

Solar hot water systems

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Solar hot water systems are the first choice of hot water system from a sustainability perspective. A good installation - well sized, well installed, with a good controller; should deliver up to 75% of your hot water, for free, year round. New Zealand is a sunny country, and even our less sunny areas (Dunedin and Southland) have more sunshine hours than countries like Germany, where solar hot water is commonly installed.

When is solar hot water suitable?

Solar hot water works best in the following circumstances:

- Sunny locations with year round sun
- Where there is sufficient area of roof exposed to a good lot of northerly sun year round. South facing houses, or those shaded by trees, buildings or hills might not get enough sun to make solar hot water worthwhile.
- Where there is a high demand for hot water. Generally the more people in the house, the more cost effective solar hot water is. It's particularly good for high hot water uses or houses with 4 or more people.

Types of solar hot water system

There are two types of solar hot water system: thermosiphon or active.

Thermosiphon systems have the hot water cylinder on the roof. Active systems locate the cylinder inside. In colder climates, active systems are better, as there are high heat losses having a cylinder on the roof. Thermosiphon systems also require a more complex building consent, making sure that your roof can take the weight of the cylinder.

Timers and controls

One key to making the most of your solar hot water system is to control your supplementary heating. Solar water heaters allow for electricity to kick in and heat the water if there is not enough sun. But if your system immediately re-heats your water with supplementary electric heating after early morning water use, you miss out on using solar energy to re-heat the water during the sunny parts of the day.

Timers that are set to exclude electric supplementary heating in the mornings are a simple and practical way to avoid this.

Look for a system that provides information about how your system is operating to get a better understanding of when your household needs hot water and when the sun provides it.



This display in the Waitakere NOW Home showed the homeowners exactly what temperature their solar system was providing

Solar panel orientation and angle

We call on more hot water in winter than in summer, and well installed systems will ensure that your solar system will produce plenty of hot water even in winter sun.

Panel orientation

The sun shines from the north, so any surface facing north (preferably in a range of 20oW to 30oE of true north) will capture sun. True north can be found from local maps and street directories; or use a rough visual while on the site – the line between you and the sun at midday is an estimate of true north.

Panel angle

Ensure your solar panel (collector) is installed at the same angle as the latitude of your location to get the best year-round performance. Use an array frame to achieve an angle greater than your roof.

As an example from Beacon's earlier research projects, two of our solar water heating systems (the Waitakere NOW Home and the Rotorua NOW Home) were installed at shallow angles. They provided only 45% and 36% of hot water energy, compared to 75% from the well-angled Papakowhai panels.



The Waitakere NOW Home panels were only installed at 20° in line with the roof. It should have sat at 37°. This system provided only 45% of water heating.



The Rotorua NOW Home panel was limited to 30° by the framing that it came with. It should have been at 38°. This system provided only 36% of water heating. The outdoor cylinder also had the most heat loss.



The Papakowhai panels sat at 41° to match the latitude of the site. With large collectors and cylinders, these systems provided 75% of hot water.

Sizing of system components

Ensure that the collector area is sufficiently large for the demand required. Our Papakowhai systems connected two twelve-tube panels to form a large collection area – and their performance far surpassed the other, smaller, systems.

With a larger collector area, you will also need a larger hot water cylinder (300L cylinders matched the panels in Papakowhai) to ensure you can store the solar energy collected during the day for later use when hot water is required.



The large panels of the Azzuro Solar systems and 300L cylinders worked in balance for a good result in Papakowhai

In both these cylinders you can see that the pipes moving hot water are lagged to prevent heat loss.

Reducing heat losses

Ensure that heat losses from the systems are kept to a minimum. Make sure that insulation levels on cylinders are appropriate for New Zealand conditions and that pipe run lengths are kept short and well insulated.

Good installation is vital

Make sure that your installer is well qualified and has a lot of experience in installing solar hot water systems. Research shows that the quality of installation is the biggest factor in how well your system will install.

Tips: Getting the most from your solar water heater

- Control your supplementary heating using timers and control to exclude electric supplementary heating in the morning. Solar water heaters allow for electricity to kick in and heat the water if there is not enough sun. But if your system immediately re-heats your water with supplementary electric heating after early morning water use, you miss out on using solar energy to re-heat the water during the sunny parts of the day.
- Look for a system that provides information about how your system is operating to better understand when you need hot water and when the sun provides it.
- Ensure your solar panel (collector) is installed at the same angle as the latitude of your location to get the best year-round performance.
- Ensure that the collector area is sufficiently large for the demand required.
- With a larger collector area, you will also need a larger hot water cylinder (300L) to ensure you can store the solar energy collected during the day for later use when hot water is required.
- Ensure that insulation levels on cylinders are appropriate for New Zealand conditions and that pipe run lengths are kept short and well insulated to minimise heat loss.

For more information:

- See Fact sheets on
 - Saving with hot water
 - Choosing between solar and heat pump hot water systems
- Find out more information on the [Energywise](http://www.energywise.govt.nz) website: www.energywise.govt.nz. You'll find a tool to help you pick the right solar water heater for you.
- You can also find out more from the Solar Association of New Zealand website, including which products comply with New Zealand standards, and lists of accredited solar water heating and installers: www.solarassociation.org.nz
- Visit www.beaconpathway.co.nz/further-research/article/choosing-the-right-renewable-energy-source-for-your-site for a checklist which will help you decide if your site is right for solar hot water.