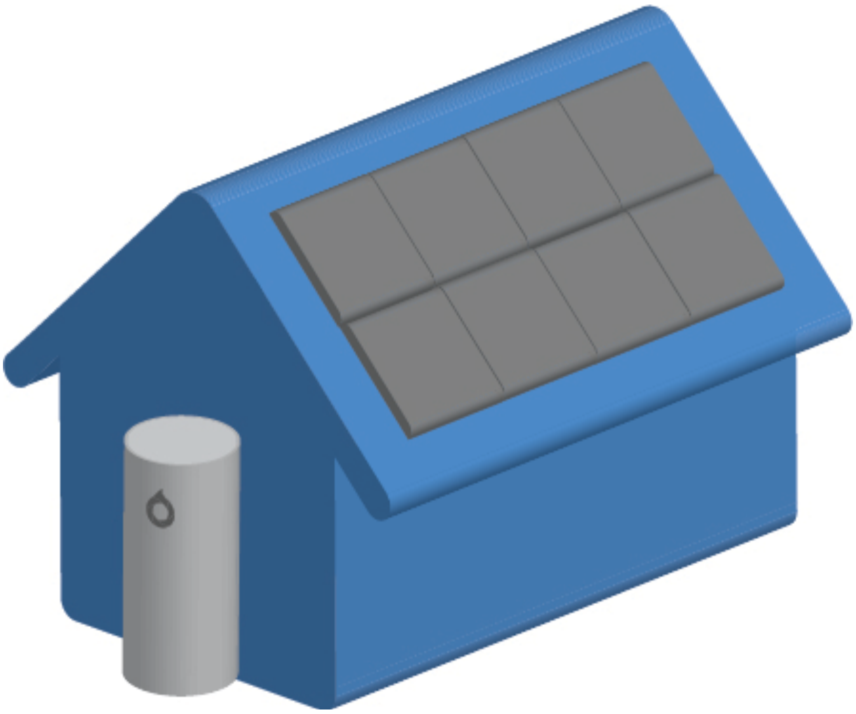
aquatech
engineered hot water



aquatech & Your Solar PV

As of September 2019, approximately 2 million Australian homes have installed Solar Photo Voltaic (PV) systems, making each home their own mini-power plant. These homes have a unique advantage in being able to take control of their power usage to deliver significant reductions in energy costs.

Installing a **aquatech** can provide an effective tool to assist homes in maximising their Solar PV investment and further reducing energy costs. This document is designed to assist home owners with a Solar PV system to integrate their **aquatech** to achieve the best possible results.

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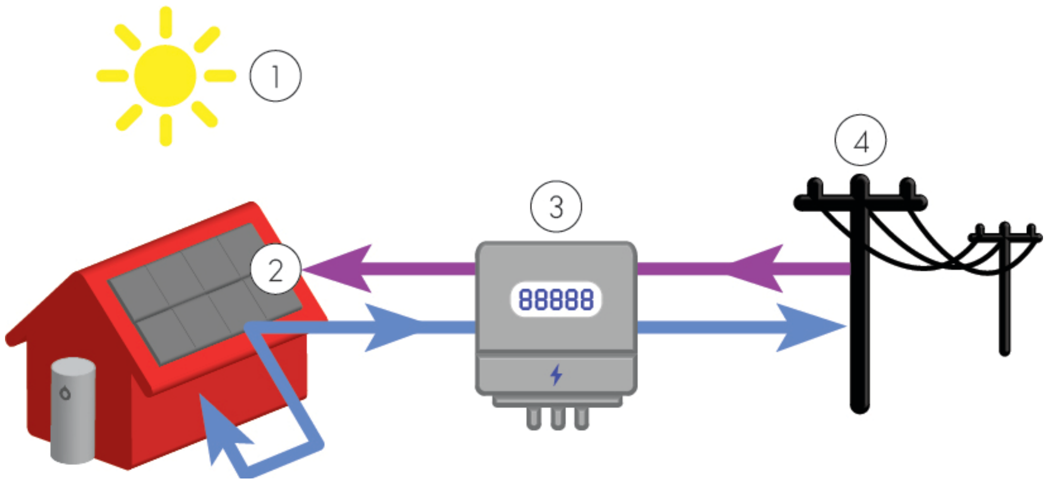
SECTION 1 - How to calculate savings

In order to determine the saving benefits for a home running their **aquatech** *system on Solar PV, rather than grid power, it is important to understand how energy providers charge owners for grid power and how much they pay owners for generated Solar PV power. Once a homeowner is able to calculate the cost differences between running their* **aquatech** *on Solar PV versus Grid Power, they will be able to estimate their savings based on the* **aquatech's** *annual power consumption.*

1. UNDERSTANDING NET SOLAR PV BILLING

Net metering works by allowing a two-way flow of PV generated power, both within the home as well as back into the electricity grid. This form of metering priorities the energy being produced by the Solar PV system to meet the homes current power needs, with only excess electricity being sent back to the grid. When the homes Solar PV output is less than the homes current energy demand, power is then drawn off the grid.

