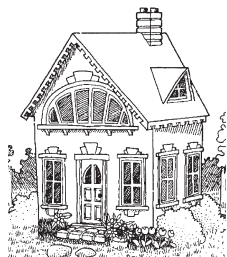


Home Energy Brief



#4 WATER HEATING

Water heating is the second largest energy use in the home, after space heating and cooling. Heating water costs the typical family \$160 to \$390 a year. Heating water with electricity costs over twice as much as with natural gas. You can take many steps to cut your water heating costs short of replacing your water heater. In fact, using hot water more efficiently, so you need less of it to get the same or better service, is one of the easiest and quickest ways to save energy and water costs in the home. Switching to water-efficient fixtures and making a few simple adjustments to your existing heater are great ways to start.

WATER EFFICIENT FIXTURES AND APPLIANCES

Showerheads

Standard showerheads have flow rates of 3.5 to 6 gallons per minute (gpm); efficient ones use 1.0 to 2.5 gpm. High-efficiency showerheads are designed to give excellent showers with less water — not to be confused with primitive flow restrictors that simply reduce flow and result in wimpy showers. You'll

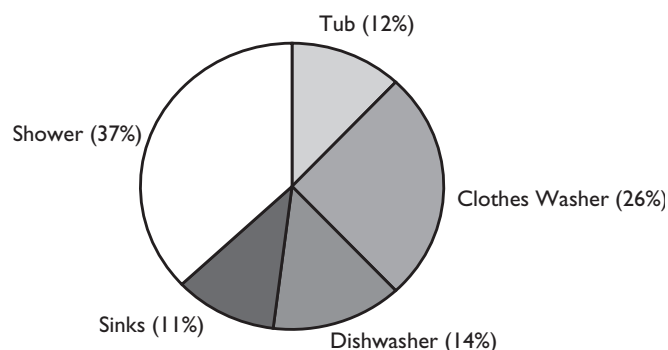
recover the \$10–20 price of an efficient showerhead within three months to one year in saved energy and water costs.

Faucet Flow Controls

Average sink faucets have flow rates of 3 to 5 gpm. Flow controls such as aerators and laminar faucets (which produce many tiny parallel streams of water) can reduce this to 0.5 to 1 gpm in the bathroom (for washing, brushing teeth, and shaving) and to 1.5 to 2 gpm in the kitchen (for washing dishes and food, and filling pots). Since aerated water thoroughly wets objects instead of bouncing off, you won't regret using less water. Aerators are inexpensive (\$2–5 a piece), easy to install, and more convenient to use (models with a fingertip control allow you to slow the flow to a trickle without losing the hot-cold mix.)

Retrofitting one showerhead and two faucets at a total cost of \$25 will reduce the average family's yearly electric bill by \$86 (or \$36 if you heat with natural gas), cut the yearly water bill by \$33, and reduce your annual carbon dioxide emissions by 580 to 3,200 pounds.

WHERE DOES THE HOT WATER GO?



Adapted from *The State of the Art Water Heating (1991)*, E SOURCE, Boulder, CO.

Clothes Washers

Horizontal axis washing machines (like the front-loaders often seen in laundromats) use 60% less energy because they use far less water. Horizontal axis washing machines are not as commonly available as vertical-axis machines, but are worth seeking out. Though they cost more, you will save money on water heating and detergent in the long run. They usually spin-dry your clothes better, saving on drying energy, too. Whatever type of machine you have, you can save energy and money by using cold water instead of warm or hot; if you use a cold-water detergent, cold water cleans as well and makes clothes last longer.

Dishwashers

About three-quarters of new dishwashers in the U.S. have booster heaters that raise the incoming water temperature to the 140°F recommended for proper cleaning with conventional (non-enzymatic) detergents. Booster heaters save energy by allowing you to set the household's main water heater to the lower temperature required by other uses (bathing, etc.), thereby reducing heat loss through the tank's walls. Also, since only 20–40% of the hot water used by the dishwasher must be 140°F, booster heaters heat only the amount of water that actually needs to be at that peak temperature. Choose no-heat drying for additional energy savings.

Other briefs in this series give more tips and information on clothes washers and dishwashers.

