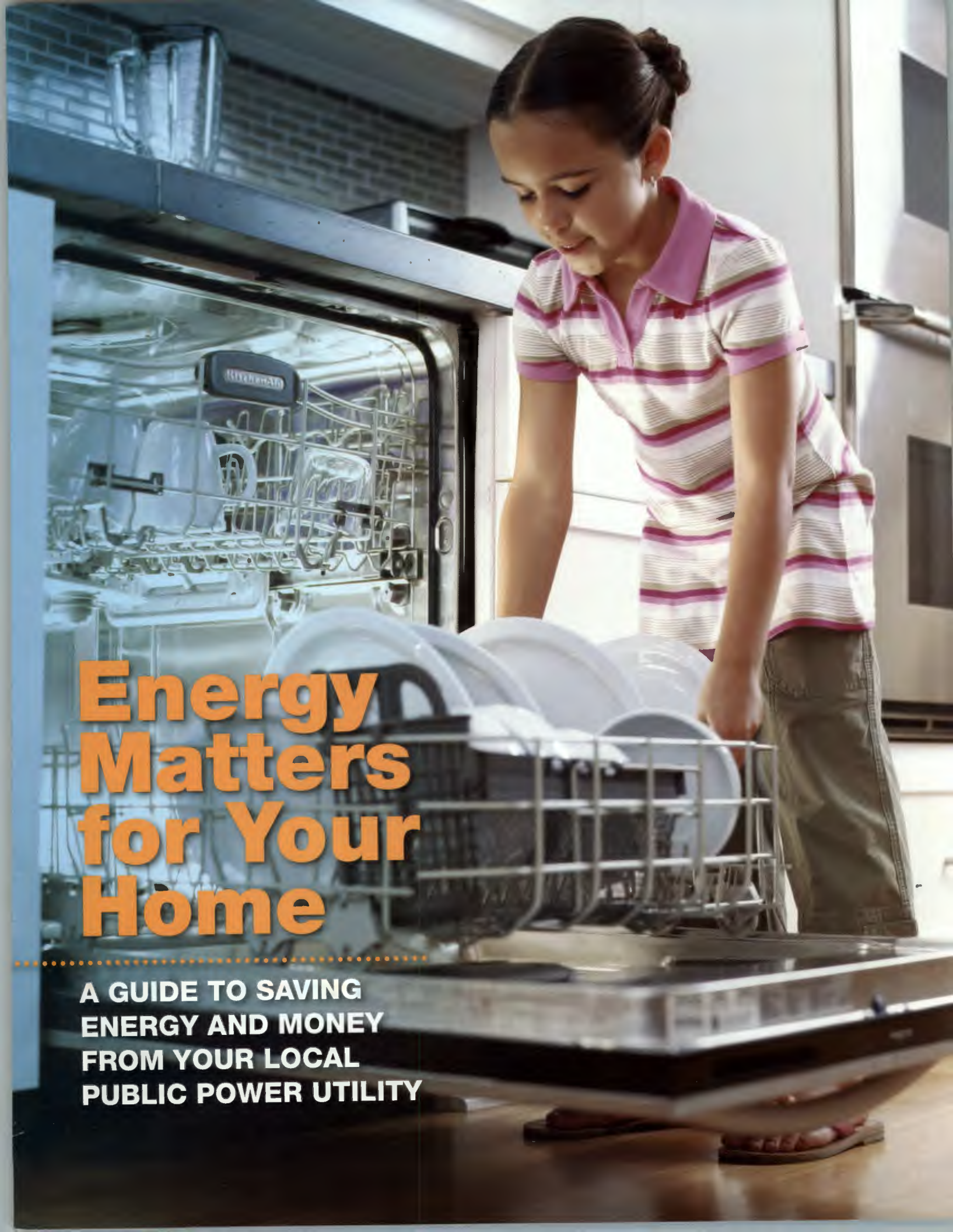

Energy Matters for Your Home

A GUIDE TO SAVING ENERGY AND MONEY FROM YOUR LOCAL PUBLIC POWER UTILITY

"We want to improve our comfort as well as save money." **p.6, 10**

"What is an energy audit? Is it really worth the cost?" **p.4**

"I'm a renter. Do you have any ideas for me?" **p.2, 14**

"The weather here has been fierce. How can I save more on heating and cooling my home?" **p.10**

"I've seen so many new light bulbs at the store, but I don't know which to buy." **p.8**

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Find Savings in Every Room

Whether you live in a mobile home, an apartment, or a multi-level house, your first steps for reducing energy costs will be similar. Start with a room-by-room tour and plan to make these easy, low-cost energy improvements. Take notes, list any supplies you will need, and prioritize bigger projects.

