EnergyWise Queensland

Solar hot water

Powered by the sun's natural energy

Fact sheet
Solar hot water

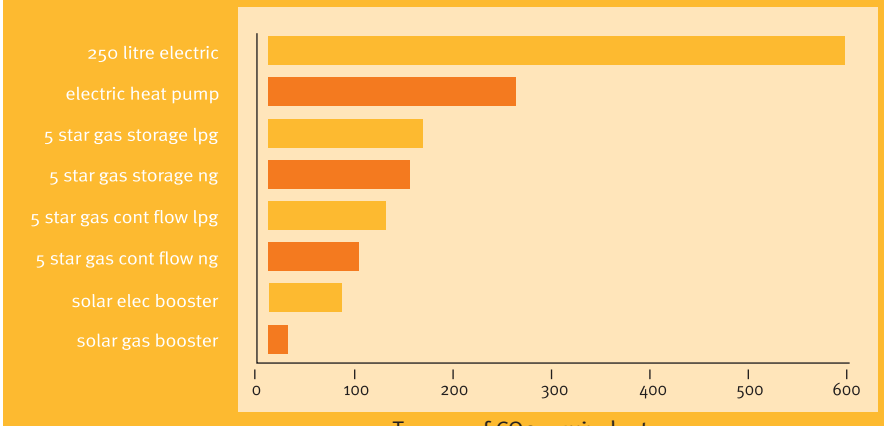
The benefits of solar hot water

For most Queensland households, around 35 percent of annual energy use is for hot water. However, by using the sun's energy to heat water, the average household can reduce its annual hot water costs by around 85 percent when compared to conventional electric systems. As well as costing less to run, solar hot water systems have a significant environmental benefit as their reduced energy use means less greenhouse gases produced.

Despite Queensland's year-round abundance of solar energy, most Queensland households (around 80 percent) use electric hot water systems, which are the single largest electricity-consuming item in most homes. As solar hot water systems provide the greatest potential for savings on energy costs and greenhouse emissions, they make smart sense for homeowners and the environment.

Greenhouse Gas Emissions

A comparison of hot water systems and their greenhouse emissions over 15 years is shown below.



Source: ENERGEX Institute

Queensland Government
Environmental Protection Agency

Hot water system options for new housing

Queensland's Sustainable Housing Regulations that came into effect on 1 March 2006 require new houses to be more sustainable. The changes require greenhouse-efficient hot water systems to be installed in all new Class 1 buildings (houses).

This can be achieved by installing:

1. a solar hot water system or heat pump that is eligible to receive:
   (i) at least 22 Renewable Energy Certificates* in a building with 3 or more bedrooms; or
   (ii) at least 14 Renewable Energy Certificates* in a building with 1 or 2 bedrooms; or
2. a gas hot water system with a 5-star energy rating.

** Renewable Energy Certificates ('RECs') may be issued at point of sale or applied for separately by the purchaser as a 'cash back' rebate under the Commonwealth Government's Mandatory Renewable Energy Target (MRET).*

Types of greenhouse-efficient hot water systems apart from solar are:

- instantaneous gas (in reticulated areas e.g. urban)
- gas storage (stand alone tanks used in non-reticulated areas e.g. rural)
- heat pumps.

Types of solar hot water systems

A solar hot water system does not make electricity, but takes energy from the sun in a similar way that a hose does when it is left lying in the sun – but the pipes in a solar hot water system have been designed to work much more efficiently than a garden hose!

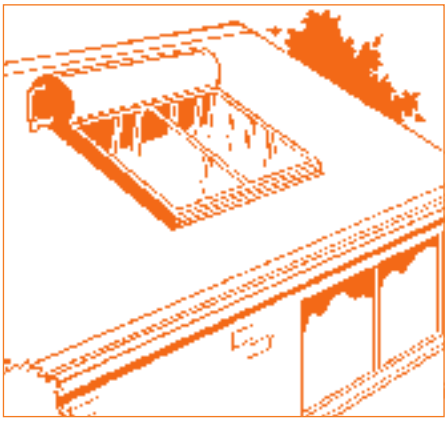
In solar hot water systems, heat from the sun is absorbed through solar collectors. This solar energy heats water, which circulates through the collectors and into a storage tank, ready for use. The storage tank is usually fitted with a 'booster' to maintain water temperature during long periods of cloudy or wet weather.

There are two types of solar hot water systems:

- Thermosyphon
- Split system (or 'forced circulation').

