energy saver

Tips on Saving Money and Energy in Your Home

U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Contents

Save Money and Energy Today

You have the power to save money and energy in your own home. Saving energy reduces our nation's demand for the resources needed to make energy, and improving your energy efficiency is like adding another clean energy source to our electric power grid. The result is reduced utility bills and money in your pocket. Improving your energy efficiency can also improve the comfort of your home and your quality of life.

This guide shows you how easy it is to reduce your energy use at home and on the road. You'll find quick tips you can use to start saving today, as well as information on larger projects that will help save you money over the long term.

Find even more information about saving money and energy at home by visiting our website, EnergySaver.gov.

To learn more about U.S. Department of Energy (DOE) programs in energy efficiency and renewable energy, visit DOE's Office of Energy Efficiency and Renewable Energy website at energy.gov/eere.

The suggestions in this guide and on the EnergySaver.gov website can help you save energy, save money, and improve the comfort of your home.

Assess Your Home's Energy Use

The first step to improving the comfort and efficiency of your home is obtaining a home energy audit, also referred to as an energy assessment. A certified auditor evaluates your home and identifies and prioritizes the recommended energy-saving improvements. You can also conduct a basic do-it-yourself (DIY) energy assessment.

Professional Energy Audits

A professional home energy audit determines how much energy your home uses and evaluates steps you can take to make your home more energy efficient. Some audits take about an hour, do not require specialized equipment, and are relatively inexpensive. More thorough assessments require about four hours to complete, require specialized equipment, and are more expensive, but they provide more detailed information on your home's energy use.

Some home energy professionals provide a simple assessment called the Home Energy Score. Like a miles-per-gallon rating for a car, the Home Energy Score is an easy-to-produce rating designed to help homeowners and homebuyers gain useful information about a home's energy performance. The Home Energy Score helps homeowners, buyers, and renters to compare U.S. homes in terms of estimated energy performance. It also provides recommendations on how to cost-effectively improve your home's energy efficiency. Some of the information on the Home Energy Score Report can be included in real estate listings and potentially influence home appraisals and financing. Visit betterbuildingssolutioncenter.energy.gov/home-energy-score to find a partner that offers the score.

A more detailed home energy assessment will include diagnostic tests (such as a house air leakage test, duct air leakage test, or infrared scan) to identify additional areas for improvement.

Work with a certified energy professional trained in the use of diagnostic equipment that can find air leaks, areas lacking insulation, and inefficient or malfunctioning

A professional home energy auditor evaluates your home's energy use and provides steps to make your home more efficient.

equipment. The energy professional analyzes how well your home's energy systems work together and compares the analysis to your utility bills. A detailed energy assessment will help you use a whole-house systems approach when making improvements or remodeling. Learn more about this approach in the Design for Efficiency section of this guide.

A home energy professional may conduct a thermographic inspection to find air leaks in the home.

An in-depth energy assessment includes three steps:

1. **Interview, tests, and inspection:** In this phase, also known as the "test in," a home energy professional interviews you about your concerns (comfort, high energy bills, etc.), conducts safety and air leak tests, visually inspects equipment and insulation, and checks for signs of mold and moisture. The home energy professional then provides recommendations for steps that will reduce your energy bills and improve your home's comfort.
2. **Complete recommended improvements:** Qualified contractors install the home energy professional's recommendations. Some home energy professionals can provide recommendations for contractors to complete the work.
3. **Evaluate results:** During this final phase, also known as the "test out," safety tests and visual inspections are used to evaluate the contractor's work. Not all home energy professionals offer this service; ask yours whether it is part of the energy audit or if you can request this follow-up evaluation.

Find a home energy professional to help you obtain a more detailed energy audit by visiting Home Performance with ENERGY STAR® at energystar.gov/campaign/improvements/find_local_help. You'll be able to find local programs that work with qualified, vetted contractors trained to diagnose and improve your home according to the latest building technologies and standards. Home Performance with ENERGY STAR programs are required to have the quality of the contractors' work checked by third parties to make sure homeowners receive services that comply with industry standards and program requirements. Programs may be able to help you find rebates, a low-interest loan, or other financial incentives.

You can also obtain detailed assessments and contracting services from home energy professionals certified

by the Residential Services Network (resnet.us) or the Building Performance Institute (bpihomeowner.org). Some utilities may operate programs that offer assessments and may provide access to contractors who work with the utility.

DIY Energy Audits

You can use the Home Energy Saver tool to conduct a do-it-yourself audit. Home Energy Saver can also help you plan next steps following your DIY energy audit (hes.lbl.gov/consumer).

Your Whole-House Plan

After you know where your home is losing energy, use your findings to make a plan. Create a whole-house, systems-based plan that considers how any one change will affect the energy efficiency, comfort, durability, health, and safety of your whole house. Remember that changes in your energy usage habits are important, but a plan that considers how all features of your house work together can achieve the greatest savings.

Plan your habit changes. Consider the questions below and review the other sections of this guide for additional ideas.

- Do you forget to turn off lights and electronics? Which items could be unplugged when not in use? See the Home Office and Electronics section for more information.
- Are you using window coverings for maximum heating, cooling, and lighting benefit? See the Windows section for more information.
- Could you take advantage of time-of-day electricity rates and complete activities that use large amounts of energy—such as laundry and dishwashing—at night? See the section on Saving Electricity and Use Renewable Energy for more on these utility offerings.
- How can you adjust your heating and cooling to save energy? See the Heat and Cool Your Home Efficiently section for more information.

Plan your projects. Make a timeline of projects to do now, in the near future, and over the long term. Start by sealing air leaks and move on to other weatherization projects; see the Weatherization section for more information. Also ask yourself the following questions:

- Where are the greatest energy losses in your home?
- What projects would provide the greatest return on time and money investment?
- How long will it take for an investment in energy efficiency to pay for itself in energy cost savings? The Home Energy Saver tool provides estimates for return on investment, yearly savings, and payback times.

- How long do you plan to own your current home?
- What would help make your home most comfortable now? What projects should you plan for the future?
- What can you do yourself? What should you hire out? What is your budget?

Purchase materials and complete projects.

- Search for federal, state, local, and utility incentives such as tax credits and rebates on the Database of State Incentives for Renewables and Efficiency (dsireusa.org). See the section on Financing, Incentives, and Assistance for more information.
- Visit EnergySaver.gov for guides and videos that show you how to complete improvement projects around the home, including caulking, weatherstripping, installing storm windows, and improving your water heater efficiency. See the Weatherization section for more steps to get started.

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Summer

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Fall

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Winter

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Weatherize Your Home

Weatherizing your home helps you save money by saving energy, and it can also improve the comfort of your home. Home weatherization includes sealing air leaks and adding insulation.

Air Sealing

Air leaks are among the greatest sources of energy loss in a home. One of the quickest money- and energy-saving tasks you can do is caulk, seal, and weatherstrip all seams, cracks, and openings to the outside. By sealing uncontrolled air leaks, you can save 10%–20% on your heating and cooling bills. Following your energy audit, you may have a number of recommended energy-saving projects you are considering. Prioritize weatherization projects to quickly improve the efficiency and comfort of your home.

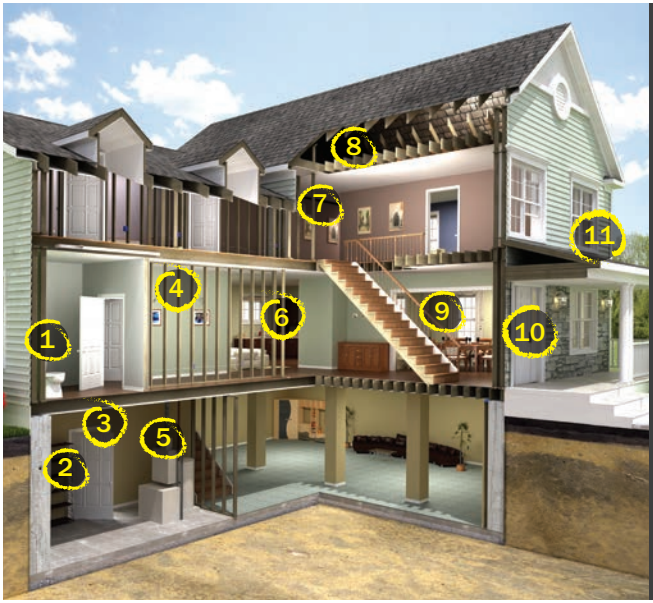
To identify air leaks, check around your walls, ceilings, windows, doors, lighting and plumbing fixtures, switches, and electrical outlets. Look for gaps, improperly applied caulk and weatherstripping, and doors and windows that don't close tightly.

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 places where air may leak. If the smoke stream travels horizontally, you have located an air leak.

After you identify all air leaks, do the following:

- Weatherstrip doors and windows.
- Caulk and seal air leaks where plumbing, ducting, or electrical wiring comes through walls, floors, ceilings, and soffits over cabinets.
- Install foam gaskets behind outlet and switch plates on walls.
- Use foam sealant on larger gaps around window trims, baseboards, and other places where air may leak out.
- Check the fireplace dampers to make certain they properly close.
- Consider an inflatable chimney balloon to seal your fireplace flue when not in use. Fireplace flues are made of metal, and repeated heating and cooling can cause the metal to warp or break over time, creating a channel for air loss. Inflatable chimney balloons are made from durable plastic and can be removed easily and reused hundreds of times. If you forget to remove the balloon before making a fire, the balloon will automatically deflate within seconds of coming into contact with heat.