Entrance. Find energy savings before you even step inside. Change your outside lights to energy-saving CFL or LED lamps. Add a photo sensor, and the light will automatically come on to welcome you after dark.

Windows. In summer, block direct sunlight using screens, film, blinds, or outdoor awnings, vines, and trees. In winter, reverse your thinking, and let the sunshine in for free heat.

Ceiling Fans. According to the U.S. Environmental Protection Agency (EPA) Energy Star program, you can raise summer air-conditioner settings by three to five degrees with no loss of comfort if you use ceiling fans. Remember to turn the fans off when you leave the room.

Air Leaks. A typical home has a half mile of cracks and gaps around windows, doors, and edges where walls and floors meet! You can purchase supplies from your local home store to fix this problem. Don't miss the gap around the door or panel that leads to your attic. Fix it with foam weather-stripping.

Fireplace Flue. Close the damper when the fire is out. Leaving the damper open when the fire is extinguished can draw out conditioned air and increase energy bills by 15% or more.

Dishwasher. Save energy and water by scraping dishes instead of rinsing before loading them in the dishwasher. Run the dishwasher with a full load, and use the air-dry option if available.

Refrigerator. If you have an old refrigerator or freezer that you barely use, unplug it. Old appliances can add up to 15% to your electric bill! Save energy with your working fridge — keep the condenser coils clean, place it in a well-ventilated spot, and keep it full but not overloaded.

Clothes Washer. Try to wash most clothes in cold water and always rinse cold. You may save hundreds of dollars on water heating each year. Try to dry clothes on a cooler setting, too. And, keep that lint trap clean.

Find out how you can make your whole house more energy efficient — the building, insulation, heating and cooling system, appliances, electronics, and more. Check out the Energy Star website, at EnergyStar.gov, for energy-saving information.

Furnace. Change the air filter regularly—once a month in the heating season. Buy multi-packs of replacement filters, so you always have one on hand.

The Switch. Turn lights, appliances, and electronics off when they are not in use. To charge electronics, use a power strip with an on/off switch, so you can leave cords plugged in without wasting energy.

Understand Your Energy Use

American homes are much more energy efficient today than 15-20 years ago. New homes are built to better withstand the weather and have better heating equipment.[1] According to the U.S. Energy Information Administration (EIA), homes built in the 2000s consumed 21% less energy, on average, for space heating than older homes. Most new homes have more energy-efficient lighting and appliances, too.

These energy savings are not as apparent as they might be, because homes built after 2000 are 30% bigger than older houses, and the number of energy-using appliances and gizmos inside homes has boomed. But, thanks to energy efficiency, the average home today uses just two percent more than homes built before 2000. And, you can take steps to be even more energy efficient.

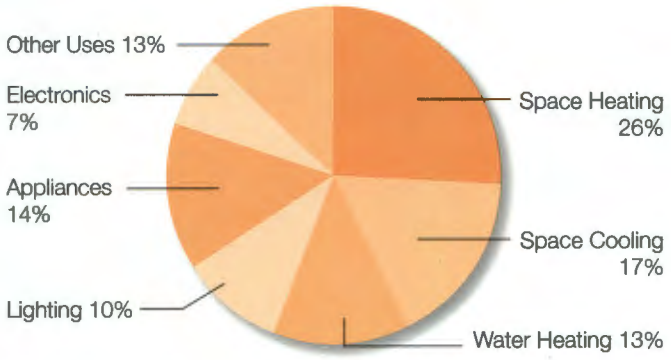
Your heating and cooling energy use will differ somewhat, based on where you live. The chart on page five shows all household energy use, which is likely to include electricity plus natural gas, fuel oil, propane, or some other fuel. In electricity use, home electronics is the fastest growing category, with computers alone using an estimated three percent of home electricity.

HOME ENERGY AUDIT

You can make simple energy improvements easily. If you have more complicated questions or don't know where to begin, a home energy audit or check-up may provide answers.