MAKING YOUR WATER HEATER MORE EFFICIENT

Turn Down the Temperature

If you have to mix cold water with the hot to get the right temperature, your water heater temperature is set too high, and you're wasting energy and money. Many heaters are set to 140°F or higher. For most households, 115–120°F is sufficient. For each 10-degree reduction, you save up to 13% on your water heating costs.

To change the setting, turn off the electricity to the heater at the circuit breaker in the main electrical panel (if you have an electric heater). Open the access panels to the thermostats (some models have one, some two) and turn the indicators to 115–120°F or halfway between low and medium. Check the temperature with a thermometer at the tap since the dials are often inaccurate. After living with the new setting for a while, re-adjust, if necessary, to a temperature that suits your needs. In addition to saving energy, you'll increase the life of the water heater and reduce the risk of scalding. If you have installed efficient showerheads and faucet controls, your hot water will last longer, too.

Turn Heater Off When on Vacation

For electric water heaters, simply switch off the breaker at the main panel. For gas units, get instructions from your gas supplier about putting out and relighting the pilot.

Insulate Tank

Unless your water heater tank is already insulated to at least R-24, which only a few new ones are, adding an insulating jacket to your water heater is one of the most cost-effective do-it-yourself energy-saving projects.

Choose a jacket with an insulating value of at least R-7 to R-11, or use two R-5 jackets if that's all you can find. Follow directions carefully and leave thermostats uncovered. On gas water heaters, keep the jacket away from the drain at the bottom and away from the flue at the top, and make sure the air flow to the burner is not obstructed. The jacket will reduce heat loss through the walls of the tank by 25–45%, saving 4–9% of your water heating costs. Jackets cost \$10–20 and pay for themselves in lower bills in less than one year.

Insulate Hot Water Pipes

Insulate hot water pipes wherever they are accessible, especially within three feet of the water heater (insulate the cold water pipe for the first three feet, too.) On gas water heaters, keep insulation at least six inches from the flue. The split foam rubber type is effective and easy to use; be sure to choose the right size so it closes fully around the pipe, put it on crack downward and tape the seams with acrylic tape (duct tape won't last).

Insulating hot water pipes reduces losses at the tank and as hot water flows to the faucet. You also won't have to wait as long for the water to get hot when you turn on the faucet again.

Controls

You can save an additional 5% to 12% of water heating energy by turning water heaters off for certain periods, say, during the night, when no hot water is being used, or during a utility's peak demand times. You can control your own water heater with a timer that automatically turns the heater off for pre-set periods. The \$30–\$60 investment is paid back in lower bills in 6 to 14 months.

Some utilities use radio signals to cut electricity to the water heaters of participating customers during periods of high electric demand, rewarding those customers with lower rates or a set fee for their participation. The shut-off periods are brief enough that customers observe no reduction in service.

Bottom Boards

A simple board of rigid insulation under the tank of an electric water heater prevents heat from leaking into the floor, saving 4–9% of water heating energy. This is best done when installing a new water heater.

Anti-Convection Valves and Loops

A \$5 pair of these simple devices can save \$8–\$28 a year, or 2–7% of average electric water heating energy, by preventing convective heat losses through the inlet and outlet pipes of the water heater. Some new models have these built in or available as an option; existing heaters are easily retrofitted by your plumber or by you (if you can solder a joint).

The Whole Package

To make your hot water system truly energy efficient, do all the things described above. You'll save so much energy and money that the total amount spent on the retrofit will be paid for in saved energy costs in the first year, and you'll continue to collect dividends for many years to come.

CHOOSING A WATER HEATER

There's a good chance that you didn't choose your current water heater. Most water heaters are selected and paid for by building contractors, plumbers, or landlords, and since they won't be paying the water heating bills, they have no incentive to choose efficient models. Your chance to select a water heater will come when your existing one fails (they generally last ten to fifteen years). Unfortunately, when that hap-

pens, you'll want it replaced immediately with whatever is available. Take the time to do some research now so when the time comes you can choose a model that will save energy and money, and you'll know where to get it.

When choosing a new water heater, it may be tempting to select a model that is inexpensive to buy, ignoring how much it will add to your energy bill each month. Such a strategy will cost you dearly in long run. That "cheap" \$425 electric tank heater can cost you \$5,500 (13 times its purchase price) in energy costs over its typical 13-year life. The chart offers comparisons of lifecycle costs for several types of water heaters.