Where to Air Seal in a Home



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

- Seal air leaks around fireplace chimneys, furnaces, and gas-fired water heater vents with fire-resistant materials such as sheet metal or sheetrock and furnace cement caulk.
- Install an insulated box to seal leaky attic stairs. Visit EnergySaver.gov for DIY instructions.

Insulation

After you complete air sealing, consider whether you need to add insulation. Insulation is essential for reducing heat flow through a home's building envelope (the parts of the home that separate the interior from the outside elements, including the walls, roof, and foundation). The greater the difference between the indoor and the outdoor temperatures, the more energy it will take to maintain a comfortable temperature in your home.

Adding insulation between the indoors and the outdoors reduces that energy demand, improves the comfort of your home, and saves you money.

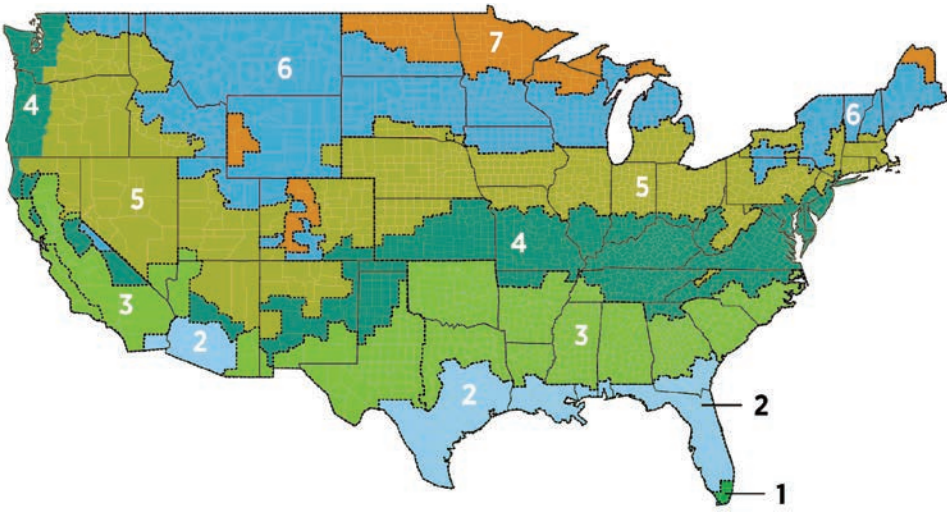
R-Value

An insulation's R-value is a measure of its resistance to heat flow; the higher the R-value, the greater the insulating effectiveness. R-value is dependent on the type of insulation and the thickness. When purchasing insulation, refer to the insulation packaging or the paper backing of rolled insulation to find the R-value.

How Much Insulation?

Consult the ENERGY STAR recommended insulation levels for retrofitting existing wood-framed buildings

U.S. Department of Energy Recommended*
Total R-Values for New or Existing Wood-Framed Houses



Alaska climate zones:

7 - Aleutians East
7 - Aleutians West
7 - Anchorage
7 - Bethel
7 - Bristol Bay
8 - Denali
7 - Dillingham
8 - Fairbanks North Star
6 - Haines
6 - Juneau

7 - Kenai Peninsula
5 - Ketchikan Gateway
6 - Kodiak Island
7 - Lake and Peninsula
7 - Matanuska-Susitna
8 - Nome
8 - North Slope
8 - Northwest Arctic
5 - Prince of Wales

Outer Ketchikan

5 - Sitka
6 - Skagway-Hoonah-Angoon
8 - Southeast Fairbanks
7 - Valdez-Cordova

8 - Wade Hampton
6 - Wrangell-Petersburg
7 - Yakutat
8 - Yukon-Koyukuk

Zone 1 includes Hawaii, Guam, Puerto Rico, and the Virgin Islands.

Climate Zone	Uninsulated Attic	3-4 Inches of Existing Attic Insulation	Uninsulated Floor	Uninsulated Wood-Frame Wall	Insulated Wood Frame Wall
1	R30–R49	R19–R38	R13	R13 or R0 + R10 CI*	N/A
2	R49–R60	R38–R49	R13	R13 or R0 + R10 CI	N/A
3	R49–R60	R38–R49	R19	R20 or R13 + R5 CI or R0 + R15 CI	Add R5 CI
4 Except Marine	R60	R49	R19	R20 + R5 CI or R13 + R10 CI or R0 + R15 CI	Add R10 CI
4 Marine and 5	R60	R49	R30	R20 + R5 CI or R13 + R10 CI or R0 + R15 CI	Add R10 CI
6	R60	R49	R30	R20 + R5 CI or R13 + R10 CI or R0 + R20 CI	Add R10 CI
7 and 8	R60	R49	R38	R20 + R5 CI or R13 + R10 CI or R0 + R20 CI	Add R10 CI

*Note: In the table above, CI stands for "continuous insulation" that is applied to the exterior of the wall assembly just inside the cladding.

Whenever exterior siding is removed on an uninsulated wood-frame wall:

- Drill holes in the sheathing and blow insulation into the empty wall cavity before installing the new siding, and
- Add the amounts of continuous insulation recommended in the table above.

Whenever exterior siding is removed on an insulated wood-frame wall:

- Add the amounts of continuous insulation recommended in the table above.

* These recommendations are cost-effective levels of insulation based on the best available information on local fuel and materials costs and weather conditions. Consequently, the levels may differ from current local building codes.

Source: ENERGY STAR

to determine how much insulation you should consider adding to your home. For masonry sidewalls (such as concrete block or poured concrete), it is sometimes feasible to install rigid insulation on the outdoor side. However, if that is not an option, you can use rigid insulation boards or batts to insulate the interior of masonry walls. A home energy professional can help you evaluate options for your specific home.

Consider factors such as your climate, home design, and budget when selecting insulation for your home. A home energy professional may be able to help you decide what type of insulation is best for you.

The Home Energy Saver tool can also provide recommendations for your home.

Types of Insulation

Insulation is made from a variety of materials. The following are some of the most common types of insulation you'll find in a home: rolls and batts, loose-fill, rigid foam, and foam-in-place. The type of insulation you should choose depends on how you will use it and on your budget. Visit EnergySaver.gov for more details on these and other types of insulation.

Rolls and batts—or blankets—are flexible products made from mineral fibers, such as fiberglass and rock wool, as well as recycled fibers such as denim. They are available in widths suited to standard spacing of wall studs and attic or floor joists.

Loose-fill insulation is 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 odd-sized building cavities and attics with wires, ducts, and pipes, making it well suited for places where it is difficult to effectively install other types of insulation.

Rigid foam insulation is typically more expensive than rolls and batts or loose-fill insulation, but it is very effective in exterior wall sheathing, interior sheathing for basement walls, and special applications such as attic hatches.

Foam-in-place insulation can be blown into walls, on attic surfaces, or under floors to insulate and reduce air leakage. You can use small pressurized cans of foam-in-place insulation to reduce air leakage in holes and cracks, such as window and door frames and around electrical and plumbing penetrations. There are two types of foam-in-place insulation: closed-cell and open-cell. Both are typically made with polyurethane.

Caution: installing foam insulation requires that you wear personal protective equipment, maintain adequate ventilation, and take other safety measures. Consider hiring a professional to install foam insulation.

Use higher R-value insulation, such as spray foam, on exterior walls and in cathedral ceilings to get more insulation with less thickness.

If your attic has enough insulation and proper air sealing, and your home still feels drafty and cold in the winter or too warm in the summer, your heating or air conditioning system may not function properly, or you may need to add insulation to the exterior walls. Consult with a home energy professional to evaluate whether your HVAC system has design or equipment issues, or if you need additional insulation.

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

Air Sealing and Insulation Projects

See the References section for links to DIY air sealing and insulation project steps and instructional videos.

Energy Efficient New Construction and Additions

In many jurisdictions (but not all), if you build a new home or an addition to your current home, the contractor must meet the requirements of the local building code related to energy efficiency. Building energy codes are issued by the International Energy Codes Commission (IECC) and updated every 3 years. State and local jurisdictions adopt the IECC codes and may choose to amend them.

Ask your local building code office which version of the IECC your contractor is required to follow. If the local code is older than the latest IECC, consider building an ENERGY STAR Certified New Home or a Zero Energy Ready Home.

An ENERGY STAR Certified New Home has integrated systems and features such as high efficiency heating and cooling, complete thermal enclosure systems, efficient lighting and appliances, and water protection systems. Independent inspectors ensure that the home meets the program requirements. ENERGY STAR certified homes and apartments are at least 10% more efficient than homes built to code and achieve a 20% improvement on average. Learn more at energystar.gov/newhomes.

A Zero Energy Ready Home is so energy efficient that a renewable energy system can offset all or most of its annual energy consumption. Zero Energy Ready Home requirements include all ENERGY STAR Certified Home requirements, plus additional requirements that bring unparalleled performance. DOE Zero Energy Ready Homes are verified by a qualified third party and are at least 40%–50% more energy efficient than a typical new home. Learn more at energy.gov/eere/buildings/zero-energy-ready-home.

Heat and Cool Your Home Efficiently

Air conditioning and space heating together are the largest energy users in your home, typically making up about 32% of your energy use.

No matter what kind of heating and cooling system you have in your house, you can save money and increase your comfort by properly using, maintaining, and upgrading your equipment. But remember, any upgrades to heating and cooling equipment should consider the effect on all areas of the house (known as a whole-house, systems-based approach) to maximize energy savings and ensure health and safety. Most importantly, work with a contractor to ensure that the upgraded heating and cooling system is both properly sized for your house and installed to deliver its full capacity.

