

Buying a New Water Heater

Time to change your water heater? Has your old one finally worn out? A typical water heater lasts anywhere from 10 to 25 years, depending on the quality of the liner, maintenance, mineral content of the water and other factors. Everyone needs hot water. You can't go without replacing it. But you can make sure your new one is as efficient as possible.

Most manufacturers make standard models as well as improved and premium efficiency models. The improved efficiency models can typically reduce water heating bills about 10 percent. Energy cost savings pay for the added costs within a few years depending on your energy rates and how much hot water your family uses. A few premium efficiency systems can save 20 to 40 percent and qualify for an Oregon energy tax credit.

Energy Factor

When shopping for an energy-efficient water heater, your foremost indicator is the Energy Factor. Energy Factor is an annual measure of the useful energy coming out of your water heater, divided by the amount of energy going in to the water heater to heat the water. It is, therefore, the annual efficiency of the water heater. The greater the Energy Factor, the more efficient the water heater and the more energy and money it will save.

Conventional water heaters with a storage tank come in standard efficiency and improved efficiency models. A standard efficiency 50-gallon **electric water heater** has an Energy Factor of about .87 or .88. That means about 87 or 88 percent of the energy used to heat the water actually ends up being delivered to your tap as usable hot water. It also means 12 to 13 percent of the energy is lost to heat transfer through tank insulation or thermosiphoning into the water pipes at night or other periods when hot water is not being used.

If you're going to buy a electric water heater, we recommend you look for one with an Energy Factor equal to .93 or greater. This represents a 5 to 10 percent savings compared to a standard efficiency electric water heater. This higher efficiency is achieved by better tank insulation to reduce standby losses, and a device to block cooler water from adjacent water pipes from sinking into the tank where it needs to be reheated. The savings pay for the slightly higher costs of these heaters within a year or two.

A standard efficiency 40-gallon **gas water heater** typically has an Energy Factor of about .55, due to inefficiencies of combustion, a central flue carrying heat away with combustion exhaust, and a continuous gas pilot light, as well as standby losses through insulation and thermosiphoning. We recommend gas water heaters with an Energy Factor of .62 or greater. This represents a 10 percent savings compared to a standard efficiency gas water heater. In addition to reducing standby losses with added insulation and anti-thermosiphon device (heat traps), these improved efficiencies can be achieved for very little added cost by using electronic ignition instead of a pilot light, having automatic draft dampers, and reducing losses out the flue by recovering more of the heat first. In a submerged combustion or wet base gas water heater, the burner sits inside the combustion chamber completely surrounded by water instead of a central flue.

Energy Guide labels or salespeople may also talk about the **First-Hour Rating**. Don't be confused – the first-hour rating does not relate to the efficiency or energy savings potential of the water heater. You still want to use the Energy Factor to determine the efficiency of the unit. The first-hour rating is a measure of how much hot water the heater can deliver during a busy hour. It may help you decide which size water heater you should get.

Premium Efficiency Water Heaters That Qualify for Oregon Tax Credits

To encourage Oregonians to buy premium efficiency water heaters, the Oregon Department of Energy issues tax credits for qualifying models. Several kinds of premium efficiency water heating systems qualify for an Oregon tax credit. These include tankless (or on-demand) water heaters; combined ("combo") space and water heaters (tankless or on-demand water heater combined with a hydronic loop to provide space heating for your house as well); solar water heaters; and wastewater heat recovery units.

Tankless water heaters, also known as instantaneous, point-of-use, or on-demand water heaters, heat water as it is needed, or on demand. Water is not heated and stored in a storage tank like conventional water heaters. Some units are very efficient, with an Energy Factor of .70 to .80 or greater depending on whether it uses a pilot light or electronic ignition. That represents approximately 20 to 30 percent savings compared to a conventional gas water heater. Tankless water heaters are compact and some electric versions can be located under your kitchen or bathroom sinks. Tankless water heaters last longer and don't run out of hot water. However, because they can heat 2.5 to 6 gallons per minute, some may not be able to meet a heavy load such as a shower and clothes washer at the same time. While they are highly efficient, tankless water heaters are also considerably more expensive.

Tankless electric water heaters typically don't make sense for household use except in unusual, point-of-use applications. Providing adequate hot water on demand for the whole house might require as much as 28,000 watts of electricity, compared to 4,500 watts for standard or improved efficiency electric water heaters with storage. This would require two separate 80-amp circuit breakers, as well as larger gauge wire. Combined with utility rates that charge more to meet larger peak demands, tankless electric water heaters can be cost-prohibitive for most installations.

