

Solar Water Heating with Natural Gas Backup

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SOUTHWEST GAS CORPORATION



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Installing a solar water heater can be a great way to help your home (or business) “go green” by capturing and using the sun’s “free” energy (solar energy) to help produce hot water. However, for hot water to be available whenever you need it, be it for an early morning shower or evening bath, there are two very important items you will need:

1. Storage for hot water produced when solar energy is available
2. Back-up energy source to guarantee that hot water will be available when needed

Storage and the back-up energy source work together when there is insufficient solar energy to meet the hot water demand (such as in winter when solar energy availability is low and demand for hot water is greatest).

Remember, most solar hot water systems are designed to work in combination with another energy source.

How Solar Water Heaters Work

Solar water heaters use the sun to heat either water or a heat-transfer fluid such as a water-glycol antifreeze mixture in collectors generally mounted on a roof. Besides the collectors, solar water heating systems include storage tanks and, depending on the system, electric pumps and controls. There are two types of solar water heating systems: active, which has an electric pump to circulate the fluid through the collectors, and passive, which do not have pumps.

Solar water heaters require a well-insulated storage tank. Solar storage tanks have an additional outlet and inlet connected to and from the collectors. Otherwise, they are similar to a conventional gas or electric water heater tank.

Natural gas, the greener fuel, has been the natural choice for water heating for generations and it is now the natural choice as the backup energy source for a new generation of technologies such as the solar hot water system.

Solar water heaters can operate in any climate. Performance varies depending on how much solar energy is available at the site, and on how cold the water temperature is coming into the system. You’ll want to make sure your site has enough available sunshine to meet your needs efficiently and economically. Your local solar equipment dealer can perform a solar site analysis for you or show you how to do your own analysis. Tested solar

components and systems may have earned OG100 or OG300 certifications. These certifications are needed for compliance of systems for tax benefits.

A Comparison of Three Natural Gas Options for Back-up Systems

Solar hot water systems with natural gas are primarily configured in three ways:

1. Two-tank system solar water heater with one storage tank and a conventional gas water heater
2. One-tank and tankless system solar water heater with one storage tank and a gas tankless water heater
3. All-in-one-tank system solar water heater with natural gas backup all-in-one-tank

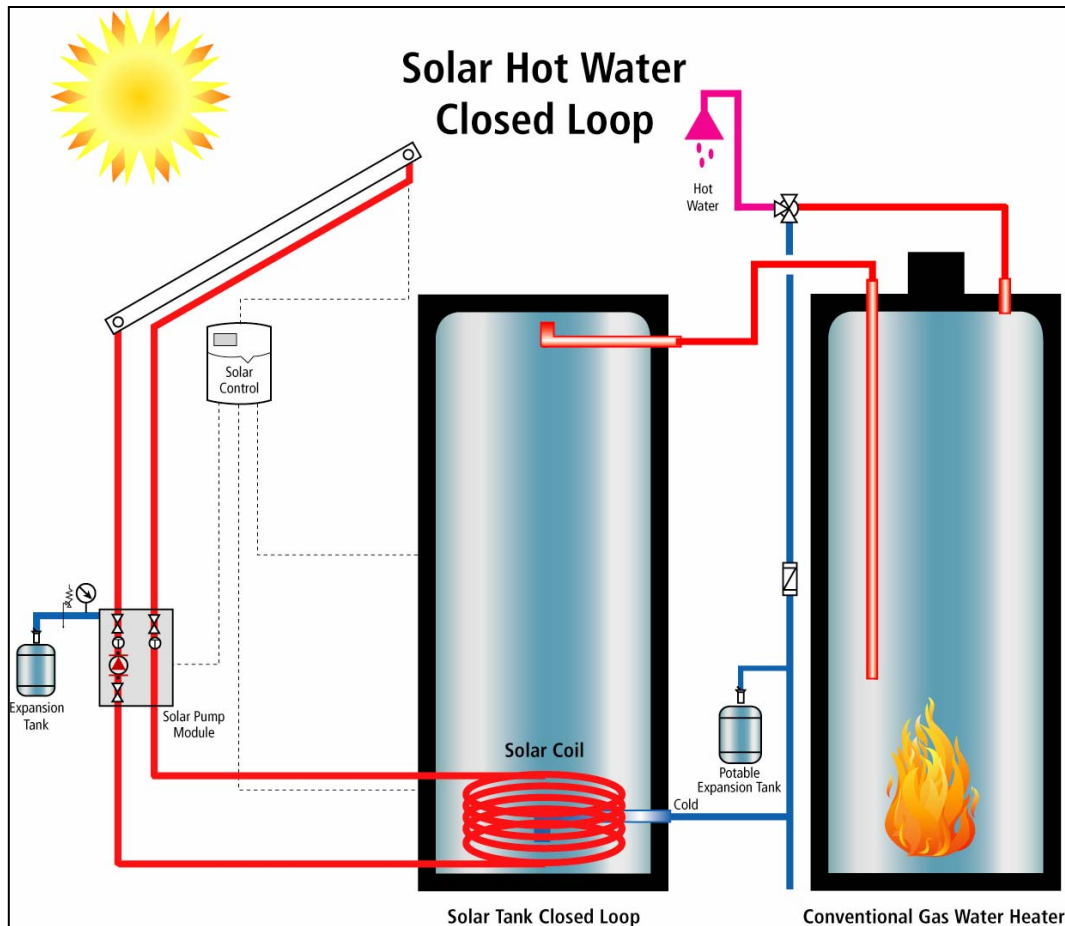
Two of these are very similar in that they start with a storage tank for hot water from the solar collectors. The stored hot water is fed to either a standard gas hot water tank (two-tank system – diagram 1) or it may be fed to a gas tankless water heater designed for solar temperatures (one-tank system + tankless system - diagram 2).

