Water Heater Efficiency

Efficiency of Fuel Types and Alternatives for Heating Water

Touchstone Energy® Cooperatives

Efficiency Ratings and Costs

Energy Factor (EF) rates the efficiency of a water heater. It considers the efficiency of heating water and the amount of heat lost from the tank, known as the standby loss. Comparing like fuel types is useful; for example, an electric tank with a 0.94 EF is more efficient and will cost less to operate than an electric tank with a 0.87 EF.

Energy cost can greatly affect operating costs. *Consult the chart below for examples of hot water bills for a family of 4-5 occupants.* Look for the ENERGY STAR™ label when replacing equipment.

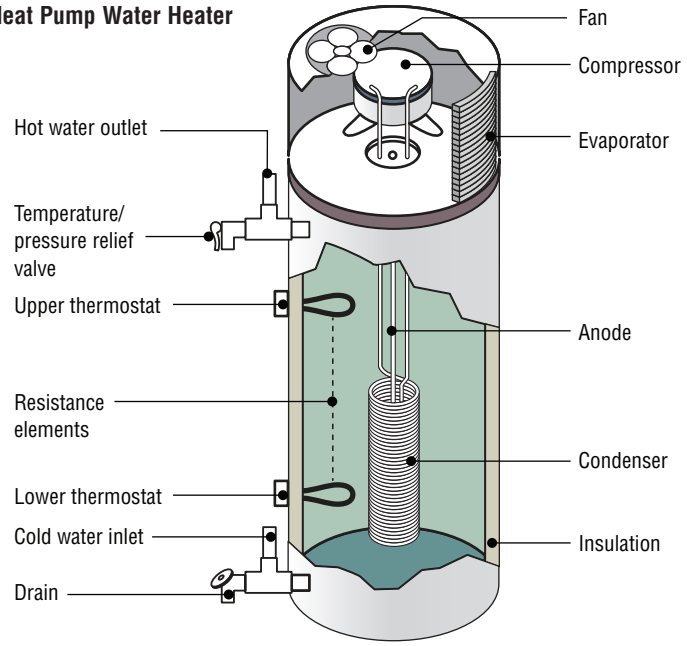
While the efficiency of the home's water heater is certainly important, there are a number of other variables (plumbing layout and distribution, pipe diameter, entering water temperature and usage patterns) that affect the cost to provide hot water.

Water Heating Fuel - Type	Tank Size (gal)	Water heater EF *(Annual cost for 4-5 occupants)*	Water heater EF *(Annual cost for 4-5 occupants)*
		Standard Efficiency	High Efficiency
Natural Gas - Tank	40	0.59 EF	0.67 EF
@ $0.60 / therm		($152)	($132)
@ $0.90 / therm		($228)	($198)
@ $1.20/ therm		($304)	($264)
Natural Gas - Tankless	n/a	0.82 EF	0.95 EF
@ $0.60 / therm		($108)	($95)
@ $0.90 / therm		($162)	($143)
@ $1.20/ therm		($216)	($190)
Propane-Tank	40	0.59 EF	0.67 EF
@ $2 / gal		($558)	($488)
@ $2.50 / gal		($698)	($610)
@ $3 / gal		($837)	($732)
Electric - Tank	50	0.87 EF	0.94 EF
@ $0.08 / kwh		($404)	($374)
@ $0.12 / kwh		($606)	($561)
@ $0.16 / kwh		($804)	($748)
Electric - Heat Pump	50	n/a	2.3 EF
@ $0.08 / kwh			($156)
@ $0.12 / kwh			($234)
@ $0.16 / kwh			($311)

Heat Pump Water Heater

Electric heat pump water heaters extract heat from the surrounding air to create hot water. Most heat pump water heaters are at least twice as efficient as standard electric tank water heaters and provide supplemental cooling and dehumidification as a byproduct of their operation – often a desirable benefit particularly in a basement location. However, the units require ample space and can be noisy so they may not be suitable for all applications. Their maintenance is unique in that the homeowner would likely need to call an HVAC company instead of a plumber.

Heat Pump Water Heater



A **desuperheater** is a small, integral heat exchanger for geothermal heat pumps that captures waste from a heat pump's compressor to heat water. This hot water then circulates through a pipe that feeds the home's main water heater tank. In addition to saving on water heating costs, a desuperheater can increase the cooling efficiency of a heat pump.

