GENERAL

Who is Equinox Solar?

Equinox Solar is a brand of Rinnai Australia. All solar water heaters are designed in Australia. Equinox solar collectors and stainless steel storage tanks are manufactured in Australia. Gas boosters are manufactured in Japan.

What constitutes a Solar Hot Water System?

Solar hot water systems are a complete package made up of solar collectors, storage tank, a gas or electric booster and a solar controller and pump for split systems.

Why use a Solar (Thermal) Hot Water System?

Replacing an electric storage tank with an Equinox solar hot water system can reduce electricity consumption, running costs and environmental impact by 2/3rds.

40% of a typical household electricity use is for water heating. Therefore a solar water heater can reduce the overall electricity use by 25%.

Australian electricity is predominantly generated using non renewable and dirty coal fired power stations. As well as electricity they produce carbon dioxide emissions, ash, particles and waste heat, while consuming vast quantities of water and non renewable coal.

Equinox solar hot water systems reduce the need for electricity and are part of many major energy reduction programs. Solar hot water systems also offset electricity just when it is needed most: Summer - as that is when air conditioners are running, loading up the electricity network.

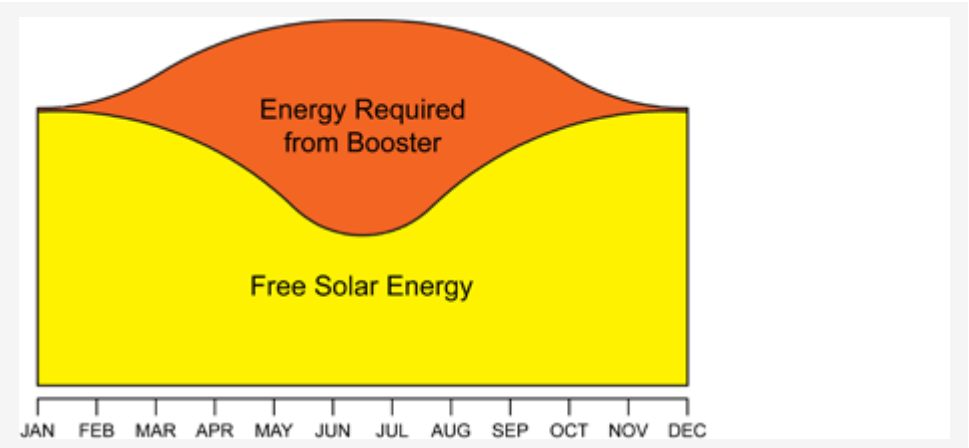
With rising electricity costs, future electricity bills will only increase. One method to reduce electricity bills is to use less electricity with a solar water heater.

Will I get solar gain in winter?

Solar gain is available during the day throughout the year. Even cloudy days can deliver some solar gain. A clear Winter day may sometimes deliver more solar energy than a cloudy Summer day.

- Clear and sunny — high solar contribution
- Clear and cold — reasonable solar contribution
- Overcast and warm — reasonable solar contribution
- Overcast and cold — low solar contribution

Approximate solar gain throughout the year is shown in the graph below:



What types of systems are available and what are the differences?

There are two types of systems available

1. Close Coupled systems
2. Split systems

Close Coupled systems have the storage cylinder above the solar collectors all located together on the roof. Close Coupled systems rely on thermosyphon to operate: cold water from the bottom of the tank falls to the inlet at the bottom of the solar collectors. The water is heated by the sun, rising up through the solar collector and back into the middle and top of the tank.

Split systems have the storage cylinder located on the ground and the solar collectors located on the roof. Split systems use a solar controller and pump to transfer cold water from the tank to the solar collectors to be heated and returned to the middle or top of the tank. The solar controller compares the temperature of the water in the solar collector to that in the tank. When the collector is hotter than the tank the pump is switched on, transferring the solar heated water to the tank.

Should I use a close coupled or split system?

Equinox solar hot water systems are available as split or close coupled. The choice of system is dependent on a number of things such as available roof space, structural capacity of roof to support a close coupled storage tank and aesthetics.