Below is a simplified explanation of how net metering works for typical Solar PV installations:



1. Solar PV systems use sunlight to generate electricity.
2. Homes will first use the Solar PV produced electricity and excess will be supplied to the grid.
3. Net meters measure the excess Solar PV generation and household generation.
4. Any excess Solar PV produced electricity is sent to the grid and a feed-in tariff is applied to this amount.

Under net meter billing, owners are typically paid less for the power they send back to the grid then the power they draw from the grid. Therefore, homeowners should utilize the power created from their Solar PV systems by running as many appliances during daytime hours as feasible.

2. UNDERSTANDING POWER SUPPLY COSTS

The majority of energy providers across all states and territories will offer residential customers at least the two main tariff options to run their hot water systems:

Continuous Tariff
The standard full rate tariff. Power is supplied for 24 hours a day and no separate meters are required.

Shoulder Tariff
The reduced rate tariff. Power supply is determined by energy providers but typically operate 18 hours day and homes with this tariff require dual power meters.

For homes with Solar PV systems, there is a third alternative option for powering their **aquatech** system:

Solar PV Feed-In
Customers set the **aquatech** run times to coincide with PV output the tariff rate cost is equal to the amount owners would have received if Solar PV power was sent back into the grid.

It is important to note that net metering only applies to homes with Continuous Tariff and therefore appliances that are connected to the Continuous Tariff.

By examining the three available tariff costs, owners can then determine the most cost-effective option for running their **aquatech**. The below table has a breakdown of three power supply options based on advertised rates from major energy retailers as of May 2020.

Table 1. Tariff and Feed in rates for some Australian States

	Continuous tariff	Shoulder tariff	Solar PV Feed-in rate
QLD	$0.25	$0.21	$0.08
SA	$0.40	$0.22	$0.10
NSW	$0.30	$0.17	$0.08
VIC	$0.25	$0.20	$0.12
WA	$0.29	$0.29	$0.20
TAS	$0.27	$0.18	$0.09

**Tariff and feed-in rates will vary from energy suppliers and can also be higher or lower depending on your state and the energy plan you choose. We recommend that you discuss these options with your energy retailer to ensure you are receiving the best available rate.*

aquatech *does not recommend that any customer connects their system to a night time tariff. Heat pumps should be run during the day when ambient air temperatures are their highest, which is more energy efficient.*

Solar PV net metering only applies to appliances on a Continuous tariff supply. Therefore, when having a **aquatech** *installed, ensure that the electrician connects the system to a Continuous tariff supply if you want the system to run on Solar PV.*

3. AQUATECH ANNUAL POWER DRAW

Before owners can determine the most cost-effective power supply option for running their **aquatech** it is necessary to estimate the annual power draw of the system to meet a home's hot water load. Australian Standard AS/NZS 4234:2011 provides an estimated annual hot water power consumption based on three load profiles. These profiles are used to determine the HYDROTHERM's energy savings and STC ratings. The three different profiles are:

Small hot water load – approximately a two-person home.
Medium hot water load - approximately a four-person home.
Large hot water load - approximately a six-person home.

The below table provides an estimate of the **aquatech's** annual power draw to meet different hot water loads.

Table 2. Annual energy rates for different hot water loads.

	Heat pump draw	Element draw	Total Annual Power Draw
Small hot water load	734kWh	0kWh	734kWh
Medium hot water load	1208kWh	0kWh	1208kWh
Large hot water load	1208kWh	1622kWh	2830kWh

Owners with a large hot water load running an **aquatech** *on limited heat up cycles will need to engage the system's electric element booster to raise the stored water temperature from 60°C to 70°C. This results in a higher annual power draw but ensure the home has sufficient hot water.*

4. RUNNING COST CALCULATIONS

To calculate the potential annual running cost of the **aquatech**, owners will need to use the following calculation:

Power Cost ($/kWh)	= Tariff rate ($/kWh) (from electricity bill)
Annual Power Draw (kWh)	= Hot water load (kWh) (from electricity bill)
Annual Running Cost ($)	= Power Cost ($/kWh) x Annual Power Draw (kW)

Below is an example equation for a home based in Brisbane Queensland with four residents running their **aquatech** on a Shoulder Tariff:

Power Cost ($/kWh)	= $0.21kWh
Annual Power Draw (kW)	= 1208kwh
Annual Running Cost ($)	= $0.21 x 1208kWh
	= $253.68

The summary graphs at the end of this document provide a breakdown of estimated annual running costs based on small, medium and large hot water loads for each state based on their power supplies *aquatech owners who have Solar PV arrays can have significantly less running costs compared to owner's who run their system solely on Continuous or Shoulder tariffs. However, these savings are based on the home's Solar PV array having enough generation output to meet the aquatech's power draw down at all times.*

To determine the minimum Solar PV array size need to prevent excess draw down of grid power, we will need to examine:

1. *Solar PV hourly power output*
2. *Solar PV daily seasonal power output.*
3. ***aquatech** daily seasonal power draw down.*

1. UNDERSTANDING SOLAR PV DAILY OUTPUT

Solar PV panels generate electricity by absorbing sunlight and using it to create an electrical current. The effectiveness of the panels to produce electricity is therefore linked to the amount of received light and light intensity. This results in a bell curve occurring during the day where by the Solar PV output will be highest in the middle of the day and lowest at sunrise and sunset.