Smart and Programmable Thermostats

Being smart about how you control your temperature settings will help you save money and stay comfortable in your home. You can save as much as 10% per year on heating and cooling by turning your thermostat down 7°–10°F for 8 hours a day in the fall and winter; turn it up in the spring and summer. (If you have a heat pump, don't do this without a smart or programmable thermostat designed for use with heat pumps.)

A *smart thermostat* is a Wi-Fi enabled device that automatically adjusts heating and cooling temperature settings for optimal performance. Smart thermostats that earn the ENERGY STAR label have been independently certified, based on actual field data, to deliver energy savings.

Control your thermostat remotely while away from home.

Smart thermostats provide convenience, insight, and control. While system designs vary, the following are common smart thermostat features:

- Learning the temperature you like and establishing a schedule that automatically adjusts to energy-saving temperatures when you are asleep or away
- Providing data on home energy use that you can track and manage
- Allowing you to control home heating and cooling remotely through your smartphone or tablet.

ENERGY STAR certified smart thermostats are also designed to be compatible with incentive programs offered by some utilities. These incentives reward customers in ways that help utilities manage energy availability and reliability.

A *programmable thermostat* will automatically turn on the heating or air conditioning at times you schedule. Programmable thermostats can store multiple daily settings that you can manually override without affecting the rest of the daily or weekly program.

Smart thermostats are generally easier to use and have more reporting and interactive features than programmable thermostats. Programmable thermostats need to be set up to turn the temperature up or down on a schedule and usually don't have interactive features, but they are cheaper than smart thermostats.

Air Ducts

Air ducts are one of the most important systems in your home, as they carry the air from your home's furnace and central air conditioner to each room. If the ducts are poorly sized, poorly sealed, or poorly insulated, they are likely contributing to higher energy bills.

You can often address discomfort from heating and cooling by fixing blocked registers, stuck dampers, or disconnected or damaged ducts, or by replacing register grilles that don't direct the air adequately.

Seal ducts at joints to prevent heated or cooled air from leaking out or unconditioned air from leaking into the ducts.

Ducts that leak air into an attic or crawl space can add hundreds of dollars a year to your heating and cooling bills. Insulating and sealing ducts in unconditioned spaces is usually very cost effective. 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.

If you are installing a new duct system, talk to your contractor about options for locating the ducts in

Insulate ducts that are located in unconditioned spaces.

conditioned spaces or insulating any ducts that will run outside conditioned spaces.

Hire a qualified professional to perform changes and repairs to a duct system. All duct sealing should be tested by a qualified professional to ensure combustion safety and proper air flow.

Buying Heating and Cooling Systems

If you plan to buy a new heating or cooling system, ask your contractor about the latest technologies on the market. See our Financing, Incentives, and Assistance section for information on searching for incentives.

When buying a new heating or cooling system, look for the ENERGY STAR and EnergyGuide labels to compare efficiency and ensure quality.

Your contractor should provide you with information on the following:

- Safety and cost effectiveness of repair versus replacement
- Heating and cooling system options
- Fuel types and prices in your region
- Required permits and building code compliance
- Calculations for proper sizing for your home
- Other home efficiency improvements that should be made.

New energy efficient heating or cooling equipment alone can reduce energy use by 20% or more, but combining a new system with recommended insulation, air sealing, and thermostat settings can cut your heating and cooling bills by about 30%.

Read ENERGY STAR's "A Guide to Energy-Efficient Heating and Cooling" to learn how to work with a certified technician to ensure a quality installation. (See References for URL.)

Home Heating

Consider replacing your existing heating system if any of the following are true:

- Your heat pump or air conditioner is more than 10 years old.
- Your furnace or boiler is more than 15 years old.
- Your equipment needs frequent repairs and your energy bills are going up.
- Some rooms in your home are too hot or too cold.
- No one is home for long periods of the day, and you do not have a programmable thermostat.
- Your home has humidity problems.
- Your home has excessive dust.
- Your heating or cooling system is noisy.
- Your score on the Home Energy Yardstick is below five.

Furnaces are the most common way to heat a home in the United States. Central forced-air furnaces distribute heated air through the house via ducts. Most are fueled by natural gas; others use electricity, oil, or propane.

Boilers use natural gas, oil, electricity, or propane to heat water (for steam or hot water) that is distributed via pipes to upright radiators, baseboard convectors, or radiant floor tubing. Combination units can provide space and water heating.

For both furnaces and boilers, tell your contractor you are interested in models with a high annual fuel utilization efficiency, also known as AFUE, which is a measure of heating equipment efficiency.

Electric heating includes central forced-air electric furnaces, as well as wall-mounted or baseboard heating. Electric heat can be more expensive than other fuel options. If electricity is the only choice, heat pumps are preferable in most climates.

Heat pumps are an efficient option for all-electric houses or houses with central propane or oil. Heat pumps are generally air-source or ground-source and can be used for both heating and cooling. See the section on Heat Pumps for more information.

Wood and pellet-fuel stoves heat homes using biomass or waste sources. Look for EPA-certified wood stoves and fireplace inserts for cleaner, more efficient burning. Visit epa.gov/burnwise for options.

Active solar heating uses the sun to heat air or liquids. The heat is then ducted or blown into living space or stored for later use. Solar water heaters can preheat water for radiators or radiant floor heat. Both liquid and air systems can supplement forced air systems (i.e., furnaces or heat pumps).

Passive solar home design can also improve the comfort of the home and reduce heating and cooling costs; see the section on Passive Solar for more information.

Visit EnergySaver.gov for more detailed information on each technology.

Replacing furnace filters regularly will keep your system running efficiently.

Heating Tips

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

- Eliminate trapped air from hot-water radiators once or twice a season; contact a professional if you're unsure how to perform this task.
- Place heat-resistant radiator reflectors between exterior walls and the radiators.
- Open draperies and shades on your south-facing windows during the day to allow the sunlight to enter your home. Close them at night to reduce the chill from cold windows.

Heat Pumps

Heat pumps can be used for both home heating and home cooling. They are the most efficient form of electric heating, providing up to three times more heat than the energy they use. Heat pumps can reduce your electricity use for heating by approximately 50% compared to electric furnaces or electric baseboard heaters.

A heat pump heats your home by collecting heat from the air, water, or ground outside and concentrating it for use inside. It does double duty as a central air conditioner by collecting the heat inside your house and pumping it outside.

Air-source heat pumps transfer heat between your house and the outside air. They are the most common type of heat pump and can be used in all climates.

Cold-climate air-source heat pumps are designed specifically for cold climates. These heat pumps take heat from the outside air, run it through a refrigeration cycle to step up the temperature (just like your refrigerator, but in reverse), and deliver it to your house.

Ductless mini-split heat pumps are air-source heat pumps that can be installed in homes or additions without ducts. They are small in size and offer flexibility for zoning or heating and cooling individual rooms.

Geothermal (ground-source or water-source) heat pumps transfer heat between your house and the ground or a nearby water source. Because they move heat that already exists, geothermal heat pumps are among the most energy efficient and comfortable heating and cooling technologies currently available.

Absorption coolers and heat pumps usually only make sense in homes without an electricity source, but they have an added advantage in that they can make use of any heat source, including solar energy, geothermal hot water, or other heat sources.

A dual-source heat pump combines an air-source heat pump with a geothermal heat pump. These can be less expensive than a single geothermal unit and work almost as well.

Heat Pump Tips

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

- Install or have a professional install a smart or programmable thermostat with functions suitable for a heat pump.
- Clean or change filters once a month or as needed, and maintain the system according to manufacturer's instructions.

Home Cooling

Although air conditioning is often used for home cooling, there are many alternatives that provide cooling with less energy use. A combination of proper insulation, energy-efficient windows and doors, daylighting, shading, fans, and ventilation can often keep homes cool with a minimum of energy use in all but the hottest climates.

Air conditioner options include room air conditioners, ductless mini-split or multi-split air conditioners, and central air conditioning. Look for ENERGY STAR certified air conditioners. Make certain the air conditioner you are considering is sized correctly for your home or space that needs to be cooled; an oversized air conditioner performs less efficiently and effectively than a smaller, properly sized unit. Work with your contractor to determine the correct size for a central air conditioner.

Fans can help provide home cooling and comfort. Ceiling fans cool by creating a wind chill effect and can allow you to turn up the thermostat a few degrees. In summer, use the ceiling fan in a counterclockwise direction to create a wind chill effect; turn off the fan when you aren't in the room. In winter, reverse the fan to run clockwise and force warm air down from the ceiling.

Using a ceiling fan allows you to turn up the thermostat about 4°F without any loss in comfort.

Whole-house fans pull cool air through the house and exhaust warm air through the attic. Use the fan during cooler times of the day to most effectively cool down your house.

Evaporative coolers, or "swamp coolers," cool outdoor air with evaporated water. The cooler air is directed into the home and warmer air is pushed out through windows. They work well in climates where the air is hot and humidity is low.

Cooling Tips

- In the summer, set your thermostat as high as is comfortable when you're home and awake, and raise the temperature when you're sleeping or away from home. Be mindful of the comfort and safety of any pets that are in your home.

- Clean or replace filters on air conditioners once a month or as recommended.
- Except for fans that are designed for continuous operation, 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.
- Turn off ceiling fans when you leave a room.
- Set the fan switch on your thermostat to "Auto" unless an indoor air quality professional has set up your system to operate continuously for health reasons.
- During summer, keep the window coverings closed during the day to block the sun's heat.

Water Heating

Water heating is the second largest energy expense in your home. It typically accounts for about 18% of your energy usage.

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

Reducing Water Heating Costs

You can take steps to use less hot water and improve the efficiency of your existing water heating system.

Visit EnergySaver.gov for a DIY video and instructions for insulating your hot water tank.