On most days, the stored solar water will be hot enough to pass through the backup water heater (of either type) without turning it on. If the water in the solar storage tank is not hot enough, then the backup unit will come on and heat it further.

Here are typical diagrams of the two-tank and one-tank + tankless systems. These may also be set up as open loop systems which heat the water directly.

Diagram 1 Two-tank system

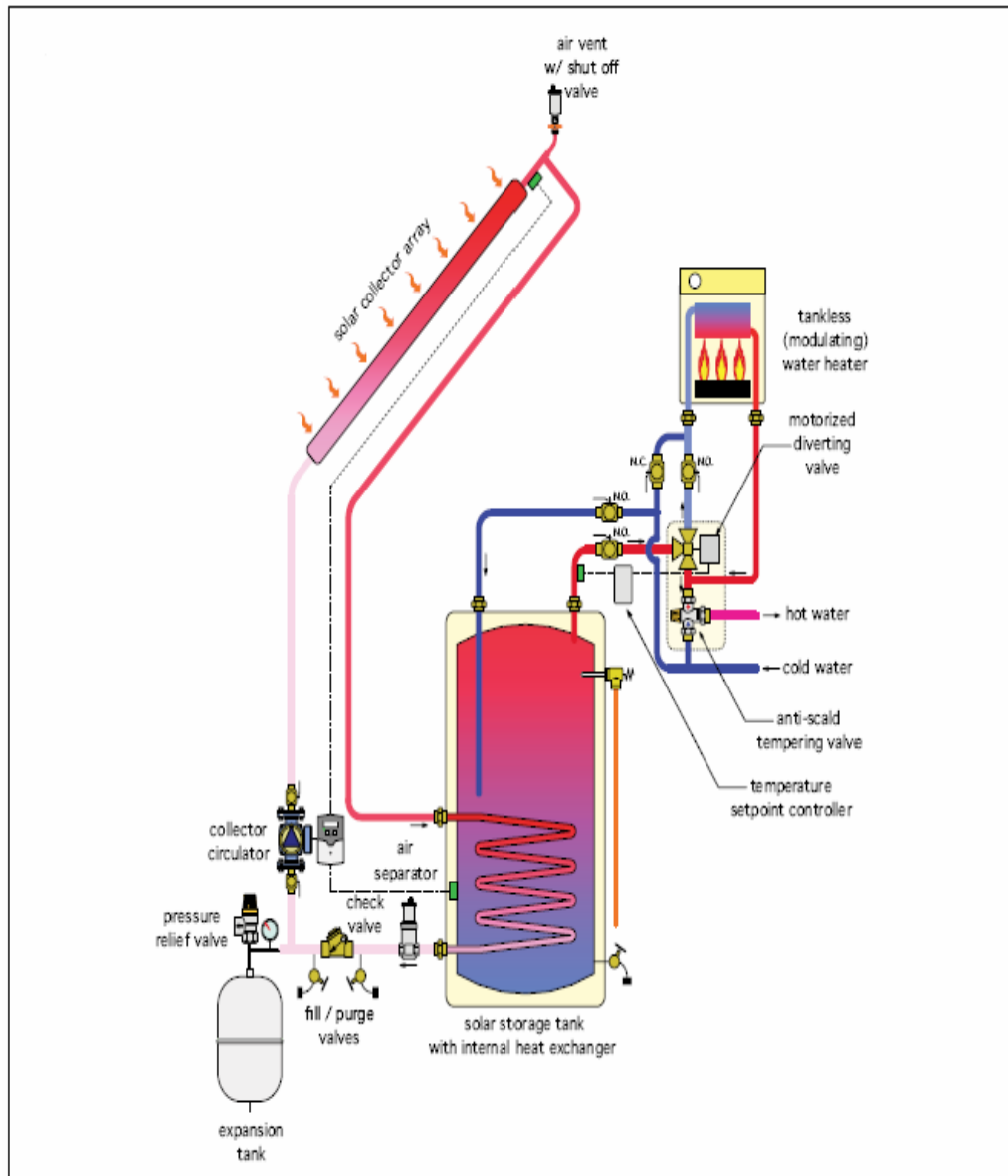
Solar water heater with one storage tank and a conventional gas water heater



Benefits of the two-tank system are simple design, large capacity, and relatively inexpensive components. However, additional space is needed for two tanks.

Diagram 2 One-tank and tankless

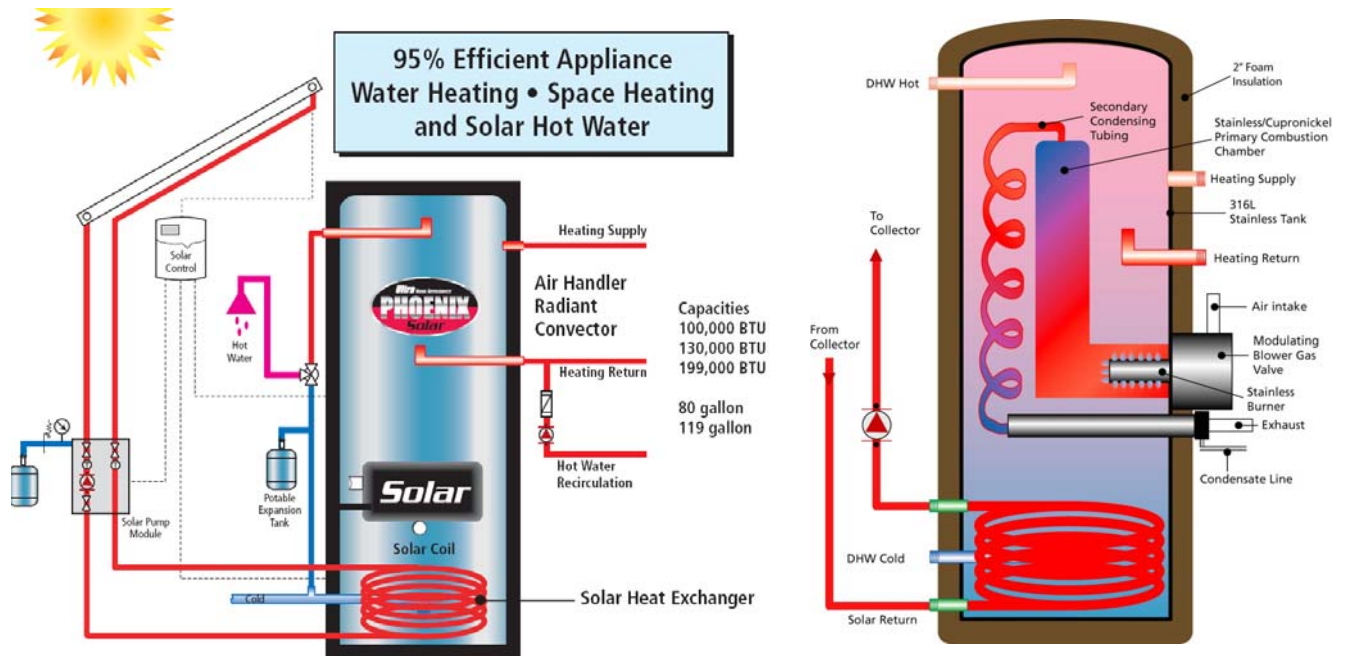
Solar water heater with one storage tank and a gas tankless water heater