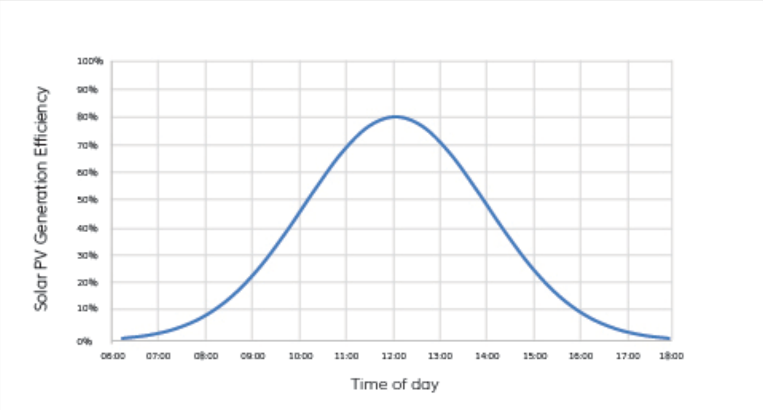


Figure 1. Solar PV Generation Efficiency based on time of day.

Solar PV production will also vary between winter and summer and does not take into account drops in Solar PV production due to shade or high cloud cover days. However, it does provide a good indication of how a home's Solar PV system output tracks on a typical sunny day.

It is also important to note that Solar PV systems are never 100% efficient in converting sunlight to energy, so the below graph is calculated as a percentage of system output based on the system rating. For example, a 1kW rated solar PW system will peak at 80% of rated output or 800W at midday, while at 9:00am, the output may only be 35% or 350W.

*Figure 1 is a good guide for home owner's to match their **aquatech's** running times to the highest Solar PV output times, using the system's in-built timer function. Otherwise **aquatech** owners can use the factory default timer periods (09:00 - 17:00).*

2. UNDERSTANDING SOLAR PV SEASONAL OUTPUT

Solar PV not only has daily output variations, but also seasonal variations. This is due to the different intensity of sunlight hitting the panels across the year, which directly impacts Solar PV power output. The result is a maximum Solar PV output in summer and a minimum Solar PV output in winter.

Figure 2 below shows the daily output in watts of a 1kW Solar PV system installed in Sydney across the year.

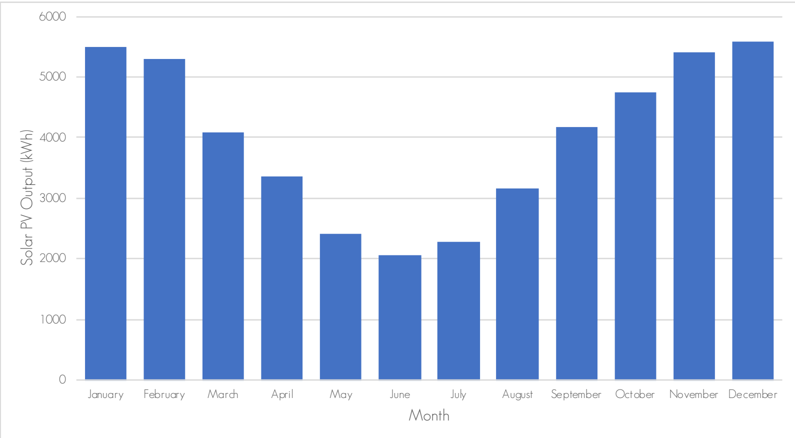


Figure 2. Seasonal Solar PV output based on seasonal variation (Sydney).

Figure 2 highlights the dip in Solar PV output in winter. When calculating the minimum Solar PV array size, it is important for customers to consider the lowest projected output in winter.

3. UNDERSTANDING **aquatech** SEASONAL DRAW DOWN

Small, medium and large hot water load profiles vary across the year based on seasonal conditions with summer having the lowest power draw and winter having the highest power draw. This is mainly due to colder inlet water temperatures in winter requiring more power to heat up to a usable 45°C outlet temperature.

Figure 3 shows the estimated daily power drawn down in watts of the **aquatech** to meet the medium hot water load profile in Sydney across the year.

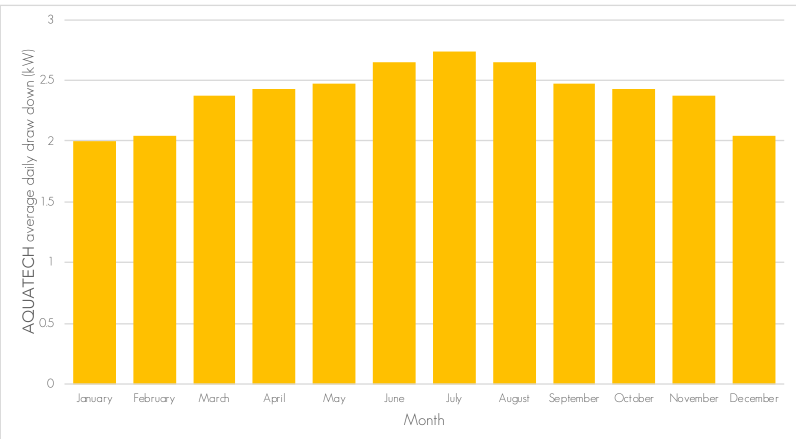


Figure 3. Daily average power draw down in watts - medium load (Sydney).

