



Tourist retreat's guests bathe in sunshine

✓ Key features

- Solar water heating a solution for tourist operators
- Simple payback of around 3½ years for Solscape Eco Retreat

✓ Key benefits

- Electricity savings estimated to be 75%
- Savings of \$4,500 per year estimated

Hot water, and plenty of it, is what tourists expect from the moment they unpack their suitcase, regardless of whether their accommodation is at a motor camp or a five star hotel.

The dilemma for many tourist accommodation operators is bearing the cost of having hot water 'always available', when occupancy is sporadic and uncertain.

This case study features a solar water heating installation at Solscape, an eco retreat near Raglan, where the hot water dilemma has been resolved using the sun's rays.

About Solscape

Solscape is situated in Raglan on the North Island's west coast, 2 hours south of Auckland. It overlooks the world famous surf break of Manu Bay and Ocean Beach.

Around 6,000 national and international tourists visit Solscape each year. They visit to enjoy the surrounding environment, to stay in the healthy, comfortable lodgings,

and to learn about the environmentally sustainable features that have been boldly incorporated into the buildings and infrastructure of the retreat.

Owners Phil McCabe and Bernadette Gavin have been working since 2002 towards achieving their vision for an Eco Tourist destination. Solscape incorporates renewable energy sources (wind and photovoltaic generation of electricity, and solar water heating), and accommodation facilities that range from the completely 'off-grid' Tipi Retreat with earth floors and composting toilets, to the Vege Bach Eco Cabins with solar water heating. Visitors can also engage in the Sustainable Living Courses run on site by Environment Education Officer, Paul Peterson.

Station House and Vege Bach water heating needs

In 2008 Phil and Bernadette embarked on a three stage development programme that, when finished, will double the capacity of the Retreat. Hand-in-hand with that development is the introduction of solar water heating. By mid-2009 two solar water heating projects had been completed on the site, one in the existing Station House, and one in the new Vege Bach Eco Cabins.

The Station House



The Station House is a communal facility that supports a collection of cottages on the retreat accommodating up to 20 people. It has kitchen facilities, four showers, and toilets. Its 300 litre electric hot water cylinder was running all the time and represented a substantial portion of the annual \$6,000 hot water heating bill.

In 2008 the Station House was retrofitted with a solar water heating system. An 8.85m² flat panel solar water heating unit was installed on the roof and a new 500 litre hot water cylinder connected to it. The solar system heats the water in the new cylinder which is then used in the kitchen, and pre-heats the water in the existing 300 litre electric cylinder which supplies the showers.

The result is that the electric element in the cylinder now needs to operate less often, and for shorter periods, than was previously required to achieve temperatures needed for a shower. The electricity savings are estimated to be around 75%.

The Vege Bach Eco Cabins



The new Eco Cabins are constructed entirely of untreated and recycled timbers and earth bricks. They combine the traditional 'kiwi bach' with contemporary design and the latest energy efficient technology.

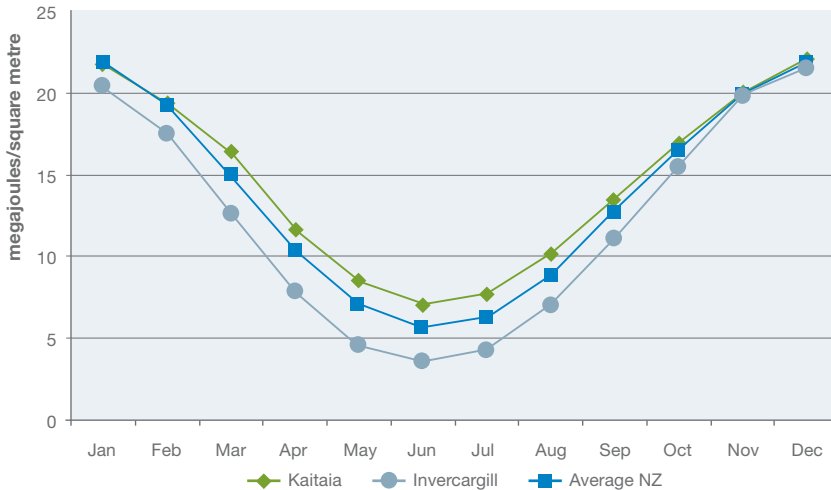
Adjoining cabins are separated by an earth wall. Each cabin contains a double and a single bed. Adjoining cabins share a single 300 litre hot water cylinder. The cylinder is heated throughout the day by a 5.6m² flat panel solar water heating unit, and an electric element tops-up the heat through the night for those early morning showers.

