Tasmanian Renewable Energy Alliance

www.tasrenew.org.au

Using solar PV for hot water in Tasmania

This guide is specifically about using excess energy from solar PV panels for heating hot water in Tasmania. This may be a viable way to save money if:

- you have or are planning to get a solar PV system of 4kW or more
- you have an existing storage hot water service (HWS) in good condition.

Traditionally people wanting an environmentally friendly way of getting hot water chose solar hot water systems using flat panel or evacuated tube collectors. When solar PV was expensive it was wasteful to use it to heat hot water since only around 20% of the energy that falls on a PV panel is converted to electricity.

However as the cost of PV has reduced there is increasing interest in diverting surplus PV to reduce water heating costs. This is also seen as a way of getting better value from an existing PV system. Instead of exporting surplus energy and getting paid 7c/kWh the energy is used to pre-heat hot water saving between 16c and 25c/kWh.

How does it work

A solar diverter is typically connected inside your meter box. It measures the amount of solar energy being exported and diverts this to the circuit supplying the hot water cylinder. As long as the hot water is below the thermostat temperature, the energy will heat water.

An advantage of solar diverters is that they measure the exact amount of export happening and divert only this to the hot water service. For example if your HWS has a 3.6 kW element but you have say 500 W of surplus solar, just 500 W will be diverted. This maximises the local use of solar energy and avoids unnecessary purchase of electricity. Additional features on some solar diverters including adaptive learning algorithm to adapt to your usage and display of the water temperature. Internet connected diverters can also access weather forecasts to optimise the use of solar and report faults.

You will maximise your savings by using a timer or settings on the diverter to use little or no boosting overnight or first thing in the morning so that there is a heating load once your solar PV starts exporting.

How much can I save?

Several suppliers claim you can save $350- $400 a year using a solar diverter. Savings will be maximised if you have more than 4kW of solar PV and use a lot of hot water.

You can expect to pay $1,000-2,000 to buy and have a solar diverter installed.

A cheaper alternative

A cheaper way of using your surplus solar energy is to put your hot water service on the same circuit as the solar PV and use a timer to heat the water only during the middle of the day. This is less effective than using a solar diverter because there is no monitoring of your solar surplus but it may prove more cost effective in certain circumstances.

Other hot water options

There are a variety of options for producing domestic hot water, including heat pumps, gas or electric hot water storage systems, solar hot water (using flat panel or evacuated tube collectors) as well as instantaneous water heaters. For a good introduction to the options we recommend the **Efficient hot water buyers guide** in issue 139 of the Alternative Technology Association's Renew magazine, or purchase the ATA's Efficient Hot Water Booklet. If you need to buy a new hot water system and want to choose between a solar hot water system and a heat-pump water heater there is also some information and advice in the presentation by TREA member Affordable Solar Tasmania.

Tariff and metering arrangements in Tasmania

Options for installing a solar diverter in Tasmania are different because of our unique tariff arrangements.

On the mainland a solar diverter will be installed in one of two scenarios:

- **single electricity tariff**: the whole house is supplied at a single tariff (either a flat rate or a time of use).
- **additional off peak circuit**: in addition to the main electricity tariff (either option above) an off-peak tariff is available. Circuits on the off-peak meter will only be powered at off-peak time (typically in the evening/night). In these situations a storage hot water service will be connected to the off-peak circuit but sometimes there will be a boost switch to allow charging from full rate power.

Most customers in Tasmania with a storage hot water system will be on two different tariffs:

- **tariff 31 light and power**: (26.065c/kWh) Circuits on this tariff may be used for any purpose (including hot water)
- **tariff 41 heating and hot water**: (15.719c/kWh) This tariff is only allowed to be used for storage hot water and wired-in space heating.

The difference from the mainland is that both of these tariffs are available 24 hours a day. Although there are two domestic off-peak tariffs in Tasmania (tariffs 61 & 62) these are not widely used.

A problem arises for solar PV owners because of the tariff 31 and 41 arrangement. A solar system needs to be connected to one circuit or the other and is generally connected to the tariff 31 circuit. This means that solar owners do not get the full benefit from their solar generation as it does not offset consumption on tariff 41. (In fact if solar PV is being exported for 7c at the same time as heating is being used on the tariff 41 circuit, solar owners can actually be paying nearly 9c/kWh to use their own electricity – for more information see the TREA solar metering page.)

From July 2016, Aurora has also offered a domestic time of use tariff (tariff 93) in which all electricity is on a single tariff which has peak (31.31c/kWh) and off-peak (14.58c/kWh) times. Peak times are 7am-10am and 4pm-9pm weekday, all other times are off-peak. For more information see the TREA website.

This time of use tariff is different from most mainland tariffs as it provides an off-peak period in the middle of the day (10am-4pm). A meter change fee applies to customers changing to the time of use tariff (or back to the tariff 31 & 41 arrangement).