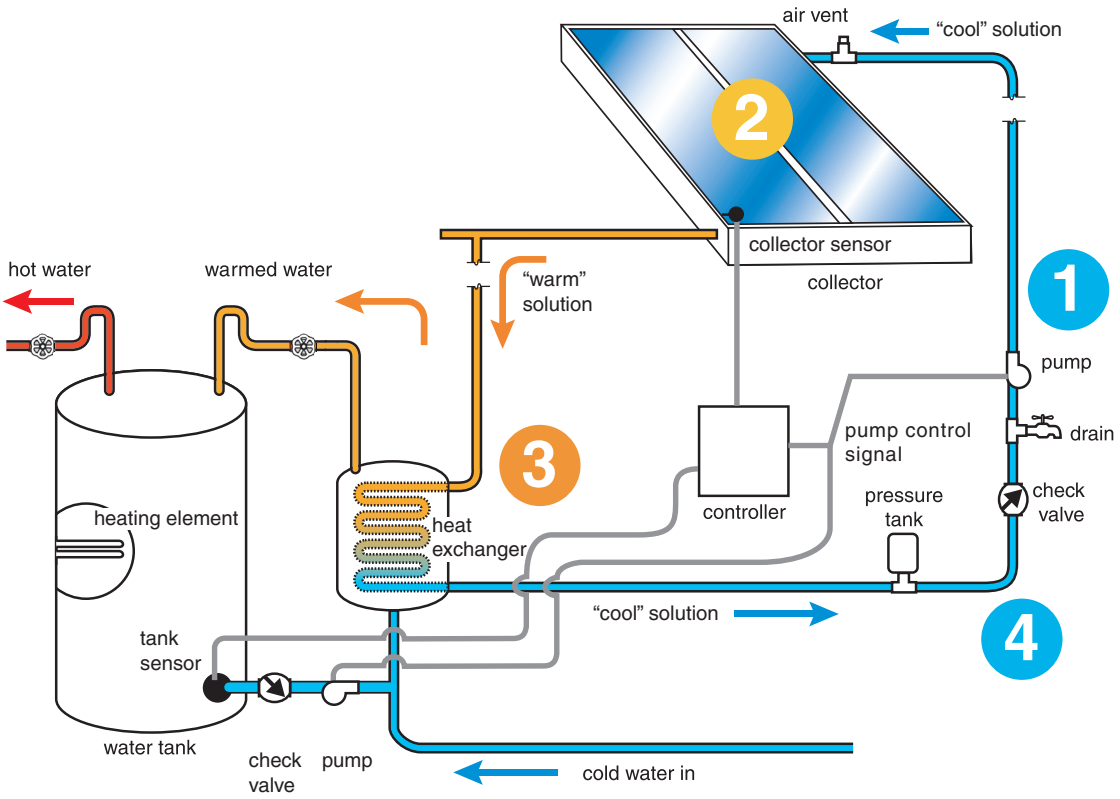
Timers can save electricity

Owners of tank type electric water heaters may benefit from the use of a timer that will shut off the electric heating element during longer periods of non-occupancy but will reactivate the element before usage is needed. This practice can reduce standby losses since the tank water temperature will be lower. Some electric co-ops offer incentives (such as lower rates, time of use rates and load control rates) to automatically allow water heating to be shut off for brief periods during times of peak demand (typically late afternoons on hot summer days).

Solar water heating has a higher installation cost but offers the benefits of nearly free operation for at least portions of the year. Solar collectors are typically designed as flat panels or evacuated tubes and rely on a non-toxic/antifreeze solution or a drain-back approach to prevent freezing during cold winter nights. During the day, solar heated water is usually stored in a tank that has back-up electric heating. On sunny days, all of the hot water needed may be supplied by the sun. If there is not enough solar heated water, the electric heater automatically boosts the water to the desired temperature.

How an active indirect system for solar thermal water heating works

1. A pump moves the water/ antifreeze solution to the solar collector
2. As the solution moves through the solar collector, it is heated by the sun.
3. The sun-warmed solution flows into a heat exchanger where it preheats the cool water from a conventional hot water tank.
4. The solution then returns to the pump to be recirculated without ever mixing with the home's water supply.



Solar Water Heating Costs

Rather than spreading energy payments over a long period of time, as with natural gas or electricity, a solar water heater places most of the costs up front. Afterwards, aside from periodic maintenance such as antifreeze changeout, the sun serves as a renewable fuel source that costs the homeowner virtually nothing to use.

Typical solar equipment costs can range from $3,000 to $10,000 for a standard home installation. Exact price quotes can only be obtained from the installer. A NABCEP certified installer using OG-300 certified equipment is recommended.

1. **Sizing the System**. An average family of four uses 80 gallons of hot water each day. Each gallon of water requires roughly one square foot of solar collector area for heating. Using this estimate, a family of four needs two 4' x 10' collector panels connected to a 40-80 gallon storage tank.
2. **Choosing the System**. Residents in mixed and cold climates need freeze protection. Both drain-back and non-toxic antifreeze systems offer freeze protection. Final system choice depends on the specific application and homeowner preference.
3. **Payback Period**. Payback period is a measure of how long it takes for the energy savings to repay the cost of the solar water heater. For example, a family of four spends $600 per year for hot water and installs a $4,000 solar water heating system that reduces their annual water heating bills by 67 percent. It will take 10 years for the system to pay for itself. However, there may be tax credits and other incentives to reduce the cost and payback.

   Average annual water heating cost = $600

   $600/yr x .67 solar savings = $400 savings/yr

   $4,000 initial cost ÷ $400 savings/yr = 10 year payback

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