Combined ("combo") space and water systems double as the space heating and water heating system for your home. Because of the need to provide both domestic hot water and space heating, these water heaters have more heating capacity than conventional water heaters. In the case of natural gas units, they typically have input ratings of more than 100,000 Btu/hour, compared to about 40,000 Btu/hour for conventional water heaters. This exceeds the size of many gas furnaces. You can use a hot water loop to distribute heat to in-floor or baseboard radiators, or you can put a heating coil in an air handler for a ducted system. This can save you the cost of a separate gas furnace. They may make most sense in new construction, but can be retrofit into a home with forced air or hot water baseboard or floor heating. Such systems are very flexible in their application, allowing easy zoning (separate thermostats) of the home's heating and cooling system. They also can provide heating in parts of a home difficult to reach with ducting.

Heat pump water heaters use electricity to pump heat from the surrounding air into a water tank instead of generating heat directly. They can be purchased as integral units with built-in storage tanks or as add-ons that can be retrofitted to an existing hot water tank. Heat pump water heaters use about half as much electricity as electric water heaters, but are considerably more expensive. The operation of these water heaters extracts heat from the surrounding air. Heat pumps are less efficient in colder conditions when there is less "heat" in the air to be extracted. Thus, heat pump water heaters generally should be in semi-conditioned spaces such as a basement, garage, or utility room. You should also avoid enclosed spaces less than 1000 cubic feet. In the heat pump mode, the recovery rate is low (10 to 15 gallons per hour). But, all heat pump water heater models have a standard 4500-watt back-up heating element that boosts recovery rates when needed. For some models, the size of the water tank can be increased to compensate. Having a high efficiency clothes washer, dishwasher, and low-flow showerheads improves the overall efficiency of these systems.

Solar water heaters can reduce water heating bills by about 50 percent, mostly in the spring, summer, and fall. On sunny days your cold water is diverted to your rooftop solar collectors instead of to your gas or electric water heater to heat your water. You still need a gas or electric water heater for night-time and cloudy day use, especially in winter. Solar water heaters cost more, but are eligible for a larger tax credit. Costs after the tax credit should be in the range of \$1,500 to \$3,000. If you don't have unshaded south-facing roof area, solar water heating probably isn't appropriate for your site.

Wastewater Heat Recovery Units are also eligible for an Oregon tax credit. These units recover heat primarily from the water that goes down your shower drain. They can reduce water heating bills about 20 percent, and cost only a few hundred dollars. They are approximately five-foot lengths of pipe with a heat exchange coil wrapped around to transfer heat from your hot wastewater to cold incoming water. To work, you must have access to at least five foot of vertical drop in your drain pipe. That means you probably need to have access to drain pipes in a basement or tall crawl space with your showers above on the ground or second floor.

Should You Choose Gas or Electric?

Whether you should choose a new gas or electric water heater varies from person to person depending on circumstances. Natural gas is not available in many rural areas, communities, and neighborhoods. That makes a liquified petroleum gas (propane) water heater, oil-fired water heater or an electric water heater your only choices. Propane water heaters should be purchased similarly to natural gas water heaters, except you will need a propane storage tank.

If you are replacing a gas water heater (or if you have a gas furnace), you obviously have gas lines running to your house, so you probably want to stay with gas. If you don't have gas lines running to your home now but there are some close by, you will have to factor in the added cost of running a gas line to and into your house. If you want gas for other reasons like cooking, fireplace or space heating, you don't have to attribute all that added cost to the water heater. In any event, if you're considering a gas water heater, please read the safety considerations — natural gas is used in millions of homes with very few problems, but be sure you take the precautions necessary to ensure your safety.

In the past, it has been somewhat cheaper to heat with natural gas in most areas where it is available. This may or may not continue to be the case, especially if more gas fired power plants are built to produce electricity. You can compare the costs by multiplying your current electric rate (cents/kWh) times 3700 kWh, and multiplying your current rate for natural gas (cents/therm) times 215 therms, representing the average usage for a family of four.

The average life expectancy of standard storage water heaters is 10 to 13 years. You can extend their lifetimes by having low mineral content, neutral pH water and following proper maintenance.