- If your hot water tank is warm to the touch, consider insulating it to save 7%–16% annually in water heating costs. Follow manufacturer recommendations.
- Consider insulating your hot water pipes. Doing so can reduce heat loss, allow you to lower the temperature setting, and save an additional 3%–4% per year on water heating. For an electric water heater, you also might consider insulating underneath the tank as well. This could save you another 4%-9% of water heating energy.
- Set your water heater temperature to 120°F, a temperature considered safe for most of the population.
- Install heat traps on the hot and cold pipes at the water heater to prevent heat loss. Most 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. Follow the manufacturer's directions.

- Consider installing a drain-water heat recovery system. Drain-water, or greywater, heat recovery systems capture the energy from waste hot water—such as showers and dishwashers—to pre-heat cold water entering the water heater or going to other water fixtures. Energy savings vary depending on individual household usage.
- Consider installing a residential circulation pump to save water.
- Install aerating, low-flow faucets and showerheads.
- If you find yourself waiting for the water in your shower to get hot, consider installing a showerhead that has a temperature-sensitive switch that turns off the water when hot. When you step into the shower, you flick a switch on the showerhead that restarts the hot water flow.
- Repair leaky faucets promptly. A leaky faucet wastes gallons of water in a short period of time.

If you are in the market for a new dishwasher or clothes washer, consider buying an ENERGY STAR model to reduce hot water use. See the Appliances section for more information or visit energystar.gov.

Fix leaky faucets. One drip per second wastes 1,661 gallons of water and can cost you up to $35 per year.

Water Heating DIY Projects

See the References section for links to DIY water heating project steps and instructional videos.

Buying Water Heaters

While a new energy efficient water heater may cost more initially than repairing an old model or buying a new, less efficient model, the energy savings will continue during the lifetime of the appliance.

Most storage water heaters last 10-15 years, while tankless water heaters can last more than 20 years.

When choosing a new water heater, look for the ENERGY STAR and EnergyGuide labels. Heat pump, high-efficiency gas storage, gas tankless, and solar water heaters all have the ENERGY STAR label. They heat your water just like standard models, but with much less energy, saving you up to $3,500 over a unit's lifetime.

(Electric storage tank and electric tankless water heaters are not ENERGY STAR eligible because they are already highly efficient and have little room for improvement.)

Conventional storage water heaters remain the most popular type of water heating system for the home. Fuel sources include natural gas, propane, fuel oil, and electricity.

On-demand or tankless water heaters (gas) heat water directly without using a storage tank. For homes that use 41 gallons or less of hot water daily, on-demand water heaters can be 24%–34% more energy efficient than conventional storage tank water heaters. They can be 8%–14% more energy efficient for homes that use a lot of hot water; around 86 gallons per day. If you tend to use hot water in multiple locations in your home at the same time, you may find you need two or more tankless water heaters to keep up with demand. These systems require unique installation specifications; consult with a certified technician before purchasing.

Heat pump water heaters can be two to three times more energy efficient than conventional electric water heaters. According to energystar.gov, an ENERGY STAR certified heat pump water heater uses 70% less electricity to make the same hot water as a standard electric model. If located in your basement, they can also provide dehumidification in the summer. However, this technology can pose some installation challenges, so consult with an installer before purchasing. For more information see EnergySaver.gov.

Solar water heaters are a good option if you heat water with electricity, have high electric rates, and have an un-shaded, south-facing location (such as a roof). In addition to the ENERGY STAR label, look for systems certified by the Solar Rating and Certification Corporation or the Florida Solar Energy Center.

Solar water heaters are eligible for a 26% federal tax credit through 2022. The tax credit decreases to 22% in 2023 and expires at the end of that year.

If you're in a climate where temperatures are 40°–90°F all year, consider a heat pump water heater to potentially save more than $300 per year on water heating costs.

Design Your Home for Efficiency

When you design a new home or a renovation, consider how any one change will affect the energy efficiency, comfort, durability, health, and safety of the whole home (known as a whole-home systems approach).

Energy efficient design approaches and features such as landscaping, windows, passive solar design, and cool roofs can save you energy and money while appealing to your design aesthetic.

The ENERGY STAR or the Zero Energy Ready Home programs are good sources of information if you are designing a new home. If you are remodeling, consider the suggestions in the "No Regrets Remodeling" guide. See the References section for links to these resources.

Landscaping

Well-designed landscaping can deliver effective shade, act as a windbreak, and reduce your heating and cooling bills.

The right landscaping plan depends on your climate and your home's microclimate—the area immediately surrounding your home. For low-maintenance, healthy, energy-saving landscaping, use plant species that are adapted to the local climate. Also consider ways to save water when planning and maintaining your landscape.

Shade

Shading can reduce heat gain from the sun and cut air conditioning costs. Deciduous trees with high, spreading crowns planted on the south side of your home will shade your roof in the summer and allow warmth from the sun to reach your home in the winter.

Trees, shrubs, and groundcover plants can shade the ground and pavement around the home, cooling the air before it reaches your home's walls and windows. Shrubs and trellised vines can also shade walls and windows.

Windbreaks

Windbreaks reduce heating costs by lowering the wind chill near your home. Plant your windbreak at a distance from your home of two to five times the mature height of the trees. Choose trees and shrubs that have low crowns to block wind close to the ground. Dense evergreen trees and shrubs planted to the north and northwest of the home are the most common type of windbreak. Avoid planting evergreens too close to your home's south side if you want to collect heat from the winter sun.

Water Conservation

When choosing plants, determine how much water they actually need. Considering water needs will help you choose plants that need less water and help you avoid overwatering. Plants that are native to the area will usually need less water. Water plants in the early morning when evaporation rates are low.

Landscape with plants that are native to your area to save water.

Consider xeriscaping, which is a systematic method of planning your landscaping to conserve water. Visit EnergySaver.gov for more information about xeriscaping.

Windows

Windows can be one of your home's most attractive features. Windows provide views, daylighting, ventilation, and heat from the sun in the winter.

Unfortunately, heat moving in and out of your home through windows can increase your heating and air conditioning bills. Energy efficient windows and measures to reduce heat gain and loss can help save energy and reduce energy bills.

Buying Energy Efficient Windows

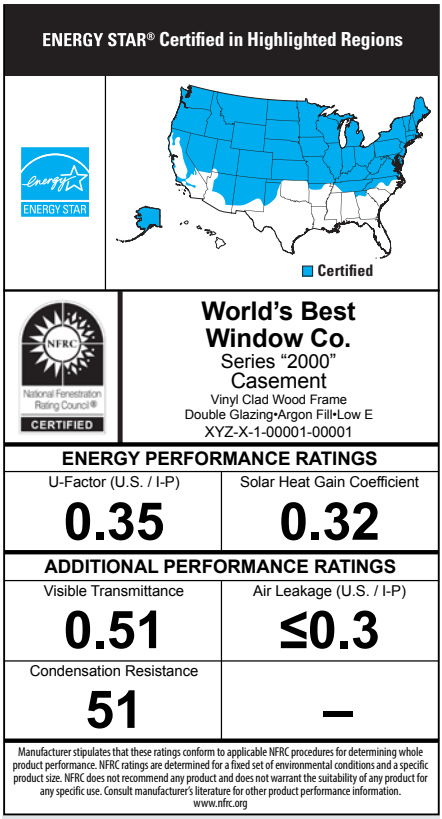
Look for the ENERGY STAR label when buying new windows. Also review ratings from the National Fenestration Rating Council (NFRC). NFRC ratings are included on all ENERGY STAR certified windows and provide a reliable way to determine a window's energy properties and compare products.

Replacing single-pane windows with double-pane windows that have high-performance glass may be cost effective, but you could also consider installing exterior storm windows. You can obtain energy efficiency ratings for storm windows and other window attachments from the Attachments Energy Rating Council (AERC, aercenergyrating.org). In colder climates, consider selecting gas-filled windows with low-e coatings to reduce heat loss. In warmer climates, select windows with coatings to reduce heat gain.

Choose a low U-factor for better thermal resistance in colder climates; the U-factor is the rate at which a window conducts non-solar heat flow.

Look for a low solar heat gain coefficient (SHGC). SHGC is a measure of solar radiation admitted through a window. Low SHGCs reduce heat gain in warm climates.

Select windows with both low U-factors and low SHGCs to maximize energy savings in temperate climates with both cold and hot seasons.



Look for the ENERGY STAR label, the NFRC label, and energy performance ratings when purchasing windows.

Look for whole-unit U-factors and SHGCs, rather than center-of-glass U-factors and SHGCs. Whole-unit numbers more accurately reflect the energy performance of the entire product.

Have your windows installed by trained professionals according to manufacturer's instructions; otherwise, your warranty may be void.

Cold Weather Window Tips

- Install tight-fitting, insulating window shades on windows that feel drafty after weatherizing. Consider insulated cellular shades, which are "honeycombed" and can be raised or lowered. Obtain energy efficiency ratings for window attachments from the AERC (aercnet.org).
- Close your curtains and shades at night to protect against cold drafts; open them during the day to let in warming sunlight.
- Apply low-e film on the inside of your windows to keep heat from radiating out. Films are rated by the NFRC.
- Alternatively, install low-e exterior or interior storm windows, which can save you 10%-30% on heating and cooling costs, depending on the type of window already installed in the home. They should have weatherstripping at all movable joints; be made of strong, durable materials; and have interlocking or overlapping joints.
- Repair and weatherize your current storm windows, if necessary.

Warm Weather Window Tips

- Choose medium-colored draperies with white plastic backings to reduce heat gain.
- During summer days, you should close draperies on windows receiving direct sunlight to prevent heat gain.
- Install awnings on south- and west-facing windows to create shade.