Benefits of the one-tank system + tankless system are a smaller space requirement and higher efficiency compared to the two-tank system. However, higher costs are usually associated with these components and require regular maintenance to remove scale from the tankless water heater.

Diagram 3 All in one-tank

Solar water heater with natural gas backup all-in-one-tank



An example of an all-in-one-tank system is the Phoenix® water heater, which integrates solar storage and backup features into one unit. The all-in-one design of the Phoenix system includes special placement of a high-efficiency burner in the middle of the tank. The efficiency of this design and its large capacity make it possible to use one appliance for both hot water needs and space heating. Benefits with this system are its high efficiency and some of your space heating needs being provided by the sun, in addition to your hot water.

Depending on the temperature of the water delivered to your house (or business), it may take a lot of energy to bring your cold water up to normal domestic hot water temperatures (120-140 degrees). Solar heating of your water can still be an advantage even if there is not enough solar energy available to heat the water to its desired temperature. This is where natural gas efficiently and effectively finishes the job and gives you the hot water you need at the temperature you require anytime of the day (sunny or cloudy) or night, year 'round.

Selecting a Solar Water Heater

Before you purchase and install a solar water heating system there are many things to consider. You will want to know more about start-up cost, payback period, possible tax incentives, installation, energy efficiency, and your solar site analysis.

Remember: Local zoning laws or covenants may restrict where you can place your solar collectors. Check with your city, county, and homeowners association to find out about any restrictions.

With the use of low flow shower heads, and water and energy efficient clothes washers and dishwashers becoming more prevalent, energy consumption for water heating per home has been shrinking. The following chart is based on Southwest Gas rates current as of August 2008, and on usage estimates from Architectural Energy Corporation's Energy Star® compliant modeling software. It is provided to help you gauge the value of a potential investment in solar water heating. Your usage may differ based on occupancy and lifestyle.

4 Bedroom Home, Family of Five	Estimated annual water heating cost by area (natural gas)	Annual estimated savings from solar based on solar effectiveness*		
		85%	75%	65%
Solar Effectiveness (%)				
Arizona Desert	\$225.00	\$191.25	\$168.75	\$146.25
Arizona Mountain California (Victorville)	\$256.00	\$217.60	\$192.00	\$166.40
Southern Nevada	\$187.00	\$158.95	\$140.25	\$121.55
Northern Nevada	\$310.00	\$263.50	\$232.50	\$201.50

*The savings shown in this chart are for domestic hot water only and do not include space heating. If you are considering using a solar system with gas backup for a portion of your space heating, the extra potential cost-savings would need to be added to the above chart.

Once you have estimated your potential savings, ask yourself "How much am I willing to spend now to save \$16 (as an example) per month? To determine a simple payback, add the cost of your equipment and installation and divide by the savings. Ask your solar distributor to estimate your costs after tax and other rebates are applied.

Here is a website that will help you determine if solar water heating is right for you:

http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=12850