You may complete your own energy audit with an online interactive tool — found on several utility, nonprofit, or government agency websites. All you need is a notebook, access to your old utility bills, a tape measure, and maybe safety glasses and a screwdriver.

There are a few limitations to the do-it-yourself approach, however. For example, you probably do not have the special equipment that professional home energy auditors have. These auditors are trained to solve mysterious and often costly energy problems and to set you up for a successful home improvement project. The list on page 5 explains popular energy audit options.



Average U.S. Household Energy Use

Source: US EIA Annual Energy Outlook 2012

Energy Star Home Energy Yardstick, EnergyStar.gov

This free online tool asks you to put in your zip code, number of home occupants, your home's age and square footage, and a little information from old utility bills. It helps you compare your home's energy efficiency to similar homes across the country and to make an energy-saving to-do list.

Energy Star can also help set you up with a professional audit, called Home Performance With Energy Star. Trained professionals offer an on-site energy audit for a moderate fee. Search EnergyStar.gov to find a link to listed Home Performance professionals (not available in all areas).

Home Energy Saver Assessment Tool, hes.lbl.gov

This free website from the U.S. Department of Energy is customized for your climate zone and based on measurements and other energy data that you provide. It also taps national average data on home construction and energy use to fill in gaps in your information. The site offers downloadable guides, supports an online community, and gives you the chance to "ask an energy expert" about your problems.

Home Energy Ratings from the Residential Energy Services Network (RESNET), resnet.us.

The Home Energy Ratings service (HERS) provides an index and a complete report with results from an onsite professional assessment, including an analysis of your utility bills and findings from sophisticated testing, such as pressurizing the home to find and measure air leakage and furnace combustion. The HERS professional also may use a thermal-imaging camera to assess heat loss through walls and floors. HERS helps to identify the true cost of home ownership and the value of an energy-efficient home.

Building Performance Institute (BPI) Home Survey, bpi.org.

BPI analysts and HERS raters have similar, but not identical, training. BPI emphasizes a broader definition of building sustainability and how the building performs as a system—for example, controlling humidity in the home—as an important consideration when deciding how to manage home energy and airflow.

Some energy professionals have both HERS and BPI training—often from the local community college. Both services charge a fee, so be clear about your expectations from the start.

Limited Income? Try the Weatherization Assistance Program (WAP), waptac.org

The U.S. Department of Energy's WAP provides state-level funding, which supports local weatherization services for low-income clients and has helped 30 million households. The service begins with an energy audit and safety check. The safety check helps to spot wiring problems, mold, and carbon monoxide issues early. Then, trained installers complete recommended improvements. Check the website for a provider near you.

Ready for Any Weather

To weatherize means to suit up your home or apartment so you stay comfortable in all kinds of weather. Fixing air leaks and improving building insulation are the primary ways to achieve this. Improvements to doors and windows are also part of weatherization.

PLUG THE LEAKS

You can reduce your heating and cooling needs by up to 10% by sealing air leaks. Use all-weather caulk or spray foam to seal small gaps. Wear gloves and stuff fiberglass insulation into larger holes. Unless you are stuffing a space that might get quite hot, you can put the insulation in a plastic bag to prevent air from moving through. You can also buy special crack filler or "backer rod" to fill larger gaps. Use only specially recommended sealants and heat-resistant flashing around furnace flues and chimneys.

ADD INSULATION

Older homes typically fall far below new building codes for insulation. Many newer homes also could use more insulation. The chart below gives a rough idea of how

SEAL AIR LEAKS IN YOUR HOME

Here are 11 places to look for air leaks that cost you money:

1. Dropped ceiling
2. Recessed lights
3. Attic door
4. Sill plate
5. Furnace and water heater flues
6. Ducts
7. Door frames
8. Chimney flashing
9. Window frames
10. Electric outlets and switches
11. Plumbing and wiring access

Source: Energy Star

When to Call an Expert

While you are fixing air leaks and insulation, be on the lookout for ventilation problems, which can have health or safety impacts. Call an expert if you see:

- Wet or damp insulation indicating a leaky roof or leaky skylights
- Moldy or rotted attic rafters or floor joists
- Ice forming in the attic in winter
- Kitchen, bathroom, or clothes-dryer vents that exhaust moist air into the attic instead of outdoors
- Little or no attic ventilation (generally, fresh unconditioned air in the attic is fine)
- Very old (pre-1930) wiring that could be a fire hazard
- Unsealed recessed light fixtures that may require special insulation

much insulation is recommended for homes in your area. A simple online tool, available from the Department of Energy at ***web.ornl.gov/sci/roofs+walls/insulation/ins_16.html***, provides recommended R-Values for attics, walls, and floors based on your zip code. Remember, heat rises and escapes primarily through ceilings and attics, if they are not well insulated. Focus on attic insulation first.