Thermosyphon system

This is the most common system available. It consists of roof-mounted solar collectors with a storage tank positioned immediately above the collectors. As the heat from the sun is absorbed through the collectors, the water inside becomes hotter and lighter, expanding and rising upwards into the tank. The colder, heavier water is drawn down into the bottom of the collector where it is heated, causing it to move upwards.



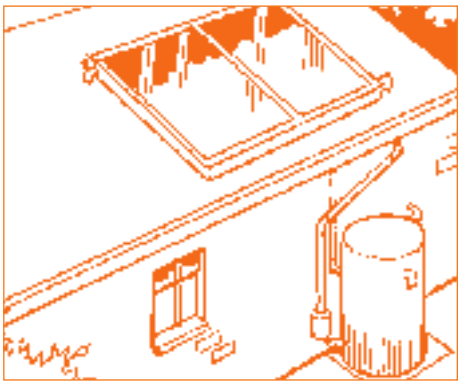
This circular heating motion is called the 'thermosyphon effect'. The greater the difference in temperature between the water in the collectors and the water in the storage tank, the faster the flow between them. A closed circuit system separating the collector circuit from the tank is available for areas prone to frost or hard water (e.g. water from groundwater bores).

Split system (or 'forced circulation')

For householders who prefer their tank at ground level, this system has the solar collectors on the roof and the storage tank on the ground.

These systems require a small electric pump to circulate water through the collectors into the storage tank. As a result, this system is generally more expensive to buy and operate than a thermosyphon system.

Furthermore, the moving parts in the pump can wear out over time meaning these systems require more maintenance than a thermosyphon system.



The pump is regulated by a controller, which reacts according to the difference in water temperature between the collectors and the tank.
The controller unit also acts as a frost protector by sending warm water from the tank into the collectors when it senses that the water is reaching freezing temperatures.

Key components of a solar hot water system

Solar collectors

Solar collectors can be either, flat-plate panels or evacuated tubes that are roof mounted to absorb heat from the sun. For maximum efficiency, collectors should be placed in direct sunlight for all seasons (to account for winter and summer sun direction). In areas south of Rockhampton, solar collectors should ideally face between north-east and north-west to best account for direct sunlight. For systems in southern Queensland where there is insufficient roof space between north-east and north-west, they can still provide acceptable performance, however their performance diminishes as the angle of the panels face further south.

Storage tanks

Vitreous enamel tanks are fitted with a "sacrificial anode" to reduce tank corrosion. The anode should be replaced every five to seven years depending on the water quality. Stainless steel and copper cylinders do not need anode protection.

The number of people in your household should determine the size of the storage tank. The following table can be used as a guide, however talk to suppliers about what size is suitable for your needs.

No. of people to serve	Capacity (litres)	Number of panels
1-2	160-200	1
3-5	300-370	2-3
6-8	440	3-4

Booster systems

All solar hot water systems have an automatic electric or gas booster system controlled by a thermostat. This ensures a constant supply of hot water in periods of little or no sunshine.

Most systems are also fitted with a manual override switch to override the thermostat and allow the booster to be turned off when not needed. When the booster is switched back on, the system reverts to automatic boosting, controlled by the thermostat. Manually overriding the booster can improve performance and reduce energy bills. Alternatively, an electric timer can also be used to reduce energy bills.

In manual mode, boosting is usually only needed for a few days a year (when solar energy is inadequate), resulting in very little energy use and greenhouse gas emissions.

Pipe insulation

Insulate the outlet pipes, where possible, to a minimum of two metres from the system. This will reduce heat loss and improve efficiency of hot water to taps.

Installation

Solar hot water systems are required to be securely installed to withstand extreme winds. In designated cyclone areas, a 'cyclone frame' is also required to improve security.

Savings and Costs

Solar hot water systems reduce annual household hot water costs by an average of 85 percent, with total household greenhouse gas emissions reduced by 30 percent. They can provide an average saving on household electricity bills of around $200 a year on automatic boosting or around $240 a year on manual boosting. As householders' energy costs can be reduced with savings made with a solar hot water system, these savings can be re-directed into a home mortgage to help pay the mortgage sooner.

Some financial institutions also offer a reduced interest rate for houses that include a solar hot water system under a 'green home loan' arrangement, either for new homes or retrofits/renovations. The payback period for a solar hot water system, over and above a conventional electric system, is typically less than 10 years. This means that average costs over the lifetime of a solar hot water system are typically less than two-thirds the costs of electric hot water systems.

