergyGuide label that tells how much electricity, in kWh, the refrigerator will use in one year. The smaller the number,

the less energy it uses. ENERGY STAR refrigerators use at least 20% less energy than required by federal standards. Look for energy-efficient refrigerators and freezers. Refrigerators with freezers on top are more efficient than those with freezers on the side. Also look for heavy door hinges that create a good door seal.

Dishwashers

Look for the EnergyGuide label that tells how much electricity, in kWh, the dishwasher will use in one year. The smaller the number, the less energy it uses. ENERGY STAR dishwashers use at least 41% less energy than required by federal standards. Look for features that will reduce water use, such as booster heaters and smart controls. Ask how many gallons of water the dishwasher uses during different cycles. Dishwashers that use the least amount of water will cost the least to operate.

Clothes Washers

Look for the EnergyGuide label that tells how much electricity, in kWh, the clothes washer will use in one year. The smaller the number, the less energy it uses. ENERGY STAR clothes washers use less than 50% of the energy used by standard washers. Look for the following design features that help clothes washers cut water usage: water level controls, “suds-saver” features, spin cycle adjustments, and large capacity. For double the efficiency, buy an ENERGY STAR unit.

Home Office and Home Electronics

In the U.S., nearly 4.2 million people worked from home in 2000, up from 3.4 million in 1990. Working from home saves energy and time by cutting out the commute, but it may increase your home energy bills a lot unless you use energy-saving office equipment.

ENERGY STAR labeled office equipment is widely available: it provides users with dramatic savings, as much as 90% savings for some products. Overall, ENERGY STAR labeled office products use about half the electricity of standard equipment. Along with saving energy directly, this equipment can reduce air-conditioning loads, noise from fans and transformers, and electromagnetic field emissions from monitors.

Home Office Tips

- Selecting energy-efficient office equipment—personal computers (PCs), monitors, copiers, printers, and fax machines—and turning off machines when they are not in use can result in enormous energy savings.
- An ENERGY STAR labeled computer uses 70% less electricity than computers without this designation. If left inactive, ENERGY STAR labeled desktop computers enter a sleep mode and use 4 watts or less.

Spending a large portion of time in low-power mode not only saves energy, but helps equipment run cooler and last longer.

- To maximize savings with a laptop, put the AC adapter on a power strip that can be turned off (or will turn off automatically); the transformer in the AC adapter draws power continuously, even when the laptop is not plugged into the adapter.

- Common misconceptions sometimes account for the failure to turn off equipment. Many people believe that equipment lasts longer if it is never turned off. This incorrect perception carries over from the days of older mainframe computers.
- ENERGY STAR labeled computers and monitors save energy only when the power management features are activated, so make sure power management is activated on your computer.
- There is a common misconception that screen savers reduce energy use by monitors; they do not. Automatic switching to sleep mode or manually turning monitors off is always the better energy-saving strategy.

\$ Long-Term Savings Tip

- Consider buying a laptop for your next computer upgrade; they use much less energy than desktop computers.

Home Electronics Tips

- Look for energy-saving ENERGY STAR labeled home electronics.
- Many appliances continue to draw a small amount of power when they are switched off. These “phantom” loads occur in most appliances that use electricity, such as VCRs, televisions, stereos, computers, and kitchen appliances. These phantom loads can be avoided by unplugging the appliance or using a power strip and using the switch on the power strip to cut all power to the appliance.
- Unplug battery chargers when the batteries are fully charged or the chargers are not in use.

- Studies have shown that using rechargeable batteries for products like cordless phones and PDAs is more cost effective than throwaway batteries. If you must use throwaways, check with your trash removal company about safe disposal options.

Smart power strips help save wasted energy.

Driving and Car Maintenance

T U.S. oil use—mainly in the form of gasoline. Luckily, there are plenty of ways to improve gas mileage.

Driving Tips

- Idling gets you 0 miles per gallon. The best way to warm up a vehicle is to drive it. No more than 30 seconds of idling on winter days is needed. Anything more simply wastes fuel and increases emissions.
- Aggressive driving (speeding, rapid acceleration, and hard braking) wastes gas. It can lower your highway gas mileage 33% and city mileage 5%.
- Avoid high speeds. Above 60 mph, gas mileage drops rapidly.
- Clear out your car; extra weight decreases gas mileage by 1% to 2% for every 100 pounds.
- Reduce drag by placing items inside the car or trunk rather than on roof racks. A roof rack or carrier provides additional cargo space and may allow you to buy a smaller car. However, a loaded roof rack can decrease your fuel economy by 5% or more.

- Check into telecommuting, carpooling and public transit to cut mileage and car maintenance costs.

Car Maintenance Tips

- Use the grade of motor oil recommended by your car's manufacturer. Using a different motor oil can lower your gasoline mileage by 1% to 2%.
- Keep tires properly inflated and aligned to improve your gasoline mileage by around 3.3%.
- Get regular engine tune-ups and car maintenance checks to avoid fuel economy problems due to worn spark plugs, dragging brakes, low transmission fluid, or transmission problems.
- Replace clogged air filters to improve gas mileage by as much as 10% and protect your engine.
- Combine errands into one trip. Several short trips, each one taken from a cold start, can use twice as much fuel as one trip covering the same distance when the engine is warm.

\$ Long-Term Savings Tip

- Consider buying a highly fuel-efficient vehicle. A fuel-efficient vehicle, a hybrid vehicle, or an alternative fuel vehicle could save you a lot at the gas pump and help the environment. See the Fuel Economy Guide (www.fueleconomy.gov) for more on buying a new fuel-efficient car or truck.

Renewable Energy

You have many options for using renewable energy at home—from solar-powered outdoor lights to buying renewable energy from your utility to even producing solar electricity at home with photovoltaic (PV) cells.

Renewable Energy Tips

- A new home provides the best opportunity for designing and orienting the home to take advantage of the sun's rays. A well-oriented home admits low-angle winter sun to reduce heating bills and rejects overhead summer sun to reduce cooling bills. See the Heating and Cooling section for more about using passive solar energy in your home.
- Many U.S. consumers buy electricity made from renewable energy sources like the sun, wind, water, plants, and Earth's internal heat. This power is sometimes called "green power." Buying green power from the utility is one of the easiest ways to use renewable energy without having to invest in equipment or take on extra maintenance.
- Another use of solar power is for heating water. Solar water heating is covered in the Water Heating section on page 16. If you have a swimming pool or hot tub, you can use solar power to cut pool heating costs. Most solar pool heating systems are cost competitive with conventional systems. And solar pool systems have very low operating costs. It's actually the most cost-effective use of solar energy.

\$ Long-Term Savings Tip

- If you've made your home as energy efficient as possible, and you have very high electricity bills and a good solar resource, you

might want to consider generating your own electricity using PV cells. New products are available that integrate PV cells with the roof, making them much less visible than older systems.

If the following conditions apply, you might want to do more research to see if investing in PV is right for you:

- Your site has adequate solar resources.
- A grid connection is not available in your area or can be made only through an expensive power line extension.
- You are willing to pay more up front to reduce the environmental impact of your electricity use.
- Your power provider will connect your system to the electricity grid and buy any excess power you produce.
- Your state, city, or utility offers rebates, tax credits, or other incentives. Visit www.dsireusa.org to find out about financial incentives in your area.