Batts, Loose-fill, or Foam Insulation?

Fiberglass, rock wool, and slag wool insulation batts and rolls come in various thicknesses and are labeled for their insulating value (R-value). They are available with and without a paper or foil facing. The facing material is a vapor barrier, generally installed toward the "warm-in-winter" side and helps prevent damaging condensation. If you lay batts on top of one another, do not use a batt with facing for the second layer.

Loose-fill insulation—usually made of fiberglass or treated cellulose—is designed to be blown into attic spaces or wall cavities. Loose-fill insulation is often used to add insulation to an older home, because it readily fills gaps between previously installed batts. When installed in a new home or addition, loose fill requires a vapor barrier. Read product information on insulation packaging carefully.

Foam insulation is increasingly popular. This includes rigid foam boards, often used to boost wall insulation. Boards come in range of thicknesses and R-values and some have an additional foil vapor barrier attached. Blown-foam insulation, a newer product, is useful in remodeling or in a setting such as a crawlspace, where moisture

resistance is important. Closed-cell foam offers that protection, while lighter, less expensive open-cell foam does not.

Foam is tricky and dangerous to install, so be sure to work with a trained, experienced professional. All types of insulation should be installed according to manufacturer's instructions. The online resources recommended in this guide offer additional background.

More Lighting Choices, More Savings

When new lighting standards first resulted in the disappearance of most incandescent light bulbs from store shelves, consumers worried that they might have fewer lighting choices. Today, most people would say that the opposite is true.

You can still find specialty incandescent lights. A range of new halogen incandescent bulbs has appeared—they look just like the old light bulbs, but use about one-third less energy. There are improved compact fluorescent lamps (CFLs) and light-emitting diode lamps (LEDs)—softer, dimmable, and more likely to hold their brightness.

You can expect to see more choices, at lower prices, on store shelves in coming years. The biggest problem for most lighting customers today is deciding which lamps to use in which fixtures to get the most appealing and cost-effective results. New labeling that shows the brightness, color, and energy used by the lamp will help.

Look for new lighting labels, similar to the nutrition labels on food. Remember, the estimated daily use and energy costs are national averages, which may differ from your situation.

Source: Federal Trade Commission.

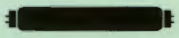
WARM OR COOL?

Lighting color tone is measured on a temperature scale referred to as Kelvin (K). Lower Kelvin numbers mean the light appears yellower and warmer; higher Kelvin numbers mean the light is whiter, bluer, or cooler. Old-fashioned incandescent bulbs were fairly warm, at around 3000° K. Today, energy-efficient lamps come in a variety of color choices to suit your mood!

Kelvin	Associated Effects & Moods	Appropriate Applications
6500°	Bright, cool	Bright daylight; seldom used in homes
5000°	Bright, alert	Ambient light for workshop, kitchen; reading, spotlighting
4100°	Neat, clean, efficient	Warm household; reading lamp
3500°	Friendly, inviting	General household; decorative kitchen lighting
3000°	Soft, warm pleasing light	General household; compare to incandescent lamps
2700°	Friendly, personal, intimate	Living, dining room; layer with brighter ambient light
1900°	Candlelight	Unique decorative lights; layer to set a mood

