

# HOME ENERGY GUIDE

## WATER HEATING

*Water heating is often the second largest energy expense in the Minnesota home and may account for up to 20% of annual household energy costs.*

### Water heater options

Water heaters heat water by using electricity or by burning a fuel (natural gas and propane are the most common). In most cases heated water is stored in a tank and is ready for use when needed. Some only heat water whenever it is called for by the user; these are known as on-demand or tankless water heaters.

### Gas-fired water heaters

Gas water heaters are the most common type in use in Minnesota. Typical gas models have a burner under the tank and an exhaust stack/heat exchanger that runs through the middle of the tank. The exhaust stack has two functions: it is a vent for the burner and it transfers heat to the water.

- Atmospherically vented water heaters use room air for combustion and direct the exhaust gasses through a double-wall (class B) chimney through the roof of the house. These units are commonly found in older homes and are the least efficient option. They also carry a risk of backdrafting in certain conditions.
- Power-vented water heaters are similar to atmospheric models in that they rely on room air for combustion, but they feature an exhaust system that is assisted by a fan. This reduces the risks of backdrafting. Because of their higher efficiency most models can be vented through a sidewall or vertical roof vent using PVC piping.
- Sealed combustion or condensing water heaters use only outside air for combustion. Again, because they are more efficient at extracting heat from the combustion process, most of these water heaters can be vented with PVC piping.

### Electric water heaters

Most electric models use resistance coils inside the tank. Electric water heaters typically have slower recovery rates than many gas models. They make up for that with larger tanks. Electric water heaters may be more expensive to operate than gas models (depending on rates), but they do have some advantages. Electric units have no chimney or flue pipe, so you can put one almost anywhere in your home—for instance, in a closet or under a sink. The entire tank is surrounded with insulation, so less heat is lost when compared to a standard gas model.

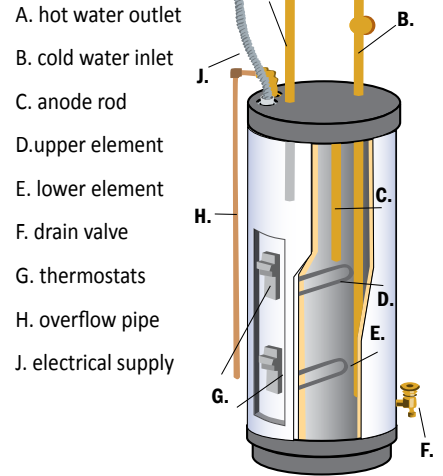
Some local electric utilities offer incentives for installing storage heaters for off-peak applications or control devices that shut off the water heaters for interruptible service:

- **Off-peak electric options.** Storage heating is an inexpensive and efficient method of electric water heating. Many utilities offer low-cost off-peak night electrical rates for water heating. Water is heated at night, storing all you need for daily use. Make sure you have adequate storage capacity and check with your utility company for details.
- **Interruptible electric** water heating allows the utility to temporarily interrupt electricity to the water heater during times of peak electrical usage, usually for a few hours only on the hottest or coldest days of the year.

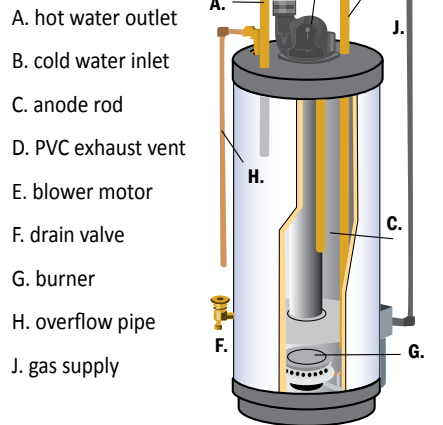
### Mobile home water heaters

It is very important to install the correct type of gas water heater in a mobile home (or manufactured housing). If your mobile home has an exterior access door, you may use a standard mobile home water heater with an open draft hood (atmospheric vent). If your water heater access door opens to the interior or your water

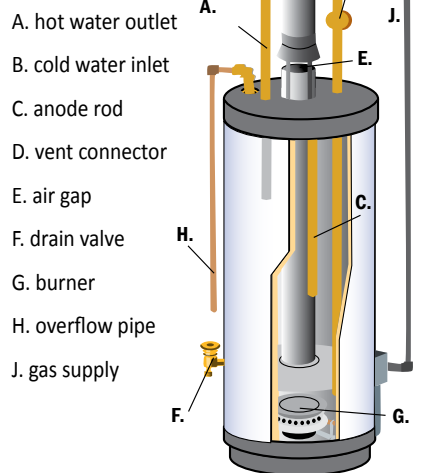
### Electric Water Heater



### Power-Vented Gas Water Heater



### Atmospherically Vented Gas Water Heater



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heater is located in a cabinet or closet, you must install a direct-vent mobile home water heater. A direct-vent water heater is designed to prevent the accidental spillage of flue gases into the home. The letters “DV” will appear in the model number.