- Apply sun-control or other reflective films on east- and west-facing windows to reduce solar heat gain.

DIY Window Projects

See the References section for links to DIY projects to improve the efficiency of your windows.

A passive solar home collects heat as the sun shines through south-facing windows, retains it in thermal mass, and distributes it through the home.

Passive Solar Home Design

Passive solar home design has the potential to significantly reduce the cost of heating a home. The following basic elements are needed for passive solar design:

- Properly oriented, south-facing windows
- A slab floor or a heat-absorbing wall to store heat (known as a thermal mass)
- Distribution systems to move heat through the home
- Vents and dampers, low-emissivity blinds, insulating shutters, awnings, and sensing devices, such as a differential thermostat. Ceiling and window fans may also be part of the design.

Well-designed passive solar spaces also provide daylight all year and comfort during the cooling season through carefully designed overhangs and reflective coatings on windows, exterior walls, and roofs.

A passive solar house or space requires careful design and siting, which vary by local climate conditions. If you are considering passive solar design for a new home or a major remodel, consult an architect familiar with passive solar techniques.

Passive Solar Tips

- Keep all glass clean.
- Make sure that objects do not block sunlight on concrete slab floors or heat-absorbing walls.

Cool Roofs

A cool roof reflects sunlight and efficiently emits heat. Standard roofs can reach temperatures of 150°F or more in the summer sun. By installing a cool roof, you can lower the temperature of your roof by up to 50°F and save energy and money by using less air conditioning.

Cool roofs can be made by using a highly reflective type of paint, a sheet covering, or highly reflective tiles or shingles. A cool roof doesn't have to be white. Many cool roof products use darker-colored pigments that are highly reflective in the near-infrared part of the solar spectrum, which is not visible to the human eye. A white roof will typically be cooler than a dark roof because it reflects both visible and near-infrared sunlight.

If you are building a new home, decide during planning whether you want a cool roof.

If you want to convert an existing roof, you have the following options:

- Retrofit the roof with specialized heat-reflective material
- Re-cover the roof with a new waterproofing surface (such as tile coating)
- Replace the old roof with a new cool roof.

Look for ENERGY STAR certified roof products when planning your cool roof. You can also find information at the Cool Roof Rating Council (coolroofs.org).

Nearly any type of home can benefit from a cool roof, but consider climate and other factors before you decide to install one.

Visit EnergySaver.gov to learn more about cool roofs.

Cool roofs can be made of either white or darker colored materials. While white roofs are usually cooler, both will reflect near-infrared sunlight and save energy and money.

Save Electricity and Use Renewable Energy

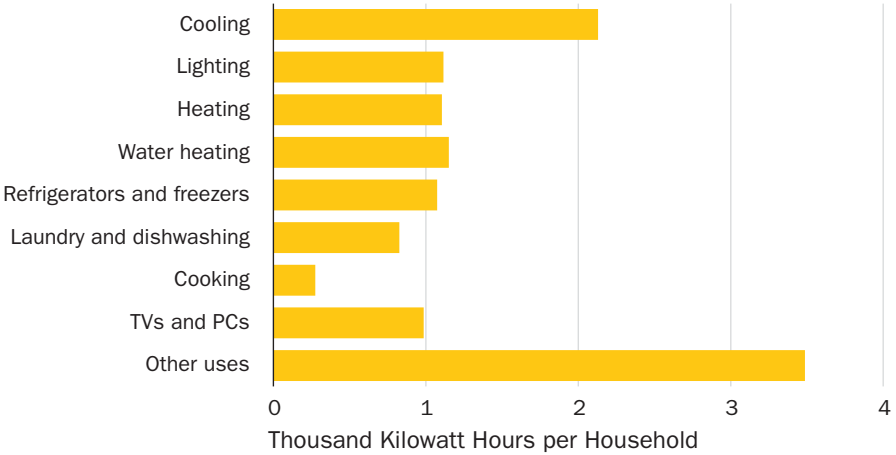
We use electricity and fuel to power our homes, communities, and vehicles. Even though we all rely on the nation's power grid for countless things we do every day, you may not be aware that the grid is undergoing an exciting transformation.

As the electric sector rolls out advanced technologies that keep the bulk electric system stable, sense and recover from outages automatically, and give customers better information, utilities are better able to locate and isolate energy disruptions to keep the grid operating during an emergency, reduce the number of customers affected by outages, and improve service restoration operations. All of that change is translating into major benefits for communities across America.

The Smart Home and Your Utility

Smart tools, appliances, and utility programs can help you automate, monitor, and control your home's energy use and make informed decisions about your energy consumption. Some tools you can install on your own; other web-based tools allow you to work with your utility to save energy and money. Check with your utility to find out what options are available in your area.

Residential Electricity Use per Household (2016)



Source: Energy Information Administration

Home energy management systems help you track energy use and control thermostats and smart appliances.

Time-Based Electricity Rates

To help reduce peak power demands, use resources more efficiently, reduce operating costs, and help their customers save money, many utilities offer programs that encourage customers to use electricity during off-peak hours. The programs pass on the savings to you, the customer, through rebates or reduced electricity rates.

Such programs might charge you the actual cost of power at any one time, ranging from high prices during times of peak demand to low prices during off-peak hours. If you are able to shift your power use to off-peak times, these programs can save you money while helping your utility operate more efficiently.

Time-based rates are very attractive to owners of plug-in hybrids and electric vehicles because typically these vehicles are recharged at night. See the Vehicles and Fuels section for more information.

Smart Meters and Smart Appliances

Millions of smart meters have been installed across the country. They provide two-way communication between you and your utility, which can help your utility locate and respond to outages more quickly. This communication helps utilities maintain more reliable electrical service and allows consumers to more easily take advantage of time-based electricity rates.

If you have a smart meter, most likely there is a customer web portal that will show you your hourly consumption on a nearly real-time basis. This could help you better understand your usage and make better-informed decisions about changing your usage patterns and lowering your energy use. Most utilities also have tools to set bill alerts and compare usage to others in your neighborhood, as well as other tools to help consumers.

A smart meter allows you to monitor your energy usage almost in real time.

Smart meters can also be used with home energy management systems (EMS), such as web-based tools that your utility provides or devices that can be installed in your home. A home EMS can help you track your overall energy use or the energy use of an individual appliance, allow you to remotely adjust your thermostat or operate appliances, and help you find ways to save energy and money.

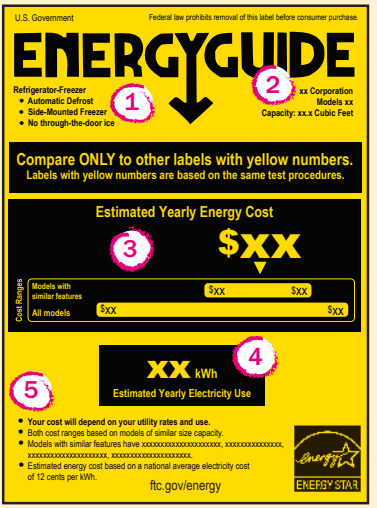
Smart appliances can be networked and operated through an EMS. An EMS allows you to monitor signals from your utility, create settings to use appliances when prices are low, or turn off appliances to help prevent blackouts. Smart appliances can then be programmed to automatically operate in ways that save you energy and money, such as deferring dishwashing to off-peak hours. You can always override any automatic settings.

To learn more about the electric grid, meters, and appliances visit DOE's Office of Electricity website at energy.gov/oe/.

Appliances

Whether you choose to purchase smart appliances or not, any appliance will have two price tags: the initial purchase price and the cost of operating the appliance during its lifetime. You'll pay your utility for the energy to operate the appliance every month for the next 10 to 20 years, depending on the appliance.

How to Read the EnergyGuide Label



The EnergyGuide label is required to be placed on all appliances by the manufacturers. The label provides information about energy consumption and shows you how much energy an appliance uses compared with similar models. Keep in mind that the numbers are averages; actual costs will differ somewhat depending on how you use them.

The EnergyGuide label includes the following:

1. Key features of the appliance and the similar models that make up the cost comparison range
2. Make, model number, and size of the appliance
3. Estimated yearly operating cost (based on the national average cost of electricity) and the range of operating costs for similar models
4. Estimated yearly electricity consumption
5. Key features of the appliance and the similar models that make up the cost comparison range.

The ENERGY STAR® Label

The ENERGY STAR label makes it easy to identify products that meet strict, specific requirements for energy efficiency. ENERGY STAR certified products exceed the federal minimum standards for efficiency and quality—sometimes significantly. Look for the label on certain appliances, electronics, water heaters, windows, and other products that consume energy in your home. Not all appliances are ENERGY STAR certified, including residential microwaves, stoves, ranges, and ovens. Visit energystar.gov for the full list of certified appliances.

When you shop for a new appliance, look for the EnergyGuide and ENERGY STAR labels.

Dishwashers

ENERGY STAR certified dishwashers use less water and energy when compared to conventional models, which results in significantly better cleaning and savings in money, energy, water, and time when compared to hand washing.

ENERGY STAR certified dishwashers offer the following technologies to help you save energy:

ENERGY STAR certified dishwashers save water, energy, and money.

- Soil sensors to detect how dirty dishes are and minimize water use
- Water filtration to remove food and use detergent and water more efficiently
- More efficient jets to use less energy while spraying dishes
- Dish rack designs to maximize cleaning.