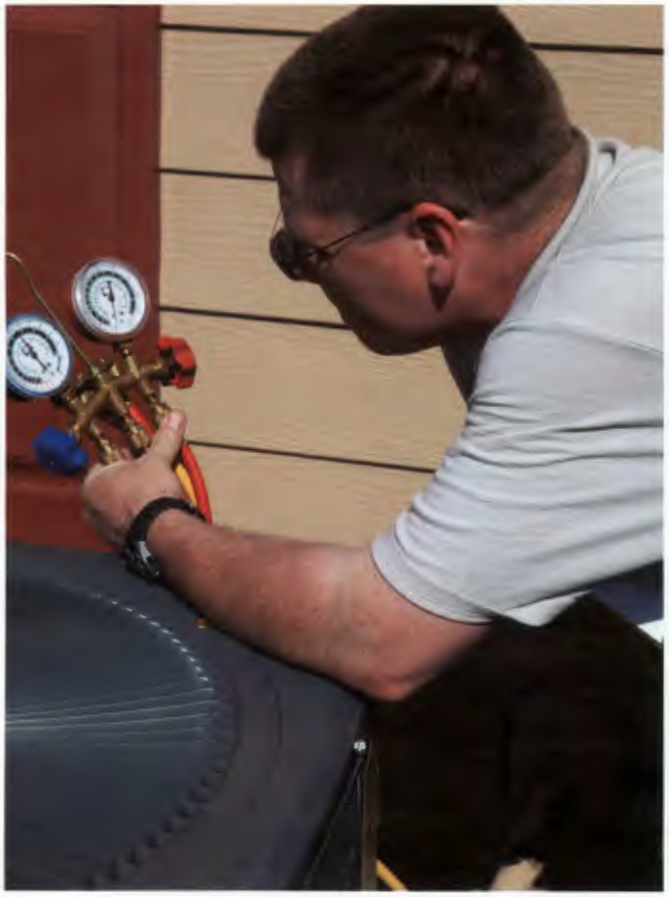
The lights that people use most are in the kitchen, living or family room, outdoor porch or driveway, and sometimes a bathroom or hallway. All these are great places for energy-efficient CFLs or LEDs, which throw off almost no heat compared to incandescent light bulbs.

Comparison of Home Lighting Choices[2]

Lamp Type	 Outdated Incandescent	 Halogen Incandescent	 Compact Fluorescent (CFL)	 Light Emitting Diode (LED)	 Fluorescent Tube (T8 or T5) with Electronic Ballast
Efficiency (Lumens per Watt)	~16 Lumens/W	~20 Lumens/W	~50 to 70 Lumens/W	~45 to 65 Lumens/W Up to 90 Lumens/W for new designs	~85 to 95 Lumens/W
Replacement for 60-W Outdated Incandescent	60-W (baseline)	43-W	14-W	12-W	Not directly comparable
Typical Energy Savings[3]	—	30%	75%	80%	Not directly comparable
Lifetime (Hours Before 30%Decline in Lumens)[4]	1,000 to 2,000	2,250 to 3,500 Up to 3.5 times the life of incandescent bulbs	6,000 to 15,000 Estmated 6 to 10 years; See EnergyStar.gov for disposal tips in case of breakage	50,000 Estimated up to 25 years. Lamp may outlast fixtures	20,000 to 40,000 Depends on fixture and conditions of use; check labels
Typical Uses	Product Phased Out	Choices closely match incandescent bulbs of various sizes, color renditions, and special qualities	Choices closely match incandescent bulbs of various sizes, color renditions, and special qualities	Choices for fashionable designs Declining prices and long life add value	Typically for garage, utility room, kitchen Many wattages and colors available; T5 is smaller; used in lighting designs

Heating and Cooling

There are three energy-saving aspects to consider while heating and cooling your home: A heating or cooling source, such as a furnace, boiler, heat pump, or air conditioner, which provides conditioned air, water, or steam. A distribution system, including ducts, pipes, or radiators, to move the conditioned air, water, or steam through your house. A control system, typically a thermostat, to control your comfort level in one room or the whole house.



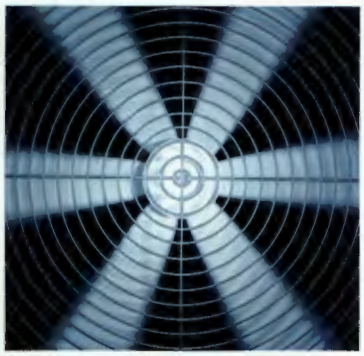
Electric and fuel-based heating or cooling system efficiencies are not directly comparable, so be sure to assess each separately. For example, for combustion-based systems, such as a furnace or boiler, you will want to consider the type and price of the fuel (such as natural gas, fuel oil, propane, or wood). Then, consider the specific combustion efficiency of the system, measured as the Annual Fuel Utilization Efficiency (AFUE) rating.