Rebates

Most solar hot water system installations are eligible for Australian Government Renewable Energy Certificates (RECs) of between $500 and $1000 for the average system. This incentive significantly reduces the cost of buying a solar hot water system either at the point of sale or through a cash-back arrangement. It should be noted that the amount of the rebate is dependent upon the RECs market and is subject to variation. To be eligible for RECs, the solar hot water system must conform to relevant Australian Standards. More information is available from the Office of the Renewable Energy Regulator at: www.orer.gov.au

Electricity Tariffs

A solar hot water system with an electric booster can be operated on either the normal domestic electricity tariff (T11) or an off-peak tariff (T31 or T33). Where manual boosting is used, the system should be connected to T11.

If your system is connected to an off-peak tariff (T31 or T33), you should be aware that minimum quarterly charges apply so they are only cost effective if you are using electric boosting enough to exceed the quarterly charges.

Durability and warranties

A solar hot water system normally lasts 15 to 20 years, which is up to double the life of an electric system. They are a well-proven product and have experienced substantial development over the past decade, with newer models expected to last even longer.

Solar hot water systems typically have a product warranty from five to 12 years.

Common Misconceptions on Solar Hot Water Systems

Solar hot water systems need to face north to work properly

The average greenhouse and energy savings solar hot water systems deliver are based on systems that face between north-east and north-west (i.e. 45 deg. either side of north). Even if a solar system was installed on the wrong side of the house in southern Queensland – facing south-east to south-west – it would still operate satisfactorily, achieving around 70 percent cost savings and providing greenhouse gas reductions equivalent to a gas hot water system.

Solar hot water systems do not operate in shaded areas

While shading from nearby trees or buildings can affect a solar hot water system's optimum performance, they can still operate adequately as they do not require direct sunlight all day. However, in extensively shaded areas it may be more effective to install a heat pump or gas hot water system.

Solar hot water systems frequently leak

While not common, over-temperature discharge (or overflow) can occasionally occur. This overflow is typically associated with older systems, particularly those that were too large for the household's hot water requirements. A new Australian Standard (AS/NZS 2712:2002/AMDT 1:2005) has been designed to address this problem for new systems.

Roofs need to be reinforced to take the weight of a solar hot water system

Roof reinforcing may only be needed for older buildings, and is not usually an issue in new housing. Split systems do not require roof reinforcing.

Installation costs can be expensive if a crane is needed to lift the system onto the roof

The cranes used by solar hot water suppliers are small units that travel on the back of a utility vehicle. It is normal practice for installations of thermosyphon systems (which have both collectors and storage tank mounted on the roof) to use a crane and suppliers normally include crane costs in quotes on installation prices.

Solar hot water systems run out of hot water

As for any hot water storage system, with normal use, if your household has a suitably sized storage tank, you will have a continuous supply of hot water.

Optimising your solar hot water system

- Have the system installed by a licensed operator who has experience with installing solar hot water systems.
- As for all types of hot water systems, set the temperature of the booster thermostat to around 60 deg. However, do not set the temperature below 55 deg. due to the minor possibility of pathogens forming, such as Legionella. By law, all new systems are required to have a tempering valve as a safety feature to prevent hot water scalding users.
- Use manual override to maximize heating efficiency and save on energy bills.
- Conserve water by installing a water-efficient showerhead and tap ware (i.e. at least the new 3-star rated or old AAA-rated).
- Keep the solar collectors clean by removing dust and sludge.

Checklist of things to consider before you buy

- ☐ Consider where you intend to locate the system. Remember that collectors should be placed in direct sunlight and positioned correctly to optimise performance.
- ☐ If you live in an estate, check if there are any covenanting issues that may need to be considered, such as visual amenity of the system located towards street frontages.
- ☐ Talk to a licensed plumber and electrician about carrying out installation work.
- ☐ If choosing a roof-mounted system on an older house, confirm the strength of your roof with your builder or installer before having it fitted.
- ☐ Check with your supplier if you live in an area with hard water or a frost-prone area to determine any special needs for your solar hot water system.
- ☐ Talk to suppliers to determine the right size system for your household and remember to consider your future needs.
- ☐ Ensure the installation cost is included in the price.
- ☐ Shop around and compare models, prices, features and warranty details.
- ☐ Find out from your supplier whether you are eligible for RECs and, if so, ensure they are factored into the total cost.

For further information, contact the Queensland Government's Energy Advisory Service on **1300 369 388.**

For more information

- visit www.epa.qld.gov.au/sustainable_industries
- email sustainable.industries@epa.qld.gov.au
- call 1300 369 388

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