Power draw down in Figure 3 shows that winter time has the highest seasonal draw down to meet load demand. Calculating Solar PV array size therefore has to be based on winter power consumption.

Installing a **aquatech** in line with a home's Solar PV system can provide significant reductions in running cost compared to grid supplied power. These savings in running costs can quickly add up to hundreds of dollars a year for a typical four-person family. The **aquatech's** in-built timer feature makes syncing with a home's Solar PV output as easy as setting a clock. However, before a household can maximize the benefits of running their **aquatech** on Solar PV they must consider the following factors:

1. Your household's hot water demand

A **aquatech's** 210L tank can provide enough hot water for even a large household's hot water load, even with a single daytime heating cycle. If you do have more than four people in the home or have a high hot water usage, you many need to utilise the systems Element Booster function, which would result in the **aquatech** drawing some of its daily energy from the grid.

2. Your energy providers tariff rates vs feed-in rates

Before determining if it is financially worthwhile running your **aquatech** on your PV system, check the tariff rates and feed-in rates offered by your energy providers. Some energy providers may offer significantly higher feed-in rates than advertised on their websites. If the Continuous, Shoulder rates or Solar PV feed-in rates are close in value, then the savings may not be significant.

3. Your Solar PV array size

We have aimed to provide a recommended minimum Solar PV array size by state as shown in the following section of this document. It is important to ensure that your Solar PV array has a minimum capacity based on these graphs. If your Solar PV array output is less than the recommended minimum, a **aquatech** is likely to draw grid power, lowering your potential savings.

4. Your **aquatech** is connected to a continuous tariff

Net metering only applies to a home's continuous tariff supply. If your **aquatech** is connected to an off-peak or shoulder tariff, even setting timers to run at the same time as your home's Solar PV production, will not result in a reduction in grid power draw. To limit the **aquatech** draw down of grid power, the system must be connected to a Continuous tariff supply.

5. Your **aquatech** is set to Timer Mode

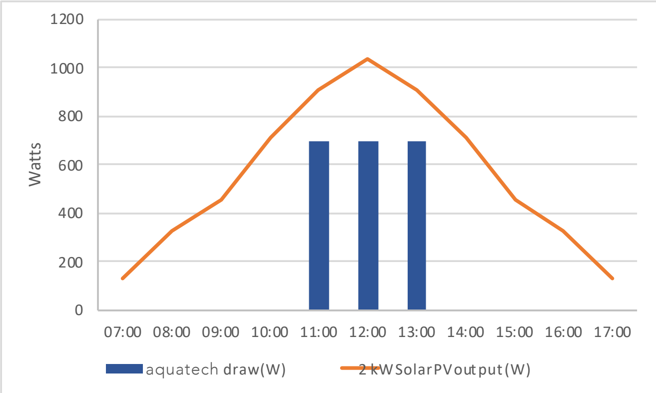
The **aquatech** has two primary running modes:

> Constant Mode – system will heat whenever the tank water temperature drops below 55°C.
> Timer Mode - system will heat when the tank water temperature drops below 55°C but only during the timer periods (factory default block is 09:00 - 17:00)

To always run your **aquatech** using Solar PV, the system must be in Timer Mode.

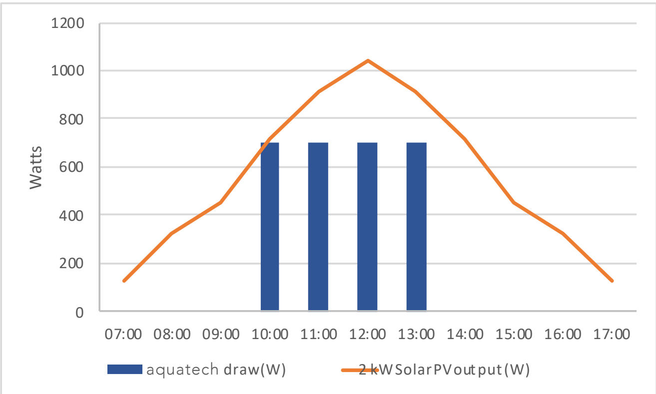
__aquatech__ systems in Timer Mode need to ensure their time is set correctly to properly utilise Solar PV and the in-built timers. If you need assistance with setting your __aquatech__ please call us on 1300 769 904 during office hours.