AFUE = how efficient the appliance is at converting the energy in its fuel to heat ÷ the annual fossil fuel energy consumed by the appliance

AFUE rating, used to compare the efficiency of combustion-based heating systems.

Use a different approach to assess the efficiency of electric equipment, such as electric forced air, resistance baseboard heating, radiant floor heating, or air-to-air and ground-source heat pumps. Electric resistance heating is considered 100% efficient because all the electricity that goes into the system is converted to heat.

Electric heat pump systems are typically more than 200% efficient because they draw additional heat from the air, ground, or other heat-storage medium.



What's missing in any comparison? The efficiency of getting energy (say, electricity or natural gas) to the home in the first place is not considered for these ratings. Neither are factors like total annual cost, equipment cost, nor customer-specific needs. For example, electric baseboard heating and zoned radiant floor heating are equally efficient, but total cost and customer satisfaction may vary.

If you are considering a new system, first compare combustion-based options, then compare electric-based options. Among your best choices from both categories, compare estimated total cost over the life of the system and adjust the results based on your needs for convenience, quiet operations, design, etc.

To compare electric heat pumps, use a Heating Season Performance Factor (HSPF) or Coefficient of Performance (COP). Air-conditioning efficiency in heat pumps and central air conditioners is separately assessed as the Seasonal Energy Efficiency Ratio (SEER). Room air conditioners have a simpler Energy Efficiency Ratio (EER) rating.

HSPF	=	total space heating required during the heating season	÷ the total electrical energy consumed during the same season	HSPF ranges from 6.8-10
COP	=	heat provided	÷ the amount of energy input	COP ranges from 2-4

Ratings Used to Compare Heating Efficiency of Electric Heat Pumps.

While shopping, look for the Energy Star label (see EnergyStar.gov). The label assures that a system meets efficiency requirements at least 15% better than the market average.

SAVE SEASON AFTER SEASON

Neglect is the number one cause of heating and cooling system breakdowns and energy waste. When seasons change, and sometimes in between, run through this simple checklist:

Check the thermostat. The average family can save $150 annually by lowering the thermostat at night and while they are away. Savings add up in summer, too, by nudging the thermostat up. If you do not have a programmable thermostat, install one and use it. There are helpful videos online to show you how.

Change filters on heating and cooling equipment. Experts recommend changing filters every month to improve airflow and reduce the amount of dust and allergens in your home.

Seal leaky, uninsulated ducts, which can reduce heating and cooling efficiency by 20% or more. If sealing them yourself, be sure to use a duct sealant, which works better than duct tape. According to the Department of Energy, cleaning inside ducts is seldom necessary.

Be sure vents are open in all conditioned spaces and closed in rooms that you do not use. In summer, hose down outdoor air-conditioner coils to clear out dust and debris.

Have a professional check and clean your system every year or two.

HEATING AND COOLING GET SMART

You might have seen them advertised—new thermostats and controls you can access from a smartphone. Some popular brands can control heating and cooling, and other household functions, too.

How does a smart thermostat work? Each brand works differently, so be sure to read the product information, but here is an example of how one popular smart thermostat works. Upon installation, you can turn the dial up or down depending on your comfort preference at that time. The thermostat "learns" the settings and times within about a week. You can make changes, and if you make them consistently over time, it will learn those, too. It also uses light sensors to implement setbacks automatically when you seem to be away. Smart thermostats may not be an option for everyone, but they make saving energy easy.

Thermostats may be controlled through smart phones.

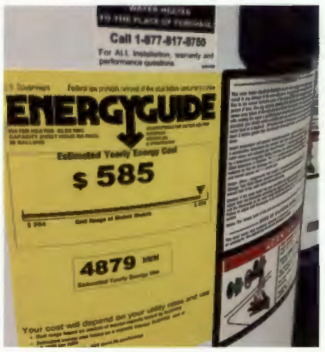
Use Space Heaters Sparingly

To estimate the cost of running a space heater, multiply the capacity in kilowatts (1000 watts = 1.0 kilowatts, or kW) times the number of running hours, times your electric rate per kilowatt-hour (kWh).

For example:
2.0 kW typical heater x 8 hours x $0.10/kWh = $1.60

That's about $48 (not including tax) per month to run a typical space heater. A space heater can be a bargain if it keeps one room warm in a large, otherwise empty house. However, running several space heaters for long periods of time can be costly.