Where should I place my hot water heater?

As for all water heaters, the location should result in short runs of pipework between the tank and the most frequently used hot water outlet(s), therefore minimising hot water waiting time and wasted water.

How do I size a system?

The storage tank should hold a one day supply of hot water and have enough capacity to store the amount of solar energy collected by the solar collectors. Once the tank size is chosen to match household hot water use, the number of solar collectors is matched to the tank. Higher users of hot water or where solar access is limited can add more solar collectors.

Undersized electric boosted tanks will run out of hot water. Undersized in-line gas boosted tanks will not run out but will heavily rely on gas as the energy source rather than solar.

Please refer to individual Equinox product flyers to make selections. Each selection is based on average hot water consumption matched to sufficient booster and storage tank capacity to deliver hot water in all weather. Spa baths, high flow shower heads and long showers may require a larger electric boost storage tank capacity or higher flow rate in-line gas booster.

What are the environmental benefits?

If electricity use is reduced by 2/3rds, then environmental impact is also reduced by 2/3rds. Typical electric hot water annual emissions of 4.5 tonnes of CO2 are reduced to 1.5 tonnes per year with an electric boosted solar water heater. They are further reduced from 4.5 tonnes to 0.5 tonnes of CO2 with the use of gas boosted solar water heating (based on heating 200 litres of hot water per day and figures from the Department of Climate Change and Energy Efficiency)

How does coal fired electricity create CO2?

Coal is consumed to heat water into steam. Steam pressure is used to rotate the electricity generator. Coal is predominantly carbon. When burnt it combines with oxygen from the atmosphere to produce heat energy and carbon dioxide

COLLECTORS

What is a Solar Collector?

Solar water heaters use a thermal solar collector. It is a combination of:-

- A glass surface (flat on a flat plate collector or round for evacuated tube collectors)
- Tubes containing a fluid that is to be heated by solar energy
- Heat absorbing surface / fins attached to the tubes
- A treated surface on the absorber to capture and retain solar radiation
- A casing / vacuum to retain heat
- Pipework to enable the transfer of solar energy to the storage tank

Where are the Solar Collectors located?

The solar collectors are roof mounted and, ideally facing within 45 deg of North (NE - N - NW) when installed in Australia. Facing East or preferably West is OK, but a reduced amount of solar energy will be collected. More collectors can be added in this situation.

Avoid having the collectors shaded by adjacent buildings, structures and trees.

The collector is ideally pitched towards the sun at latitude (Eg Sydney is 34 deg from horizontal). However, angles +/- 10-15 deg from this have minimal detriment.

An extra solar collector can be added when solar gain is restricted.

Close coupled systems must have sufficient pitch of at least 10 deg from horizontal for the hot fluid to rise from the collector to the tank above the collector. Split, pumped systems can have the collectors installed at flatter angles as the pump moves the fluid through the collector. Take into account reduced solar gain at flatter angles.

What Type of Thermal Solar Collectors are available?

There are three types of Thermal Solar Collectors:

1. Flat plate
2. Evacuated Tube
3. Hybrid of Flat plate and Evacuated tube

Flat Plate collectors are made up of an insulated tray style case with a sheet of low iron solar glass on the top surface. Beneath the glass is a solar collector surface, either one piece or multiple fins. This has multiple water / fluid channels attached to it.

Almost the whole space occupied by the collectors on the roof is available for the collection of solar energy. As most solar energy is available when the sun is overhead, this design collects the most solar energy.

Evacuated tubes comprise sets of borosilicate glass “test” tubes with an inner glass tube providing a vacuum for heat retention.

This collector can offer slightly higher efficiency than flat plate in some conditions. This is more than offset by the reduction in solar collection surface due to gaps between the

tubes and subsequent solar collector surface, noting that most solar contribution is when the sun is overhead, resulting in less energy collected, as evidenced by STCs available.

Hybrid collectors, such as Equinox's E-Frost are a combination of the best features of flat plate and evacuated tubes.

