Hot water case study: Feasibility study comparing solar PV and solar hot water

Project summary

Heating water accounts for around 23 percent of a residential apartment's annual energy consumption. This is a unique case study in the Australian context that compares the benefits of solar photovoltaic (PV) technology against evacuated tube solar hot water systems to heat water for a residential apartment building.

Limitations of this study

The residential apartment building used in this feasibility study is in Brisbane. While the quantity of energy captured by the solar PV and hot water system will be higher than what is expected in NSW, the findings of the study are still applicable in NSW because the characteristics of the technologies remains the same. The output of solar PV and solar hot water systems will also vary from system to system. There are other variables to consider as well, like roof shape and size, energy consumption, hot water consumption and the height of surrounding buildings - so you need to evaluate solutions based on your unique circumstances.

The building used for this feasibility study has 38 apartments, 200-square meters of available roof space and an annual energy consumption of 77.4 MWh.

The feasibility analysis of the two systems includes an economical, technical and environmental analysis, which was conducted by Wattblock (www.wattblock.com).

RETScreen, an international simulation software tool was used to assess the feasibility of the two technologies.

Based on a technical, environmental, and economic analysis, it was found that both solar photovoltaic (PV) technology and evacuated tube solar hot water systems methods are feasible options.

Out of the two options, solar PV was the superior option to heat water for this particular building.

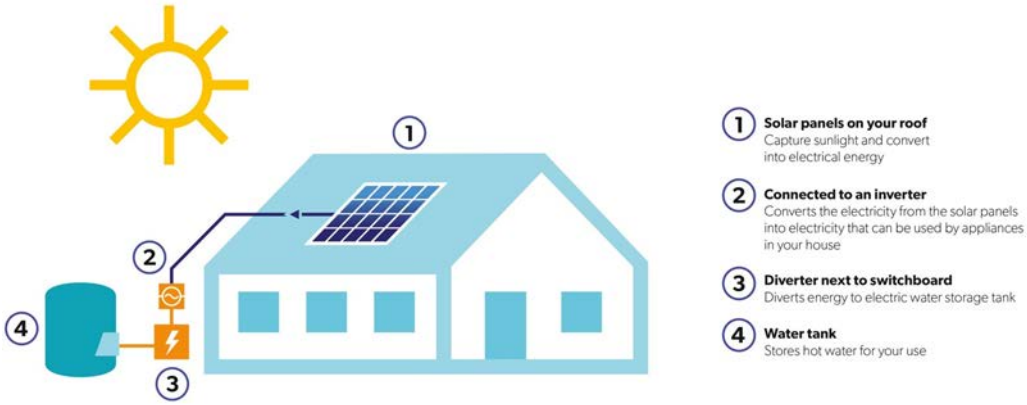
Solar PV can generate more energy than an evacuated tube solar hot water system. A solar PV system is also able to provide energy to the building beyond heating water.

Fast Facts

	Solar PV	Solar hot water*
System size	o 35 kW	o 35 kW
Energy generated	o 57 MWh electrical energy (includes 18 MWh electricity demand for hot water)	o 27 MWh thermal energy (the system is slightly oversized for the hot water demand)
Space occupied	o 180 m^2	o 87 m^2
Annual lifecycle savings (est)	o $23,429	o $9,584
Payback period	o 3.9 years	o 8.4 years
Carbon emissions savings (est)	o 54 tonnes per year o 1355 tonnes for a 25-year life	o 25 tonnes per year o 633 tonnes for a 25-year life
Renewable energy	o Solar PV can be used to heat water by diverting energy captured from the solar PV to electric hot water tanks.	o Solar hot water systems work by having cold water from the mains enter the solar collector on the roof. As the solar collector captures heat from the sun, it transfers this heat to the water in the storage tank.
Results	o Potential to use electricity from solar PV for heating water and to meet electricity demand o Eligible for Small-scale Technology Certificates (STCs)	o Eligible for Small-scale Technology Certificates (STCs)

*The solar hot water system size was determined by assuming that 23% of the building's energy is used for heating water.

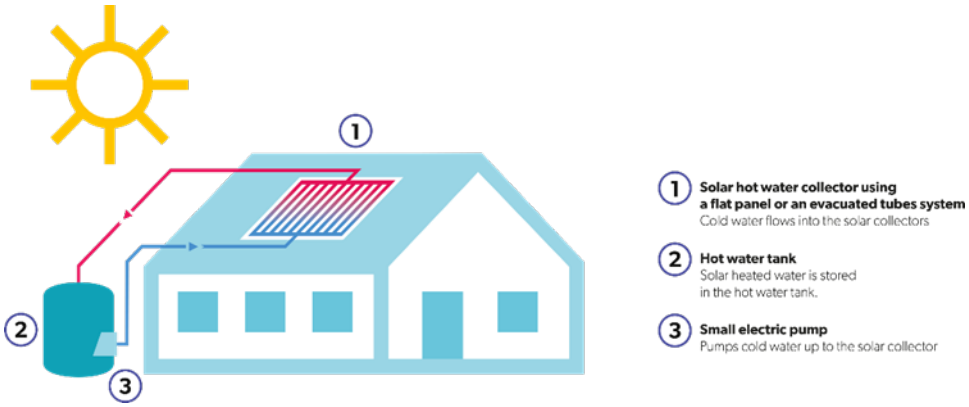
Solar PV



With a solar PV system, you can:

- Make the most of space on a residential apartment building
- Minimise the amount of energy used by the building
- Reduce the carbon emissions associated with running the building
- Heat hot water
- Provide electricity for the common area of the building and to apartments

Solar hot water



The two main types of solar hot water systems are:

1. Tank on the ground
2. An integrated system where the tank is on the roof

The two types of solar collectors are:

1. Flat panel collectors
2. Evacuated tube collectors

This case study looked into the feasibility of evacuated tube collectors. Evacuated tube collectors have a greater surface area for capturing sunlight and require less roof space than flat panels.