Water Heating



The Energy Guide label estimates operating costs based on national average gas and electricity rates. It is useful in comparing water heaters of the same basic design.

Water heating probably accounts for 10 to 15% of your total energy use. This is partly due to the equipment itself, and partly due to your water-use habits. If your water heater is old, consider replacing it before it gives out. Ask about energy efficiency, as many home centers and plumbing companies sell what they have in stock and will not explain the difference in operating costs unless you ask them.

Comparing Home Water Heating Choices[5]

Water Heater	Energy Savings vs. Standard Unit[6]	Comments
Standard with Super-insulated Storage Tank (natural gas or electric)	10% - 20%	Lowest first cost. Electric model may be controlled if utility load-control savings apply.
Tankless "On Demad" (natural gas or electric)	45% - 60%	Near-limitless hot water, but for a limited number of fixtures at a time. May require a filter and maintenance to prevent mineral build-up. Electric model requires expert wiring and may add to peak demand and power quality issues.
Heat Pump with Storage Tank	65% compared to standard electric water heating	Works well in mild climates or install in semi-conditioned space. High cost first, with better savings for big hot water users.
Solar with Electric Back-Up	70% - 90% compared to standard electric water heating	Different designs work well in many climates. Systems may last 20 years. Proper siting and installation are key.

Plug In to Energy Savings

The number of electric cords and plugs in your home may astound you. There are the big items like the refrigerator, stove, washer, and dryer, and the smaller items like the microwave oven, computer, TV, toothbrush, and cell phone charger.

According to the Consumer Electronics Association:[7]

- Nearly 70 million households own at least one smartphone, which they charge at home.
- Three-fourths of all households own at least one high-definition TV; most have more than one.
- More than one-third of households do video streaming.
- 80% of households had at least one home computer in 2013, and one-fourth of all households planned to buy a new tablet or laptop computer in the next year.

A plug switch is an easy, inexpensive solution for single devices.

Most of these devices use relatively little electricity, but small uses add up. Consumer electronics and "miscellaneous" devices represent the fastest-growing segments of home energy use.

STOP QUIET WASTE

Many small electronics and appliances remain in standby mode and consume energy all the time. For some of these devices, the instant start-up, onboard clocks, and memory features are a great advantage. But the average household spends $100 a year to power devices while they are off or in standby mode. Nationally, standby power accounts for more than $10 billion in annual energy costs, according to Energy Star.

Check if you need to keep all of your devices plugged in (like the clock radio or TV in the guest room) and if they have power-saver settings. For example, comput-

ers should be set to go into "sleep mode" after five or 10 minutes without use. Screen savers do not save energy.

Most cell phone chargers and power adapters for MP3 players, cameras, laptops, etc., waste energy when they are plugged in but not in use. You can tell if the charger "brick" feels warm. Newer chargers tend to be more efficient, as the International Energy Agency has set efficiency targets for manufacturers worldwide.

Simple energy management tools can help you avoid energy waste.

Use a power switch or smart strip. Plug in one to six devices and turn them on or off with the flip of a switch. Mount your power strips conveniently because you won't use them if they are hard to reach. In some cases, it is also worthwhile to use timers. If you know that your phone will charge in a few hours, you can set an outlet to provide power for only that many hours each night.

Identify which appliances and electronics are using more energy with a "watt meter." There are several brands available from online stores, or you might borrow one from the local utility or school. A simple readout tells you how much electricity is being used.

Make Your Energy Savings Plan Today

Winter

- ✓ Change furnace filters monthly.
- ✓ Install ___ (#) new CFL or LED light bulbs in frequently used lamps.
- ✓ Reduce standby power use in chargers and home electronics.

Spring

- ✓ When you change your clocks, test smoke detectors and change batteries if needed.
- ✓ Get ready for summer by adding a light sensor to outdoor bulbs.

Summer

- ✓ Change AC system filters monthly.
- ✓ Change adjustable ceiling fans to pull cooler air upwards.
- ✓ Plant a tree that will give you shade in summer.

Fall

- ✓ Change furnace filters monthly.
- ✓ Call a professional to clean and tune your heating system or wood stove.
- ✓ Switch out ___ (#) more energy efficient lamps.
- ✓ Repair weather stripping and plug air leaks.
- ✓ When you change your clocks, test smoke and carbon monoxide detectors. Double check home safety.

American Public Power Association

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