Small hot water load - peak winter



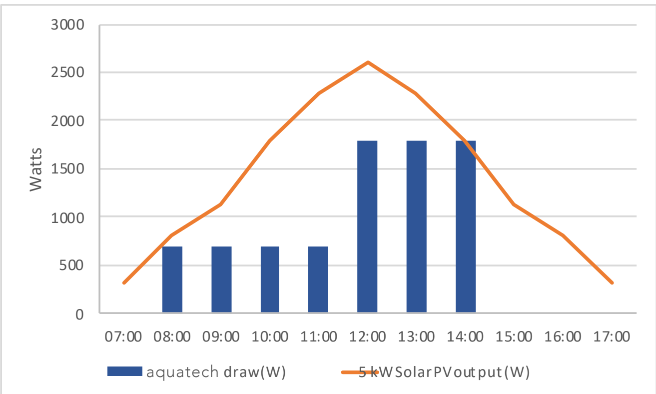
aquatech Recommendations	
Min. Solar PV Array	2kW
Timer Periods	11:00 - 14:00
Set Temperature	60°C
Reheat Temperature	55°C
Annual Heat Pump draw down	734kW
Annual Element draw down	0kW
Annual Running Cost (Continuous tariff)	$213.00
Annual Running Cost (Shoulder tariff)	$154.00
Annual Running Cost (Solar PV tariff)	$59.00

Medium hot water load - peak winter



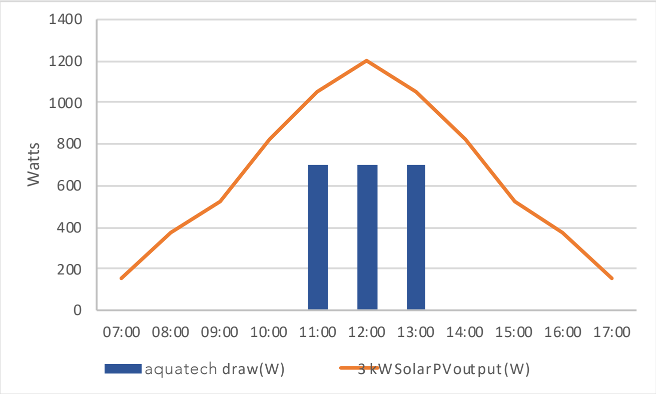
aquatech Recommendations	
Min. Solar PV Array	2kW
Timer Periods	11:00 - 14:00
Set Temperature	60°C
Reheat Temperature	55°C
Annual Heat Pump draw down	1208kW
Annual Element draw down	0kW
Annual Running Cost (Continuous tariff)	$350.00
Annual Running Cost (Shoulder tariff)	$253.00
Annual Running Cost (Solar PV tariff)	$97.00

Large hot water load - peak winter



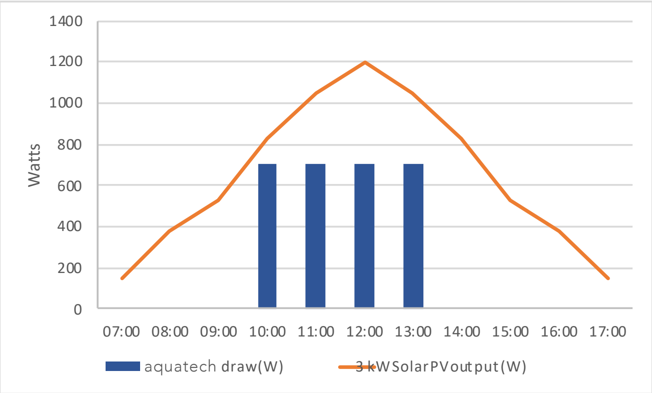
aquatech Recommendations	
Min. Solar PV Array	5kW
Timer Periods	08:00 - 15:00
Set Temperature	70°C
Reheat Temperature	55°C
Annual Heat Pump draw down	1208kW
Annual Element draw down	1622kW
Annual Running Cost (Continuous tariff)	$821.00
Annual Running Cost (Shoulder tariff)	$595.00
Annual Running Cost (Solar PV tariff)	$226.00

Small hot water load – peak winter



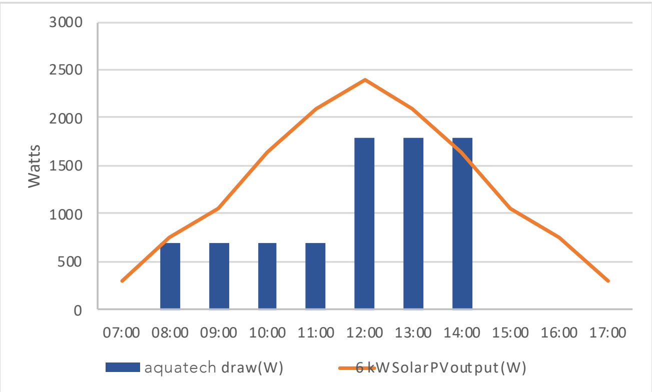
aquatech Recommendations	
Min. Solar PV Array	3kW
Timer Periods	11:00 - 14:00
Set Temperature	60°C
Reheat Temperature	55°C
Annual Heat Pump draw down	734kW
Annual Element draw down	0kW
Annual Running Cost (Continuous tariff)	$220.00
Annual Running Cost (Shoulder tariff)	$125.00
Annual Running Cost (Solar PV tariff)	$59.00