### Space heat and water heater combination units

Almost all high efficiency boilers can be made to heat potable water. This may be done with an indirect fired water heater, also known as a sidearm water heater. This type of water heater provides a separate zone of heat flow from the boiler to an insulated tank. The hot water flows through a water-to-water heat exchanger which in turn heats the water in the tank. Some boilers may also have a coil inserted into the boiler itself, but this is not as good an idea, being less efficient than the sidearm. When considering such a unit, make sure that the boiler is not too large for your home heating needs and that the water heater is reasonably priced.

### Tankless or on-demand

Tankless or on-demand water heaters have no storage tank; they heat water only as it is needed. These units can be the whole house type (installed in a basement or mechanical room) or can be individual units located near demand points, such as under kitchen sinks. Fueled by either gas or electricity, on-demand water heaters require a large amount of energy over a very short period of time. Because of this, it is important to ensure that electric circuits or gas lines are sufficient to handle the increased demand.

### Heat pump water heaters

Heat pump water heaters (HPWH) take heat from the surrounding air inside the house, or air that is ducted to the unit, and transfer it to the water in the tank.

Benefits include dehumidification, a reduced cooling load in the summer, and significant energy savings (when compared with a standard electric resistance water heater). In fact, new

federal standards require new electric storage water heaters greater than 55 gal. to use heat pump technology.

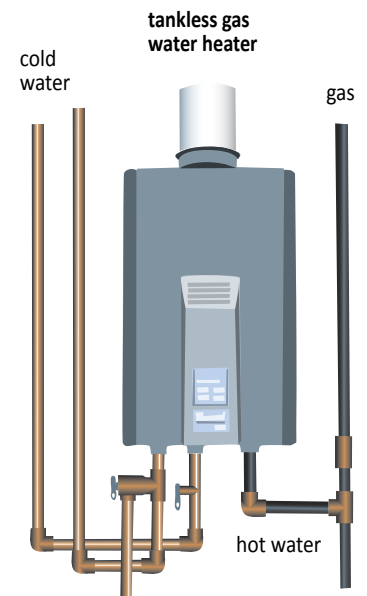
There are two types of HPWHs: integral and remote. The integral unit is a heat pump with its own water tank. The remote unit is a heat pump that can be connected to an existing electric resistance water heater tank. The remote unit is less expensive than an integral system. Both types have a resistance element as a backup, either built into the integral unit or left over in the old system to which the remote unit was added.

Ground source heat pumps (GSHP) can also provide water heating in homes with an adequately sized ground source heat pump heating system. There are two water heating options available, and both are generally installed to preheat water in an extra tempering tank.

- **Desuperheater water heaters** attach to the heat pump and make use of the compressor’s waste heat. A desuperheater water heater can satisfy 60% of domestic hot water requirements during the cooling season and 40% during the heating season. While it provides very economical heat during the air conditioning and heating seasons, it does not contribute to heating water during spring and fall periods when the compressor is not operating.
- **Water source HPWHs** are another way to take advantage of a GSHP heating system. A small water source heat pump is tied into the ground source loop to preheat water. The water will be preheated year-round, without the need for the space heating compressor to be operating. Note that with this system the ground loop will need to be sized larger to serve both the space heating and water heating needs.

### Solar water heating

Solar water heaters can reduce the annual fuel cost of supplying hot water to your home by more than half. Throughout the year, the solar



### Tank or tankless?

When replacing a water heater, many people have questions about the differences between tank and tankless systems. In terms of energy efficiency, there is no difference between units that have the same energy factor (EF): it takes the same amount of BTUs to heat water to a given temperature.

Where the real difference is lies in what is known as “stand-by” loss, or the amount of heat that escapes through the walls of a tank system when there is no demand for hot water. In an older or less insulated tank, this loss can be significant; newer high efficiency models are very well insulated, and standby losses are greatly reduced.

Another concern is estimated water usage for a household. Larger families with higher demand may find that some tankless units are unable to deliver sufficient hot water for simultaneous uses. Select models based on your hot water needs.

Finally, when comparing purchase and installation costs, consider upgrades to gas or electric service that may be needed for the high momentary demands of a tankless system.

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water heater system preheats the water before it reaches the conventional water heater. During the summer, the system may provide all of the required heat.

A solar water heater typically includes:

- collectors mounted on the roof or in a clear area of the yard
- a separate storage tank near the conventional heater in the home
- connecting piping
- a controller

There are many types of solar water heater systems, but only two are appropriate for the Minnesota climate—the closed-loop heat exchanger and drainback systems. Both of these types have protection against winter freezing.

### **Biofuels**

Wood and other wood products (chips, pellets, etc.) can be used to heat water. One approach is to use a tempering tank in the same room as the wood furnace or stove, which then preheats the water in the tank before entering a standard water heater. Another option is a wood-fueled boiler that can provide domestic hot water needs along with space heating.

### **Solar water heater**

- A. solar collector**
- B. controller**
- C. exchanger tank**
- D. pump**
- E. to taps**
- F. cold water supply**
- G. water heater / storage tank**