In addition to the ENERGY STAR label, look for the following when buying a dishwasher:

- The EnergyGuide label, to compare models and estimate operating costs
- The right size for your home. A larger or standard-sized model that is run less often may be more cost

Online comparison tools

You can also use online tools to compare the energy efficiency of products you are considering. The following tools are available:

- **Energystar.gov**: Allows you to compare ENERGY STAR certified products
- **EnergySaver.gov**: The Appliance Energy Use Calculator allows you to input an appliance's wattage, as well as your local utility rates and yearly usage to estimate annual costs to operate an appliance.
- **eeCompass**: Allows you to compare the efficiency of any new appliance that meets minimum federal standards. Visit regulations.doe.gov/eecompass.

Look for the ENERGY STAR when buying a new refrigerator. Top-mounted freezers are more efficient than side- or bottom-mounted freezers.

efficient than running a compact model more frequently.

- Several wash cycle options, to allow you to use more efficient cycles when dishes aren't heavily soiled.

The following best practices will save you energy and money when using your dishwasher:

- Scrape your dishes and load them in the dishwasher instead of rinsing or hand washing dishes; ENERGY STAR certified dishwashers will boost water temperature to 140°F. Your dishes will be disinfected, and you will spend less time and use less water at the sink—nearly 8,000 gallons per year!
- Only run the dishwasher when it is full (not overloaded).
- Let dishes air dry instead of using your dishwasher's heated dry setting.
- In general, if your dishwasher has an internal heating element that boosts water temperature, you can set your water heater to 120°F (check your dishwasher manual for instructions specific to your model).

Refrigerators

If your refrigerator is more than 10 years old, you could save hundreds each year by replacing it with a new ENERGY STAR certified refrigerator. In addition to energy savings, many utilities offer rebates for recycling your old refrigerator; visit energystar.gov for more information.

Look for the following when buying a new refrigerator:

- The ENERGY STAR and EnergyGuide labels, to compare models and ensure you are buying an efficient product
- The appropriate size for your needs. The most energy efficient models are usually 16–20 cubic feet; larger models use more energy
- A top-mounted freezer model, which is more efficient than side-by-side or bottom-mounted freezer models. Also consider models without an icemaker or water dispenser, which use less energy.

Follow these tips to reduce the amount of energy your refrigerator uses:

- Set the temperature at 35˚–38˚F for refrigerators and 0˚F for stand-alone freezers for long-term storage.
- 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 adjusting, the seal may need replacing, or you may consider buying a new unit.
- Cover liquids and wrap foods stored in the refrigerator. Uncovered foods release moisture and make the compressor work harder.
- Keep the door closed as much as possible.
- Place the refrigerator away from the oven or dishwasher and out of direct sunlight.
- Leave a few inches between the wall and the refrigerator, and keep the condenser coils clean on older models. Check the user's manual for instructions.
- If you have an old, second refrigerator or freezer, recycle it, particularly if you don't store very much in it or if it is in unconditioned space.

Other Energy-Saving Kitchen Tips

- Move the faucet lever to the cold position when using small amounts of water; placing the lever in the hot position draws hot water even if it never reaches the faucet.
- Air dry dishes instead of using your dishwasher's drying cycle.
- Check that natural gas appliance flames are blue; yellow flames indicate the gas is burning inefficiently and an adjustment may be needed. If you see yellow flames, 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.
- Cover pots and pans when you cook. The food cooks faster and you'll use less energy.

Efficient washers and dryers, as well as energy-conscious laundry practices such as washing in cold water, washing full loads, and drying on cool settings, can save you money while doing laundry.

- Match the size of the pan to the heating element.
- Use small appliances such as air fryers, multicookers, slow cookers, toaster ovens, electric pressure cookers, microwave ovens, or convection ovens for small meals rather than your large stove or oven. They will save energy and can save on cooling costs in the summer because they generate less heat.
- Replace lightbulbs and light fixtures with ENERGY STAR certified LED products; kitchen lights are some of the most used in a house. See the Lighting section for more information.

Laundry

Clothes washers and dryers are some of the largest energy consumers of any home appliances. You can save money while doing laundry by using less water, using cooler water, and taking steps to use less energy.

Clothes Washers

Clothes washers have seen a 70% drop in energy use since 1990. If your washer is more than 10 years old, consider buying a new ENERGY STAR certified clothes washer. These washers use 25% less energy and 33% less water than regular washers, and have greater capacity, allowing you to wash the same amount of laundry in fewer loads. Both top-load and front-load models are available. New technologies move clothes in the washer without a central agitator and

rinse clothes by spraying instead of filling the tub with water, resulting in a gentler wash that uses less water.

Use the EnergyGuide label or visit energystar.gov to compare models.

Warm or cold water is generally sufficient to clean your laundry; most of the energy used by clothes washers goes to heating water. Using warm water instead of hot can cut a load's energy use in half, and using cold water will save even more.

Cold water detergents can be helpful to ensure items get clean, and high-efficiency detergents (indicated by the "he" symbol) should be used when required by the manufacturer.

Try to wash full loads and use an appropriate water setting if you must wash a small load. Use the high-speed or extended spin cycle to remove as much moisture as possible before drying.

Clothes Dryers

When buying a new clothes dryer, look for the ENERGY STAR label. ENERGY STAR certified clothes dryers use about 20% less energy than conventional models. Many have a moisture sensor that automatically adjusts the amount of heat being used and shuts off the dryer when the load is dry.

Several different types of dryers are available.

Gas dryers can cost less to operate, depending on local fuel costs, but may cost more initially. They require venting and a dedicated gas line, which can add to installation costs.

Electric dryers can be less expensive to purchase than other dryer options but may cost more to operate (again, depending on local rates). Ventless models are available, and most standard-size models require a 240 volt outlet.

Heat pump dryers can save 20%–60% more than conventional clothes dryers; consumers who use a dryer a lot and have high electricity rates have the greatest potential for cost savings. Heat pump dryers take in ambient air, heat it, and recirculate it in the dryer. Moisture is drained through a condenser to prevent heat loss. There is no need for a vent, but you will need a way to drain the water; sometimes the clothes washer drain can be used for this.

Visit energystar.gov for more information on each type of ENERGY STAR certified dryer and to compare models.

When drying laundry, consider air-drying on clothes lines or drying racks. When you do use a clothes dryer, use lower heat settings even if the drying cycle is longer—you'll use less energy and be less likely to over-dry your clothes. Dry towels and heavier cottons separate from lighter-weight clothes. Try using a cool-down cycle to allow clothes to finish drying with the heat remaining in the dryer.

Thousands of clothes dryer fires are reported each year, and many are caused by failure to clean the dryer. Clean the lint screen after every load and periodically use the long nozzle tip on your vacuum cleaner to clean the lint screen slot to improve air circulation and reduce the risk of fire. Inspect your dryer vent to ensure it is not blocked. Manufacturers recommend using rigid venting material—not plastic vents that may collapse and cause blockages.

Home Office and Electronics

The average U.S. household owns approximately 24 consumer electronic products, according to ENERGY STAR. Many of us use electronics and home office equipment daily for work, hobbies, entertainment, and communication. Using efficient products and taking steps to save energy can save you money and prolong the life of your products.

When buying electronics, computers, and other office equipment, look for the ENERGY STAR label.

ENERGY STAR certified computers and office electronics offer power management features and efficient internal and external power supplies to ensure energy savings. A variety of computer and office products earn ENERGY STAR certification, from desktop computers to laptops and tablets to imaging equipment such as copiers, printers, scanners, all-in-one devices, fax machines, and mailing machines.

Electronics such as televisions, set-top and cable boxes, and audio and video equipment also are eligible to earn ENERGY STAR certification. As home entertainment systems offer increasingly advanced features and are ever more prevalent throughout our homes, they also use more energy. A home using two set-top boxes is using significantly more electricity than it takes to run a new refrigerator.

Advanced power strips prevent electronics from drawing energy when they aren't being used.

The following tips can help you save energy when using computers, office equipment, and electronics:

- Turn off computers and other equipment when they aren't in use.
- Use power management settings on computers and monitors, which will send your equipment into low-power "sleep modes" after periods of inactivity. Avoid using screen savers.
- Make sure that computer games that prevent your computer from going to sleep are not left running while you aren't using your computer.

- Use advanced power strips that can prevent electronics from drawing power when they aren't being used. Features such as timers, activity monitors, and remotes provide options that make it easy to save energy. Many consumer electronics continue to draw power even when they are switched off, which could add an extra 5%-10% to your monthly utility bill. See the References section for an infographic on how to choose an advanced power strip.
- Unplug battery chargers when the batteries are fully charged or the chargers are not in use.
- Streaming content with electronic equipment that has earned the ENERGY STAR will use 25%–30% less energy than standard equipment.
- When streaming content, choose the smallest device that makes sense for the number of people watching. Avoid streaming on game consoles, which use 10 times more power than streaming through a tablet or laptop.
- If your cable or satellite TV service provider gives you a set-top box as part of your contract, ask for an ENERGY STAR certified model, which is 25% more efficient than conventional models.
- Set your television to the "home" or "standard" setting to reduce the brightness and reduce your TV's energy use by 18%–30%.

Lighting

Switching to energy efficient lighting is one of the fastest ways to cut your energy bills. Lightbulbs are easy, fast, and inexpensive to replace, but they aren't your only option for saving money and energy on lighting.

Compatible light fixtures and lamps use less energy, produce less heat, and can prolong the life of your efficient bulbs. Many also have features such as timers and motion sensors that can save you money by turning off lights that are not being used.

Lightbulbs

The average U.S. household has about 70 lightbulbs. One ENERGY STAR certified LED (light-emitting diode) lightbulb uses up to 90% less energy than old incandescent bulbs and can save you about $55 in electricity costs over its lifetime. They also last 15–25 times longer, so you'll be buying and changing bulbs less frequently.