Passive Solar

"Passive" refers to the fact that no external energy is required for operation. The simplest passive solar systems are "batch heaters," consisting of hot water storage tanks in insulated boxes with glass lids and reflective liners. More intricate passive systems (such as thermo-siphoning units) tend perform better but are more expensive. In some climates, such systems can provide most or even all of your hot water needs. In less ideal climates, they can act as a preheater for conventional water heating methods, reducing energy consumption considerably.

Active Solar

Active systems differ from passive ones in that they use pumps, sensors, and heat exchangers to control and move the water/anti-freeze. This fluid is pumped through collectors that absorb the solar energy and then transfer it to household water. This usually means higher initial costs and more maintenance, but also maximum efficiency. For more information on both passive and active solar water heaters ask for pamphlets published by the Florida Solar Energy Center, 300 State Road 401, Cape Canaveral, FL 32920-4099. (407) 783-0300.

Storage Tank

Most conventional water heaters are of this type. You can greatly reduce water heating energy consumption by choosing one of the most efficient models on the market. Natural gas- and propane-fired units typically cost about 40% as much to run as electric units, so choose them whenever possible. For

WATER HEATERS: COUNTING THE COST

	Purchase price (\$)	Annual energy (\$)	Total cost over 13 years
High-efficiency gas	500	145	2,385
Demand gas (no tank)	650	160	2,503
Conventional gas	425	163	2,544
Electric heat pump	1,200	160	3,280
Solar w/electric back-up	3,000	140	3,770
High-efficiency electric	500	374	5,337
Conventional electric	425	390	5,495
Demand electric (2 units)	600	400	5,590

Adapted from Alex Wilson and John Morrill, Consumer Guide to Home Energy Savings. Total energy costs are not adjusted for changing energy prices or discounted for the time-value of money. Purchase price includes estimated installation cost.

a listing of the most efficient models currently available see Alex Wilson's and John Morrill's *Consumer Guide to Home Energy Savings*, American Council for an Energy-Efficient Economy; publications office: 2140 Shattuck Avenue, #202, Berkeley, California 94704; (510) 549-9914.

Electric Heat Pump

If you're stuck with using electricity for water heating, and you live in a hot or temperate climate, a heat pump water heater will generally be more cost-effective than a conventional tank heater because the electricity is used for moving heat from the outside air to the tank rather than for generating the heat directly. Heat pump water heaters use one-third to one-half the electricity of electric resistance tank units, and in warm climates they may do even better, even though they cost a lot more up front. If you're in a cool climate and have a fairly airtight house, an "exhaust-air heat pump" may be a good deal. In cold climates, ground-source heat pumps have proven effective, though these systems are more practical in new construction, since it requires extensive excavation in your yard.

Demand ("Tankless" or "Instantaneous") Heaters

For vacation homes or situations with small and easily coordinated hot water requirements, demand water heaters may be appropriate. Because they do

not use a storage tank, they avoid heat loss through tank walls and pipes, reducing energy use 15-20%. However, the flow rate from a single heater is limited to about 2 gpm for electric units and 3 gpm for gas units and therefore isn't adequate for several major hot water uses at the same time, unless they're very efficient. Combining a demand heater with a solar water heating system can be a very efficient way to go.

Integrated Water Heater/Home Heating System

If you're building a new house or upgrading your heating system at the same time as your water heater, a number of advanced, high-efficiency boilers with integral water heaters are now on the market. Heat-pump heating and cooling systems that have a water heating component are also available. Some units are plumbed for easy integration with solar systems.

SOURCES

Contact the following sources for efficient showerheads, aerators, and tank wrap if you cannot find these goods locally.

Energy Federation, Inc., 14 Tech Circle, Natick, MA 01760. (800/876-0660)

Real Goods Trading Corp., 966 Mazzoni Street, Ukiah, CA 95482-3471. (800/762-7325)

Check with your electric utility for rebates on efficient water heaters and solar water heating systems.

For more on window technologies, insulating solutions, and related home-energy measures, see Rocky Mountain Institute's forthcoming *Homemade Money: How to Save Energy and Dollars in Your Home*. Other titles in this series of Home Energy Briefs include *Lighting*; *Windows*; *Refrigerators and Freezers*; *Cooking Appliances and Dishwashers*; *Washers, Dryers, and Miscellaneous Appliances*; and *Computers and Peripherals*. Written by Sue Hassol. © Rocky Mountain Institute 1994.

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