Medium hot water load – peak winter



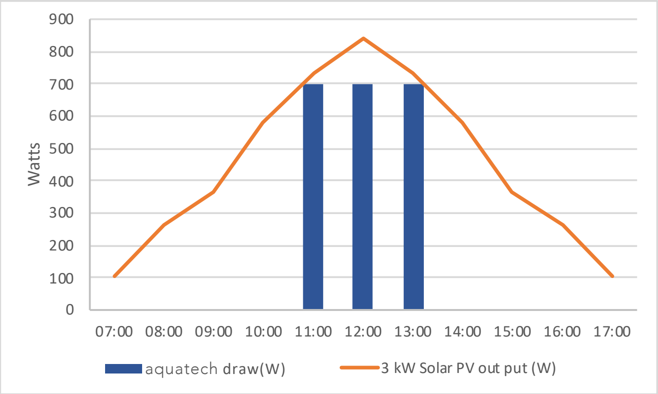
aquatech Recommendations	
Min. Solar PV Array	3kW
Timer Periods	10:00 - 14:00
Set Temperature	60°C
Reheat Temperature	55°C
Annual Heat Pump draw down	1208kW
Annual Element draw down	0kW
Annual Running Cost (Continuous tariff)	$362.00
Annual Running Cost (Shoulder tariff)	$205.00
Annual Running Cost (Solar PV tariff)	$97.00

Large hot water load – peak winter



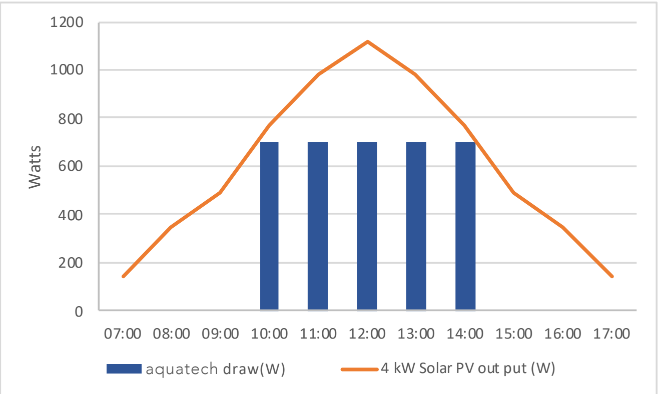
aquatech Recommendations	
Min. Solar PV Array	6kW
Timer Periods	08:00 - 15:00
Set Temperature	70°C
Reheat Temperature	55°C
Annual Heat Pump draw down	1208kW
Annual Element draw down	1622kW
Annual Running Cost (Continuous tariff)	$849.00
Annual Running Cost (Shoulder tariff)	$481.00
Annual Running Cost (Solar PV tariff)	$226.00

Small hot water load – peak winter



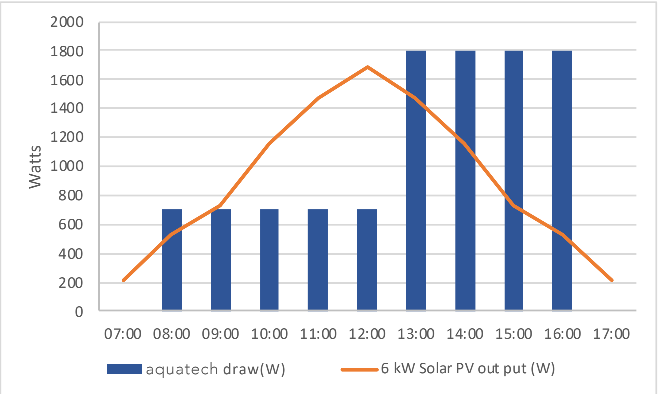
aquatech Recommendations	
Min. Solar PV Array	3kW
Timer Periods	11:00 - 14:00
Set Temperature	60°C
Reheat Temperature	55°C
Annual Heat Pump draw down	865kW
Annual Element draw down	0kW
Annual Running Cost (Continuous tariff)	$216.00
Annual Running Cost (Shoulder tariff)	$173.00
Annual Running Cost (Solar PV tariff)	$104.00

Medium hot water load – peak winter



aquatech Recommendations	
Min. Solar PV Array	4kW
Timer Periods	10:00 - 15:00
Set Temperature	60°C
Reheat Temperature	55°C
Annual Heat Pump draw down	1403kW
Annual Element draw down	0kW
Annual Running Cost (Continuous tariff)	$351.00
Annual Running Cost (Shoulder tariff)	$281.00
Annual Running Cost (Solar PV tariff)	$168.00