The key flat plate features retained are large solar collection surface and solar glass. The key evacuated tube features retained are heat pipes and heavily insulated header.

The large surface collects more solar energy. The heat pipes will not freeze. Therefore this collector is suitable for frost areas where highest levels of solar energy are required, such as for heating domestic hot water.

What is Selective Surface on a Solar Collector?

A selective surface is specifically designed to collect and retain usable solar energy. Surfaces, such as black paint, are not selective and do not retain as much of the suns energy.

All Equinox solar collectors feature a selective surface.

What Combination of Solar Collector and Tank should I use for Frost Protection?

The following table is applicable to Equinox solar hot water systems to provide frost protection:

Tank	No Frost	Mild Frost (-6°)	Severe Frost (-12°)
Close Coupled	Enduro or Excelsior	Enduro FTC or Excelsior FTC	N/A
Split	Enduro or Excelsior	Enduro FTC or Excelsior FTC	E Frost

NSW and Victoria have had frost zones defined by postcode. Refer to the warranty conditions document when selecting the required solar collector.

What is the difference between Solar Thermal Collectors and PV Panels?

They are totally separate solar energy collection technologies.

- Solar (thermal) hot water systems convert radiant energy into hot water.
- Photovoltaic (PV) solar converts radiant energy into electricity.

The argument, when choosing between the two technologies, is whether to generate electricity to heat water (PV) or to reduce the amount of electricity required to heat water (thermal).

First consider fitting a solar water heater to reduce electricity consumption. As less electricity is now required your energy requirements are reduced. Fit PV after the solar water heater is fitted to help offset your remaining electricity requirements.

Of course, gas boosted solar hot water uses very little electricity and the addition of PV to a household with gas boosted solar saves a large amount of electricity as the PV will act mainly to offset remaining electricity requirements.

What are Small Scale Technology Certificates (STC's)

The Australian Government lists solar water heaters that are eligible for STCs and are therefore eligible to receive a rebate based on the number of STCs.

An STCs is a calculation of how much energy is expected to be saved over ten years when using a solar water heater compared to the electricity consumption of an

equivalent electric water heater. 1 x STC is 1 x MWh of electricity saved over 10 years = 100 kWh saved in a year.

Performance calculations take into account geographic location, solar radiation, the angle of the sun, the efficiency of the solar collector, tank heat loss, cold water temperatures, the quantity of hot water used and hot water usage patterns.

Solar savings between different models and brands can easily be compared - the higher the number of STC, the higher the energy savings. To accurately compare systems, select the same tank size, number of solar collectors and booster type.

Gas boosted systems use almost no electricity, as gas is the booster fuel. Electricity is only used to operate the electronics in the Rinnai in-line gas booster and, when using a split system, the solar controller and pump.

TANKS

There are two mainstream types of materials that are used to fabricate solar hot water storage tanks.

1. Stainless steel
2. Vitreous enamel lined mild steel

Stainless steel refers to the actual tank that holds the water. Surrounding that tank is insulation and an outer case that is not usually made of stainless steel. Stainless steel resists corrosion, hence the term stainless, resulting in a long service life.

Vitreous enamel tanks are a mild steel tank that has the inside coated with a ceramic product that is heated in a kiln to solidify into a glass like skin, called vitreous enamel, on the inside of the tank. This protects the mild steel from corrosion. A sacrificial anode is used to protect the mild steel from any corrosion that may occur in small areas where mild steel is in contact with water.

BOOST

Gas or Electric boost?

Gas boosted solar hot water systems offer the best solution to saving electricity, as electricity consumption is very low.

Why do I need a booster and what types are available?

A booster is required to deliver hot water in times of low solar contribution or times of excessive hot water consumption.

The booster also heats the tank (electric) or outlet water (in-line gas) to a sufficient temperature to inhibit the growth of legionella bacteria. This is a regulatory requirement.

How does an electric boost work?

Electric boosters are electric elements located in the storage tank itself. The electricity supply is available in multiple tariffs. Generally, the higher the charge for a unit of electricity the more hours it is available per day.

