



## FACT SHEET

### COMPONENTS: HOT WATER HEATER

#### Description

This section covers hot water heaters, also referred to as domestic hot water systems (DHW). According to the U.S. Department of Energy 14% of the total energy consumed by an average home is used by hot water heating. The primary issues with hot water heaters are durability and energy consumption. The following comparative analysis identifies the relative economic, energy, and environmental implications of three options: conventional water heater, on-demand tankless water heater, and solar water heating.

#### Recommendations

Tankless water heaters are recommended as a balance of affordability, durability, and energy consumption. The consideration of first as well as operational cost is critical. The system has the added benefit of being wall mounted and compact, and therefore takes up less space than a traditional tank unit in a smaller home.

Solar is an economically viable option if utility service is limited to electricity and an electric water heater is the only option. It is the clear environmental winner across all types.

Install the highest available efficiency of gas water heater if a conventional system is used. The premium cost of the unit will be recouped over the life of the unit.

## Hot Water Heater Alternatives

alternatives	cost	efficiency rating	IAQ	estimated annual energy use	estimated annual energy cost	expected product life (years)	practice
conventional 40 gal. natural gas tank	\$269	0.59	typical	138 therms	\$118	6 - 9	standard
	\$320	0.6		137 therms	\$117	9	
	\$349	0.62		132 therms	\$113	12	
	\$370	0.63		131 therms	\$111	12	
conventional 40 gal. electric tank	\$184	0.92	better	5347 kWh	\$390	6	standard
	\$244	0.93		5293 kWh	\$386	9	
	\$270	0.95		5107 kWh	\$373	12	
tankless natural gas	\$600 - \$650	0.82	typical	110 therms	\$94	20 - 30	training required
solar	\$2500 - \$4000	not applicable	best	40 therms (30% of conv.)	\$34	15-40	emerging technology

Cost estimates for tank systems are based on Kenmore Power Miser and GE Smart Water water heaters. Tankless systems are based on Bosch Aquastar line with flow rate of 3.0 gpm, energy estimates at 80% of standard. Energy rates are based on 2003 U.S.Department of Energy data, \$0.853/therm and \$0.073/kWh.

## Criteria Summaries

**Cost:** Conventional tank electric water heaters have the lowest first cost, but have a significantly higher operating cost. Conventional tank natural gas heaters are more expensive than electric tank models. Cost varies for all tank models with efficiency and durability, generally the more efficient the model the longer the warranty. Warranties are in 6, 9, and 12 year terms. Tankless systems are two to three times more expensive than storage tank models. Cost is associated with flow rate which is the number of gallons per minute (gpm) a unit can produce. A flow rate of 3 gpm has the rough service equivalent of a 40 gallon tank. Solar water heaters have the highest initial cost; in effect installing a solar system is paying for the hot water up front.

alternatives	cost	efficiency rating	estimated annual energy use	estimated annual energy cost	estimated 30 year energy cost
40 gal. natural gas tank	\$269	0.59	138 therms	\$118	\$3,534
	\$320	0.6	137 therms	\$117	\$3,503
	\$349	0.62	132 therms	\$113	\$3,387
	\$370	0.63	131 therms	\$111	\$3,341
40 gal. electric tank	\$184	0.92	5347 kWh	\$390	\$11,709
	\$244	0.93	5293 kWh	\$386	\$11,592
	\$270	0.95	5107 kWh	\$373	\$11,184
tankless natural gas	\$600 - \$650	0.82	110 therms	\$94	\$2,827
solar	\$2500 - \$4000	not applicable	40 therms (30% of conv.)	\$34	\$1,020

Cost estimates for tank systems are based on Kenmore Power Miser and GE Smart Water water heaters. Tankless systems are based on Bosch Aquastar line with flow rate of 3.0 gpm, energy estimates at 80% of standard. Energy rates are based on 2003 U.S.Department of Energy data, \$0.853/therm and \$0.073/kWh.

**Energy:** Solar water heaters are the best energy performers. Under ideal conditions they require little additional energy if properly installed and maintained. At a minimum they should produce 70% of hot water needs. Tankless water heaters, due to elimination of storage energy losses, use less energy than conventional storage tank water heaters. A gas tankless system will pay for itself in energy cost savings over a conventional gas unit. The premium cost of a high efficiency gas tank unit will be recouped over its lifetime as well. Electric water heaters are less efficient than gas water heaters if electricity generation and transmission losses are included. The annual cost of an electric hot water heater is triple that of natural gas tank systems. Energy Star does not currently rate water heaters.

**IAQ:** Natural gas combustion devices require proper venting to prevent potential backdrafting, which may cause carbon monoxide or carbon dioxide building up in the house. This problem is extended to solar systems if the back-up heating element is fueled by natural gas. Electric water heaters have no impact on indoor air quality, since they produce no emissions at the site of the water heater.

**Expected Product Life:** Tankless water heaters have the longest life expectancy of 20-30 years; that is twice the useful life compared to a tank water heaters. Tankless systems can be serviced and parts replaced helping to extend its useful term. Conventional tank water heaters have a life expectancy of approximately 10-15 years depending on quality. Failure of tank systems typically results from tank rust through, which cannot be repaired. The useful life of a solar water heating systems varies from 15-40 years. Like the tankless systems, components can be replaced or repaired with the exception of the storage tank which is subject to the risk of rust through.

**Practice:** Storage tank systems are standard practice. Tankless systems require some additional training. Solar water heating systems are still an emerging technology and a specialized professional installation is recommended.