The solar solution for motor camps through to exclusive retreats

The opportunity for solar water heating in New Zealand is particularly good due to our high solar radiation levels. While there is some variation in the energy levels available between the top of the North Island and the bottom of the South Island, all parts of the country can use solar energy to produce hot water cost-effectively.

The amount of solar energy available to be captured between summer and winter varies significantly. This has implications for tourist accommodation operators. If seasonal occupancy peaks coincide with the solar radiation peaks between October and March, then hot water energy bills can be cut by up to 75% through the use of solar water heating. For those operators catering to a winter tourist trade, solar water heating can also make a significant difference to energy bills, but a high capacity electrical or gas back-up system will be required to maintain the flow of hot water in those dark winter months.

Daily average of solar radiation



Solar water heating is also the solution for tourist operators facing the dilemma of reducing hot water costs while still having hot water available on demand from the moment a guest arrives, whether they're operating a holiday park or an exclusive retreat.

Paul Peterson from Solscape says: *"The water is being heated using free energy from the sun, regardless of occupancy. There's always hot water available in the Vege Baches when guests arrive. We do turn the electric elements on when the guests arrive, but that's only to ensure that the hot water they use in the evenings is replaced overnight."*

Monitoring and payback

Paul Peterson has installed monitoring equipment at both the Station House and the Vege Bach Eco Cabins.

Monitoring is being recorded of:

- the temperature at the bottom of the cylinder
- the temperature at the top of the cylinder
- the water temperatures exiting the solar panel
- the outside air temperature
- the electricity used by the back-up electric elements.

Temperatures in the Eco Cabins cylinder are maintained above 70°C by the solar water heating system alone when there is no occupancy. This means there's hot water instantly on tap when a guest arrives, without any energy costs being incurred by the operator.

When there is full occupancy in the Eco Cabins the demand on the 300 litre cylinder is high and by mid-morning after the guests have had their showers the temperatures in the bottom of the cylinders drop to 25–30°C; and at the top of the cylinder 30–35°C. This drop in temperature can be expected in any domestic situation operating from a cylinder of this size, whether it is entirely electric or pre-heated by the sun.

Part of Paul Peterson's job is to promote energy efficiency and sustainable living concepts to guests, the local community, schools, and interested parties. This includes sharing the solar water heating data from their monitoring activities. So the plan is to keep collecting the measurements for the foreseeable future.

The data coming from the Station House shows that the large 500 litre pre-heat cylinder connected to the solar panels is regularly operating between 40–60°C in summer without top-up from the electric back-up element. This also greatly reduces the load on the electric elements in the second cylinder, and energy savings of around 75% are being observed. On an installed cost for the retrofit of \$15,000, and estimated savings of \$4,500 per year, the simple payback calculation is around three and a half years.



The monitoring equipment for the Eco Cabins is located behind a removable weatherboard, and can be incorporated into the education tour discussions.



Lessons for other tourist accommodation operators

Paul Peterson says that the solar water heating projects have gone pretty much to plan, and there's little he'd do differently if starting again.

When questioned about the alternative of using gas heating rather than electricity as a back-up to solar, Paul says *"The owners had considered using bottled gas heating rather than electricity as the back-up to the solar system, but decided on electricity because of the distributed nature of the site and wanting to avoid handling multiple gas bottles – electricity was just easier for this site."*

One thing that had been a surprise in the project was the high temperatures experienced in the circulation pipes connected to the solar panels. In the first summer the temperature exceeded 140°C and melted the insulation to the pipes. The melting problem was quickly resolved by replacing the insulation with a high temperature rated alternative.

The Solscape operators also had to modify their practices around switching off, and on, the electric top-up element in the Eco Cabins. Initially it was hoped that the 300 litre cylinder had sufficient volume of hot water by late afternoon to allow for showers both in the evening and in the morning. However it only took one or two guests to experience a tepid shower in the morning for the operators to ensure the electric top-up elements were switched on whenever there were guests in residence. As Paul Peterson says *"When you're providing premium accommodation, you can't expect your guests to put up with a tepid shower in the morning, even though in the evenings they're bathing in (hot water heated by) sunshine"*.

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