Sizing Your Water Heater

In most cases, a 50-gallon electric water heater or a 40-gallon gas water heater is appropriate. (You can get by with a slightly smaller gas water heater because it heats water faster than an electric one.) If you have three or more bedrooms or bathrooms or five or more people in the family, you may want a 66-gallon electric or 50-gallon gas water heater instead. Conversely, if you have two or fewer bedrooms or bathrooms and two or fewer people, you may be able to get by with a 40-gallon electric or 30-gallon gas water heater.

You may want to look at the **first-hour rating** of the water heater as well. The first-hour rating is a measure of how much hot water the heater can deliver during a busy hour (gallons per hour). It is an indicator of how long you have to wait for hot water after you have used a whole tank. However, you don't necessarily need the one with the greatest first-hour rating. Most customers are satisfied with first-hour ratings for electric water heaters that are greater than the storage capacity of the tank, and with first-hour ratings for gas water heaters one-and-a-half times greater than the storage capacity of the tank. Anything greater than that may be overkill. You may want a tank with a higher first-hour rating if you often have several people shower simultaneously, followed immediately by more showers and a dishwasher or clothes washer. If you have a high efficiency clothes washer and dishwasher and/or low-flow showerheads, you may not need to worry about the first-hour rating since you'll be using less hot water.

Maintenance

The average lifespan of both gas and electric standard storage water heaters is about 10 to 13 years. You can extend their lifetimes with proper maintenance.

Perhaps the single most neglected component of your home's water heater is its sacrificial anode. The anode is a magnesium or aluminum rod inside your steel storage tank. Over time, an electrochemical reaction causes the anode rod to corrode. If the anode has corroded completely and there is no metal left, then the electrochemical process attacks the water heater tank itself and causes it to rust out. You should replace the anode every two to five years to prolong the life of your water heater.

There are a few other things you can do to prolong the life of your water heater, although they're probably not as critical as changing the anode. You should check and drain sediment from the tank once or twice a year. If it hasn't been done in a while, you may need to flush the tank. Turn off the water heater circuit breaker or gas valve, shut off incoming water, and drain water from the tank. Then allow a few gallons of cold water to refill the tank and

drain again, and repeat until the water is clean. You may also want to test and replace the bottom and top thermostats and, if electric, the heating elements. With gas water heaters, be sure the flame comes on when the hot water is being used, otherwise call for servicing.

For safety, annually check the operation of the temperature / pressure relief (“pop-off”) safety valve, which prevents buildup of dangerous pressures or very hot water in the tank. Place a pan under the water outlet and lift the lever to verify good flow. Be careful – the water is very hot. If water drips from the pipe after operating the valve, trip it several times to get a better seal. If it continues to drip, the valve may need to be replaced..

Safety Considerations

Gas appliances, including gas water heaters, produce mostly carbon dioxide and water when they are running. But they also produce byproducts of combustion like carbon monoxide and nitrous oxides. These gases are dangerous to human health and safety, and must not be allowed to accumulate in the living space. In a good installation, they are vented to the outside through an exhaust flue or chimney.

In the past, less efficient appliances heated more air to higher temperatures. The volume of hot exhaust air was sufficient to create a stack effect and get a good exhaust air flow rate out of the flue. However, today’s more efficient appliances use more of the heat produced by combustion, so waste gases may not be as hot. As a result there may be less stack effect to naturally exhaust the gases of combustion. In addition, there may be powerful exhaust fans in the kitchen, bathroom, or elsewhere in the house. Under certain conditions the pressure could cause the chimney or flue to backdraft, or reverse direction, and draw dangerous combustion gases into the living space. While this scenario is remote, the Consumer Product Safety Commission warns that carbon monoxide poisoning kills 200 people each year and causes another 10,000 to need hospital treatment. More typical symptoms of long-term, low-level exposure resemble flu or allergy symptoms.

At a minimum, you should make sure your flue is sized appropriately for the gas appliances you have. A surer solution is to insist on a **sealed combustion** gas water heater. This type of water heater brings air directly from outdoors into a combustion chamber without mixing with house air. The inlet and exhaust pipes are typically located on the same side of the house within three feet of each other, but always follow the manufacturer's recommendations. If you have any gas-fueled appliances (water heater, furnace, oven, clothes dryer, etc.) in your home, a carbon monoxide detector is highly recommended. And if you smell gas, leave the house immediately. Use a neighbor’s telephone to call the fire department and the gas company.

If the water heater is located in the garage and not a sealed combustion unit, code requires the unit to be installed 18 inches above the floor. This increased height will help prevent the ignition of any gasoline or other fumes that could accumulate near the floor.