Lightbulbs are quick and easy to replace, but ENERGY STAR certified lamps and fixtures will also save you money.

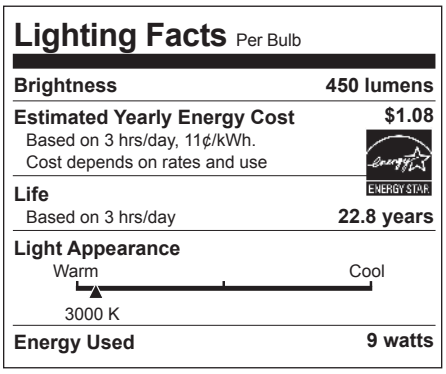
Many LED bulbs are dimmable or can be used with daylight or motion sensors; check the packaging to ensure your bulb works with these controls.

When choosing a lightbulb, you will likely think about three characteristics: bulb shape, brightness, and color.

To determine the shape of the bulb you need, look at the light fixture where you'll be using it. This should help you determine whether you need a bulb with a small- or regular-size base, and whether to look for standard, reflector, candle, or globe-shaped bulbs.

Once you've found the shape of bulb you need, look on the package for the Lighting Facts Label.

The Federal Trade Commission requires the Lighting Facts label on all light bulb packages to help consumers easily compare energy efficient bulbs. Like the helpful nutrition label on food products, the Lighting Facts label helps you to understand exactly what you are buying and to buy the light bulbs that are right for you.



The brightness of the bulb is listed first on the label. While you may be used to thinking about bulb brightness in terms of watts, with the change to LED lighting it actually makes more sense to think in terms of lumens, or the amount of brightness that a bulb provides—the higher the number of lumens, the brighter the bulb.

If you're replacing an inefficient 100 watt (W) incandescent bulb, look for an energy-saving bulb that puts out about 1,600 lumens. To replace a 60 W equivalent, look for a bulb with about 800 lumens.

Then look at the light appearance or color of the bulb. The scale on the label will tell you whether the bulb is warm or cool. The numbers shown are on a Kelvin (K) temperature scale.

- For warm/soft light, look for bulbs marked 2700–3000 K.
- For cool/bright light, look for bulbs marked 3500–4100 K.
- For blue-white light that mimics daylight, look for bulbs marked 5000–6500 K.

Light Fixtures

Efficient lightbulbs are just one element of energy efficient lighting. Another important consideration is your light fixtures. Efficient lightbulbs are most effective and last their maximum lifetimes when they are installed in energy efficient light fixtures.

ENERGY STAR certified light fixtures use 75% less energy, produce about 70% less heat than traditional models using incandescent light bulbs, and last about 10 times longer. They also distribute light more efficiently and evenly than standard fixtures.

You can find hard-wired fixtures in many styles that can be installed on the interior and exterior of your home, as well as portable floor, table, and desk lamps.

While you may not be willing to replace all of your light fixtures at once, just replacing a few of your most-often used fixtures or lamps can save you money and prolong the life of your efficient lightbulbs.

Lighting Tips

- By replacing your home's five most frequently used light fixtures or bulbs with ENERGY STAR certified products, you can save $75 each year.
- Controls such as timers and photocells 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 the energy efficient bulbs and fixtures you want to use.
- Keep your curtains or shades open to use daylighting instead of turning on lights. For more privacy, use light-colored, loose-weave curtains to allow daylight into the room. Also, decorate with lighter colors that reflect daylight.
- Choose small, energy efficient task lights for computer work, reading, or other focused work on desks and tables.
- Look for LED products and fixtures for outdoor use such as pathway lights, step lights, and porches. Many have features like automatic daylight shut-off and motion sensors. You can also find solar-powered outdoor lighting.
- Choose ENERGY STAR decorative light strings for your holiday decorating. They use 75% less energy than incandescent strands and are much more durable and shock-resistant than other light strings.

Renewable Electricity

You can purchase renewable electricity from your utility or produce it at your home or in your community.

Buying Renewable Electricity

Many utilities offer the option to buy electricity made from renewable energy like solar, wind, hydropower, biomass, and geothermal. Programs can include green pricing, in which you pay a small premium for electricity generated from renewable sources; competitive electricity markets, in which you can choose how your electricity is generated and who generates it; and green certificates, which allow you to contribute to the generation of renewable electricity, even if you can't buy it directly from your utility. Check with your local utility for more information.

Installing a Small Solar Electric System

If you've already made your home as energy efficient as possible, and you have sufficient sunlight (also referred to as your "solar resource"), you might want to consider generating your own electricity with a solar power system. Solar energy systems also often make sense if you drive a plug-in hybrid or all-electric vehicle since you use additional electricity to charge your vehicle.

Solar panels can be installed on ground- or roof-mounted racks, and some products can integrate solar cells with the roof of your home.

Solar panels can be installed onto ground- or roof-mounted racks, and products are available that integrate solar cells with the roof, making them much less visible than older systems.

You should consider several factors if you want to install a solar power system, such as your solar resource, siting and sizing the system, and electrical safety. Because of the complexity and need for proper installation, it's best to have a solar professional install your system.

There are now more ownership and leasing options for homeowners interested in installing solar energy systems. You can choose to purchase a system with cash or a loan; you can lease a system and own the power generated; or you can enter into a power purchase agreement (PPA), in which a solar system is installed on your property and you buy the power generated.

If you choose to purchase a system, small solar energy systems are eligible for a 26% tax credit for systems installed in 2020-2022, and 22% for systems installed in 2023. The tax credit expires starting in 2024 unless Congress renews it.

Community or Shared Solar

Almost half of all households in the United States are unable to install photovoltaic, or PV, solar systems because they rent or have unsuitable sites. If you can't or don't want to install solar at your own home, another option is to invest in community or shared solar programs. Shared solar programs can be sponsored by utilities, non-profit entities, or by individuals who join together as a business enterprise known as a "special purpose entity." These programs divide the costs of purchasing and installing solar energy among all participants, who are then able to buy into the system at a level that fits their needs and budget.

A small wind electric system may make sense if you live on at least one acre of land and have an ample wind resource.

Installing a Small Wind Electric System

If you live on at least one acre of land with an ample wind resource, you can generate your own electricity using a small wind electric system. You can also use a small wind turbine for pumping water. Small wind systems range in size from 400 W to 100 kW and consist of a wind turbine, tower, wiring, and balance of system components.

Before deciding to install a small wind system, you will want to assess how much wind is available at your site (also known as your "wind resource"), research any local legal or environmental obstacles, and determine whether a small wind system makes financial sense for you. See the *Small Wind Guidebook* (windexchange.energy.gov/small-wind-guidebook) to learn more about zoning/permitting, how to find the right turbine, and siting and interconnection.

More Resources

See the References section and visit EnergySaver.gov for more resources on installing small solar and wind energy systems.

Renters and Rental Property Owners

If you rent, or if you own a rental unit, you can use many of the tips throughout this guide to save money and energy.

Renters

You can reduce your utility bills and improve the comfort of your home by following the tips in this guide. Encourage your landlord to follow these tips as well.

As a renter, you may think your options for using solar or wind for electricity are limited. The section on Renewable Electricity will help you learn how you can buy clean electricity or participate in community solar programs.

Rental Property Owners

Nearly all of the information in this guide applies to rental units. Improving the efficiency of a rental unit makes it more attractive and more comfortable for renters. Efficiency can also save you and your tenants money over the long term by lowering energy bills and prolonging the life of appliances and heating and cooling systems.

Renters and rental property owners can benefit from all of the energy-saving tips throughout this guide.

Vehicles and Fuels

The vehicle you choose and how you drive that vehicle will affect your fuel use and transportation costs. Efficient driving choices can save you money.

Saving Money on Fuel

The following tips can help you improve your gas mileage or avoid using gas altogether.

- Minimize idling your car by turning off your engine when your vehicle is parked. Any shutdown longer than 1 minute will save you money, but try not to exceed 10 engine starts per day. Idling can use a quarter to a half gallon of fuel per hour, depending on engine size and air conditioner use.
- Also avoid idling to warm your engine in the winter. Most manufacturers recommend driving off gently after about 30 seconds. The engine will warm up faster being driven, which will allow the heat to turn on sooner and decrease your fuel costs.
- In hot weather, roll down the windows at lower speeds and use the air conditioning (AC) at highway speeds.
- Before turning on the AC, roll down the windows briefly to let hot air out of the cabin. Turn on the AC with the windows closed after you begin driving; it will cool the vehicle faster.
- Avoid aggressive driving, such as speeding, rapid acceleration, and hard braking. Aggressive driving can lower your gas mileage by roughly 15% to 30% at highway speeds and 10% to 40% in stop-and-go traffic.
- Avoid high speeds. Gas mileage usually decreases rapidly at speeds above 50 mph.
- Reduce drag by placing items inside the car or trunk rather than on roof racks, which can decrease your fuel economy by up to 8% in city driving and up to 25% at Interstate speeds.

Avoiding aggressive driving and using cruise control on the highway are just two ways to improve your fuel economy.

- Avoid keeping heavy items in your car; an extra 100 pounds in your vehicle reduces your miles per gallon by about 1%.
- Combine errands. Several short trips taken from a cold start can use twice as much fuel as one trip covering the same distance when the engine is warm.
- Use cruise control on the highway to maintain a constant speed and save gas.
- Check into telecommuting, carpooling, public transit, and active transportation like bicycling or walking to save on fuel and car maintenance costs. Many urban areas provide carpool lanes that are usually less congested, further improving your fuel economy.
- If your vehicle has an "economy" mode, ensure that it is turned on.