Options for combining solar PV and water heating

Combining the tariff options and the technology options leads to four possible scenarios:

Tariff **Technology**	**Time of use tariff 93**	**Combined tariffs 31 & 41**
Solar diverter	Solar and all consumption on one tariff. Diverter sends surplus to hot water.	Diverter switches hot water between circuits depending on available surplus solar.
Timer on hot water	Solar and all consumption on one tariff. Timer turns on hot water heater mainly in middle of the day.	Hot water rewired to tariff 31. Heat pumps remain on tariff 41. Timer turns on hot water heater mainly in middle of the day.

Use a solar diverter and switch to tariffs 93

Advantages:

- the maximum available surplus solar is used to heat water
- you can make additional savings with other appliances by moving time of use to off peak times

Disadvantages

- most expensive option: you will need to pay for solar diverter and meter changeover fee

- if you use significant amounts of energy on tariff 41 for space heating in the mornings and evenings you may not be better off under this arrangement because space heating at peak time will cost you 31c/kWh instead of 16c/kWh.

Use a solar diverter and remain on tariffs 31 and 41

You will need to check that the chosen solar diverter can work with the two Tasmanian tariffs (ie the hot water tank is normally on tariff 41 but is switched to the tariff 31 circuit when solar boost is activated).

Advantages:

- the maximum available surplus solar is used to heat water
- you will continue to use cheaper power for space heating 24 hours a day

Disadvantages

- cost of the solar diverter

Use tariff 93 and a timer

Moving all your electricity consumption to a single tariff means that all your consumption (heating as well as light and power) will be offset by solar generation that happens at the same time. You can then minimise your electricity bill by moving consumption to times of solar generation or to off peak times.

Put a timer on your hot water service so that it runs only in the middle of the day when you are most likely to have surplus solar. If you can set multiple times, set a short boost time in the overnight off peak window to make sure there is some hot water available in the morning, but water is not fully heated so that solar boost is used in middle of the day.

Advantages:

- cheaper setup cost
- use of all appliances can be timed to maximise savings (eg run washing machine in middle of day or at off-peak times)

Disadvantages

- increases but does not maximise the use of surplus PV for heating hot water – there may be times in the middle of the day that the water is heated but there is not surplus solar
- requires more conscious action by household members
- if you use significant amounts of energy on tariff 41 for space heating in the mornings and evenings you may not be better off under this arrangement (because space heating at peak time will cost you 31c/kWh instead of 16c/kWh.

Use a timer and switch hot water to tariff 31

In this option an electrician would change your switchboard so that the hot water service is wired to the tariff 31 circuit. Using either an added timer on the switchboard or a timer already built into the hot water service, set the hot water service to run only in the middle of the day when you are most likely to have surplus solar. If you can set multiple times, set a short boost time overnight to make sure there is some hot water available in the morning, but water is not fully heated so that solar boost is used in middle of the next day.

Advantages:

- potentially cheapest setup cost, especially if you have a heat pump hot water with a built in timer
- works with heat pump hot water as well as conventional hot water with resistive element
- because a heat pump hot water uses less power than a resistive hot water service it is less likely to use more energy than is being generated by solar PV
- Heat pumps for space heating remain on the cheaper tariff 41 at all times.

Disadvantages

- need to be confident that you usually have sufficient surplus PV to match consumption by hot water system, even in winter

- possible that you will end up paying more on average for hot water than you would have on tariff 41
- increases but does not maximise the use of surplus PV for heating hot water – there may be times in the middle of the day that the water is heated but there is not surplus solar.

FAQs

Are you allowed to use a solar diverter with tariff 41 and tariff 31?

Yes. TasNetworks preferred arrangement is that solar owners wishing to use a solar diverter change to tariff 93. However TasNetworks has confirmed that the use of diverter which switches the hot water system across to tariff 31 (so that it can use the excess generation from solar PV which is on this circuit) is permitted under their Service Installation Rules and Network tariff application guide (see section 10.1.3).

Can I use a solar diverter with other loads (eg a heat pump)?

Generally no. A solar diverter regulates the output to match the available excess solar generation. It is intended for resistive loads such as a hot water service element. A heat pump or other electronic equipment connected to this output might be damaged. Use with other resistive loads is possible, for example heating elements in a floor slab.

Available products

Catchpower. Australian product:
http://www.catchpower.com.au/ and video at https://vimeo.com/204239422

Powerdiverter UK product distributed in Australia
https://www.powerdiverter.com.au/

SunMate distributed by Australian Wind and Solar:
http://www.australianwindandsolar.com/aws-sunmate

For more information on energy efficiency see: http://tasrenew.org.au/ee

Version 4: 23 June 2017. Note that this version uses 2016-2017 feed-in tariff and consumption tariffs.