There are several electricity tariffs available, depending on supplier and location. Off peak tariffs are normally adequate and preferred for solar hot water systems as they can avoid electric boosting when solar heating is available. Contact electricity supplier for further details.

An electric element must have sufficient capacity to heat the volume of water in the tank and above the element to a minimum of 60°C in the time period that electricity is available each day. The element must not be of a higher capacity than the electrical wiring and fuse / circuit breaker available. Usually like for like element replacement size is practised.

Continuous Tariff Electricity

Available 24 hours a day. Usually attracts the highest cost per unit of electricity.

Overnight Off Peak Electricity

Available overnight, after dinner time cooking and before breakfast time. Usually attracts the lowest cost per unit of electricity. If hot water tank runs out during the day, the household must wait until the tank is reheated overnight. May require a minimum tank size.

Continuous Off Peak

Used with twin element split tanks. Both continuous tariff and overnight off peak are connected to the tank. Continuous electricity is connected to the top element and overnight off peak is connected to the bottom element. Usually requires a minimum tank size. May not be allowed to use a flow and return hot water distribution system in the house.

What is meant by the term "bottom element"?

The element is located as close to the bottom of the split tank as possible. Therefore it heats the whole tank volume when energised.

This system is best suited to households which use the majority of their hot water in the morning.

Ideally a bottom element is operated overnight, after the sun has contributed as much energy as possible, allowing the booster to bring the tank to final temperature before usage of hot water in the morning.

What is meant by the term "mid element"?

All close coupled systems are mid element. Several split systems are also available as mid element. The element is located at or around the half way mark in the tank. When energised it heats the water above the element. Even when the top half of the tank is at set point temperature, solar gain can be used to heat any cooler water below the element.

This system is best suited to households with a mix of morning and night hot water use. Ensure that volume of water above element is sufficient for household needs in times of low solar contribution.

This element location suits continuous or overnight operation. Overnight boost allows the most solar contribution, whilst continuous boost guarantees a usable volume of hot water is always available.

What is meant by the term "twin element"?

Twin element split tanks have a top element that heats around 30-50 litres of hot water, whilst the bottom element heats the whole tank.

Continuous electricity is available to the top element, while overnight off peak electricity is available to the bottom element as determined by the electricity supplier.

Should the tank run out of hot water, whether heated by the bottom element or by solar energy, the top element will operate to heat the water in the top part of the tank. Once the top of the tank is heated, the bottom element will operate when overnight off peak electricity is available.

How does an in-line gas boost work?

In line gas boost receives solar pre heated water from the tank and boosts it to set point temperature as required. If the tank delivers water at the set point temperature, the booster does not operate. If the inlet water is warm, but below the set point temperature, the booster simply boosts the solar pre heated water to the set point temperature.

An in line gas booster must be matched to the number of hot water outlets, the same method used when selecting a Rinnai Infinity.

In line gas boosters can be located remotely from the tank, therefore allowing them to be located as close as possible to the most frequently used hot water outlet(s), therefore reducing hot water waiting time and wasted water.

Water temperature controllers can not be used with in line gas boosters, as the inlet temperature from the solar tank will usually be above the desired shower temperature. Smartstart can be fitted but must be started with a momentary switch instead of water temperature controllers.

What will a solar hot water system cost me?

When calculating costs of a system take into account the savings offered by rebates and the cost of replacing the electric storage hot water system. The difference is the extra investment that a solar water heater requires to deliver fuel costs and greenhouse gas savings.

Consider the following:

- Cost to replace electric water heater with another electric water heater.
- Cost to supply and install a solar water heater.
- Rebates available when replacing electric water heater with thermal solar.

The extra cost is the cost of the solar hot water system, less the electric water heater (as this would have to be replaced anyway), less government rebates. The extra investment for the solar water heater then contributes to lower electricity costs and greenhouse gases in the future.

Example:
A solar hot water system costs $3000 more than simply replacing an existing electric water heater. 30 x STC's are available, therefore saving 3000 kWh of electricity per year @ 22c per kWh. This can result in a 4.5 year payback on your investment in the solar hot water system.