Car Maintenance Tips

- Use the grade of motor oil your car's manufacturer recommends. Using a different grade of motor oil can lower your gas mileage by 1%–2%.
- Inflate your tires to the pressure listed in your owner's manual or on a sticker that is either in the glove box or driver's side door jamb. This number may differ from the maximum pressure printed on your tire's sidewall.
- Get regular maintenance checks to avoid fuel economy problems due to worn spark plugs, dragging brakes, sagging belts, low transmission fluid, or transmission problems. Fixing a serious maintenance problem, such as a faulty oxygen sensor, can improve mileage by as much as 40%.
- Don't ignore the check-engine light—it can alert you to problems that affect fuel economy, as well as more serious problems, even when your vehicle seems to be running fine.

Learn more fuel saving tips and other ways to save money on FuelEconomy.gov.

Buying and Driving Fuel-Efficient and Alternative Fuel Vehicles

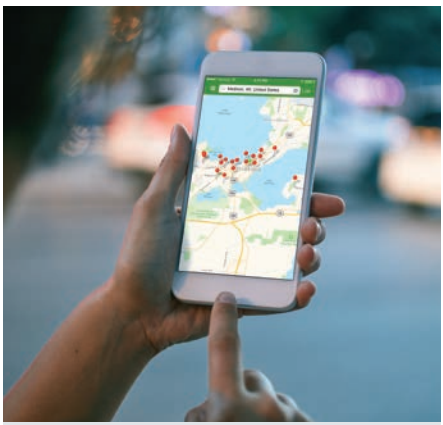
When purchasing a vehicle, consider fuel-efficient and alternative fuel vehicles. Use the tips and tools below to select the right vehicle for you and to get the most out of your purchase.

- Choose your vehicle according to your needs. If you mostly drive in cities, a smaller hybrid electric vehicle might be right for you because it gets better mileage in city driving and is easier to park. If you have more than one vehicle available to you, drive the most fuel-efficient vehicle whenever possible.
- If you need a vehicle for towing or heavy use, consider a clean diesel vehicle. Diesel engines are more powerful and often go about 20% to 35% farther on a gallon of fuel

than their gasoline counterparts. New diesel engines are much smoother and quieter than their predecessors. The new generation of clean diesel vehicles must meet the same emissions standards as gasoline vehicles. Drivers of diesel vehicles can be even more sustainable by fueling up with a biodiesel blend. Most manufacturers allow the use of B5 (diesel with up to 5% biodiesel), some approve blends up to B20 (6% to 20% biodiesel).

Keep the battery charged on plug-in electric vehicles to minimize gas use (for plug-in hybrids) and maximize driving range (for all-electric vehicles).

- Many vehicles produced by U.S. auto manufacturers are flexible-fuel vehicles (FFVs), which can run on E85 (up to 83% ethanol, 15% gasoline) and other ethanol-gasoline blends. Check your owner's manual to find out if your vehicle is an FFV.
- Consider buying a smaller-sized, fuel-efficient vehicle that will serve you well for driving around town and in urban areas where speed is not a consideration and parking can be tight. A fuel-efficient, hybrid electric, plug-in electric, or other alternative fuel vehicle could cut your fuel costs. Visit FuelEconomy.gov and use the Find a Car tool when buying a new fuel-efficient car or truck.
- If you have a plug-in hybrid electric or an all-electric vehicle, charging stations for electric vehicles are increasingly available throughout the country. You can find charging and alternative fuel stations on the Alternative Fueling Station Locator: afdc.energy.gov/locator/stations/.



The Alternative Fueling Station Locator can help you find a charging station near you.

Electric Vehicles

Electric vehicles (EVs) continue to become more affordable and economical. EVs include battery electric vehicles (BEVs), which are all-electric, and plug-in hybrid electric vehicles (PHEVs).

The main difference between the two EVs is their driving range and operating efficiency. Here is a breakdown:

- BEVs are limited in how far they can travel based on the duration of their battery charge.
- PHEVs can travel much farther on a single battery charge because they also use an internal combustion engine (ICE). The vehicle typically runs on electric power until the battery is nearly depleted; then it automatically switches over to use the ICE.
- Both EV types help reduce greenhouse gases.
- BEVs virtually eliminate tailpipe emissions, whereas PHEVs produce no tailpipe emissions when in electric-only mode.

How to Charge an EV at Home

You can charge an EV at home by plugging the EV's 110-volt cord into a standard electrical outlet. Note that charging this way may take several hours to reach full power. To speed up charging, you can purchase a portable 240-volt unit. Alternatively, have an electrician install a hard-wired 240-volt outlet in your garage. A 240-volt outlet can fully charge an EV battery in as little as 20 minutes. The following could affect charging times:

- The type of battery
- The capacity of the battery
- How depleted the battery is
- The capacity of the vehicle's internal charger.

Be sure to choose an ENERGY STAR certified electric car charger whenever possible. Before purchasing charging equipment for your EV, make sure you check your EV's charging capabilities.

PHEV batteries are charged in three ways:

- By an outside electric power source
- By the ICE
- Through regenerative braking.

Regenerative braking takes place when the electric motor acts as a generator during braking, using the energy to charge the battery and eliminating energy loss. PHEV fuel consumption depends on the distance driven between each battery charge. To maximize results, the vehicle must be consistently charged.

Charging Plug-In EVs in Public

At a public charging station, there will be a port called an electric vehicle supply equipment (EVSE) port and a connector (or plug). At each charging post there can be multiple connectors and connector types; however, only one vehicle can charge at an EVSE port at a time.

Charging equipment is classified by the rate at which the batteries are charged, with three levels: Level 1 charging, Level 2 charging, and direct-current (DC) fast charging.

- Level 1 charges through a 120-volt AC plug, which provides approximately 5 miles of range per 1 hour of charging. The connector is called a J1772 connector.
- Level 2 charges through a 240-volt (residential) or 208-volt (commercial) electrical service, which provides approximately 25 miles of range per 1 hour of charging. Level 2 uses the same connector as Level 1.
- DC fast charging enables rapid charging along high traffic corridors at installed stations, which provides approximately 100 to 200+ miles of range per 30 minutes of charging. DC fast charging systems have three different connector options: a standard SAE Combined Charging System (CCS), a CHAdeMO connector, or a Tesla Supercharger.

The majority of EVs will come with a portable cordset, so no additional charging equipment is required for Level 1 or Level 2 charging. Find out which connector your vehicle will require to meet your needs.

EV charging stations at Dallas Fort Worth International Airport.

Financing, Incentives, and Assistance

You may be eligible for financing, incentives, or assistance with energy-saving home improvements or purchases.

Financing

Financing programs for energy efficiency improvements are available from financial institutions, mortgage lenders, utilities, and state and local governments. In a few states, homeowners can finance energy efficiency and other eligible improvements through an assessment on their homes, which is known as Property Assessed Clean Energy (PACE) financing.

Homeowners can also use conventional financial programs, such as home equity loans, to finance energy efficiency improvements to their homes. Income-qualified programs for low-moderate income borrowers are available in some states, which provide reduced interest rates and other assistance.

Programs are also available that allow efficiency improvements to be financed when purchasing or refinancing a home, such as the Fannie Mae HomeStyle® Renovation loan program and FHA's 203(k) renovation loans. The DOE Home Energy Score report can be used to qualify energy efficiency improvements for a HomeStyle Energy® mortgage or to qualify FHA borrowers for a 2% stretch on debt-to-income ratios for high scoring homes. The Veteran's Administration (VA) also provides energy efficient mortgages; you can learn about them in VA pamphlet 26-7. If you live on a farm or in a rural area, you may be able to participate in the U.S. Department of Agriculture Rural Energy for America Program (REAP).

See the References sections for links to these financing programs.

Incentives

When searching for incentives, consider federal, state, local, utility, and retail incentives. A good place to start your search is the Database of State Incentives for Renewables and Efficiency®: dsireusa.org.

The federal government may offer incentives in the form of tax credits, which reduce the amount of tax you pay. Tax credits are claimed when you file your tax return.

Utilities and retailers are more likely to offer rebates. Contact your utility and retailers directly to find out if they offer any rebates. Also visit energystar.gov/rebate-finder to search for rebates from ENERGY STAR partners.

Weatherization and Home Energy Assistance

Assistance is available to low-income households to improve the efficiency of homes and to pay energy bills.

Weatherization Assistance Program

Nationally, as many as 20–30 million U.S. families are eligible for weatherization services. Weatherization reduces energy costs for low-income households by increasing the energy efficiency of homes while ensuring health and safety.

States provide homes with these services, and each state has slightly different criteria for eligibility.

To learn how and where to apply for weatherization assistance, visit energy.gov/eere/wipo/where-apply-weatherization-assistance.

Low-Income Home Energy Assistance Program (LIHEAP)

The Low-Income Home Energy Assistance Program (LIHEAP) helps low-income households with their home energy bills. The program is federally funded through the U.S. Department of Health and Human Services, which awards funds to the states, the District of Columbia, Indian tribes, and U.S. territories. LIHEAP may also offer assistance with energy crises, weatherization improvements, or energy-related home repairs.

To locate the energy assistance office in your area, call the National Energy Assistance Referral (NEAR) toll-free at 1-866-674-6327. Or, email NEAR at energyassistance@ncat.org.

Weatherization can reduce energy bills and improve the efficiency, health, and safety of the home.

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energy saver

EnergySaver.gov provides information about energy efficiency and renewable energy that you can use to save money and energy at home. In addition to the tips in this guide, you can learn how to make short- and long-term changes to save now and in the future.

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