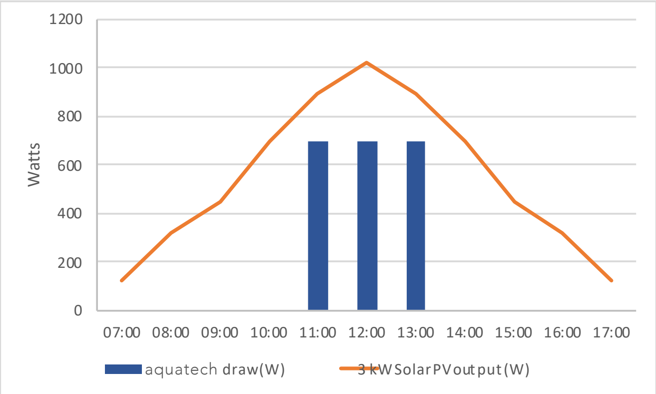
Large hot water load – peak winter



aquatech Recommendations	
Min. Solar PV Array	6kW
Timer Periods	08:00 - 15:00
Set Temperature	70°C
Reheat Temperature	55°C
Annual Heat Pump draw down	1403kW
Annual Element draw down	1797kW
Annual Running Cost (Continuous tariff)	$800.00
Annual Running Cost (Shoulder tariff)	$640.00
Annual Running Cost (Solar PV tariff)	$427.00

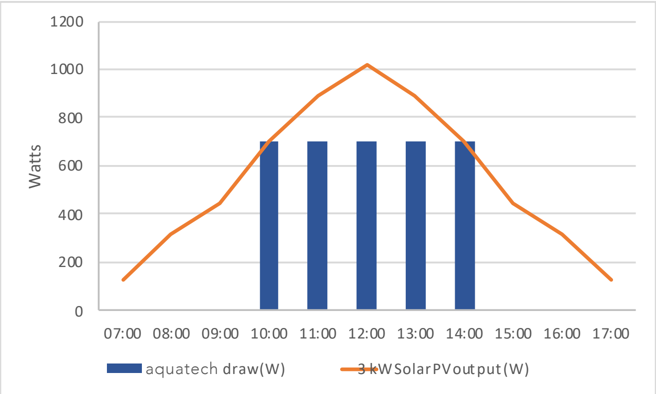
SOUTH AUSTRALIA SUMMARY

Small hot water load – peak winter



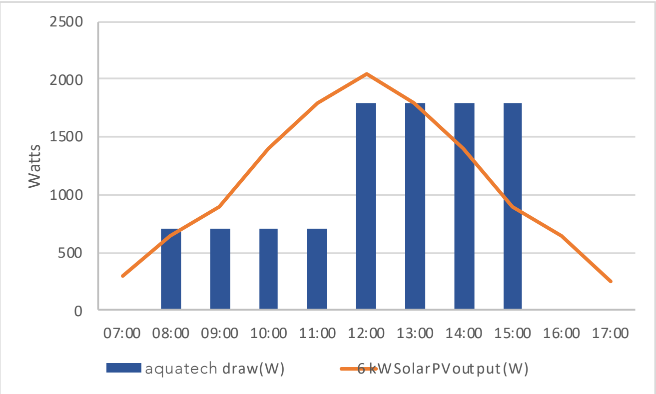
aquatech Recommendations	
Min. Solar PV Array	3kW
Timer Periods	11:00 - 14:00
Set Temperature	60°C
Reheat Temperature	55°C
Annual Heat Pump draw down	734kW
Annual Element draw down	0kW
Annual Running Cost (Continuous tariff)	$220.00
Annual Running Cost (Shoulder tariff)	$125.00
Annual Running Cost (Solar PV tariff)	$59.00

Medium hot water load – peak winter



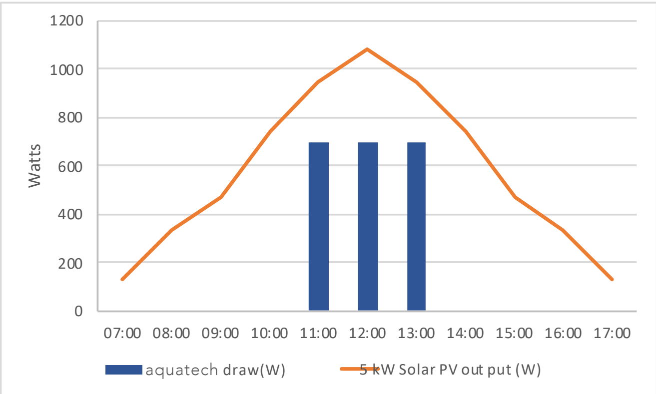
aquatech Recommendations	
Min. Solar PV Array	3kW
Timer Periods	10:00 - 15:00
Set Temperature	60°C
Reheat Temperature	55°C
Annual Heat Pump draw down	1208kW
Annual Element draw down	0kW
Annual Running Cost (Continuous tariff)	$362.00
Annual Running Cost (Shoulder tariff)	$205.00
Annual Running Cost (Solar PV tariff)	$97.00

Large hot water load – peak winter



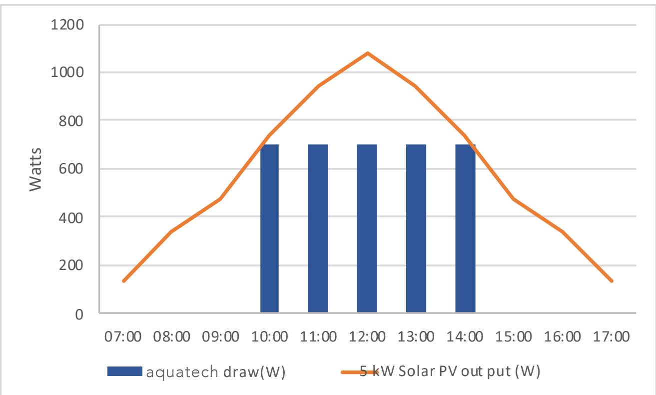
aquatech Recommendations	
Min. Solar PV Array	6kW
Timer Periods	08:00 - 15:00
Set Temperature	70°C
Reheat Temperature	55°C
Annual Heat Pump draw down	1208kW
Annual Element draw down	1622kW
Annual Running Cost (Continuous tariff)	$849.00
Annual Running Cost (Shoulder tariff)	$481.00
Annual Running Cost (Solar PV tariff)	$226.00

Small hot water load – peak winter



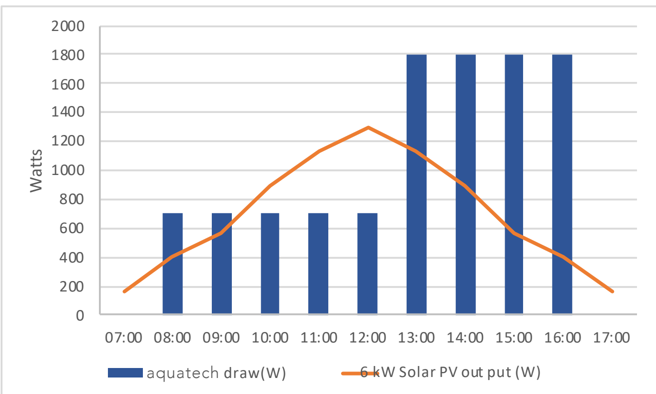
aquatech Recommendations	
Min. Solar PV Array	5kW
Timer Periods	11:00 - 14:00
Set Temperature	60°C
Reheat Temperature	55°C
Annual Heat Pump draw down	927kW
Annual Element draw down	0kW
Annual Running Cost (Continuous tariff)	$250.00
Annual Running Cost (Shoulder tariff)	$167.00
Annual Running Cost (Solar PV tariff)	$83.00

Medium hot water load – peak winter



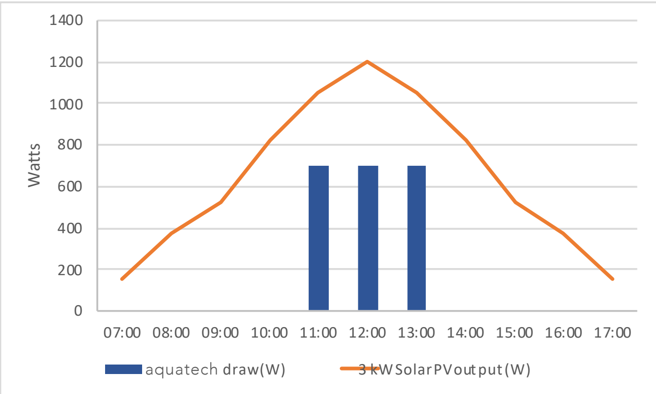
aquatech Recommendations	
Min. Solar PV Array	5kW
Timer Periods	10:00 - 15:00
Set Temperature	60°C
Reheat Temperature	55°C
Annual Heat Pump draw down	1502kW
Annual Element draw down	0kW
Annual Running Cost (Continuous tariff)	$406.00
Annual Running Cost (Shoulder tariff)	$270.00
Annual Running Cost (Solar PV tariff)	$135.00

Large hot water load – peak winter



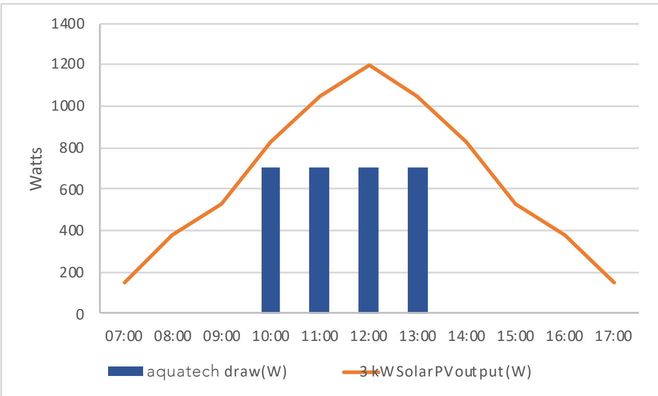
aquatech Recommendations	
Min. Solar PV Array	6kW
Timer Periods	08:00 - 15:00
Set Temperature	70°C
Reheat Temperature	55°C
Annual Heat Pump draw down	1502kW
Annual Element draw down	1797kW
Annual Running Cost (Continuous tariff)	$891.00
Annual Running Cost (Shoulder tariff)	$595.00
Annual Running Cost (Solar PV tariff)	$255.00

Small hot water load – peak winter



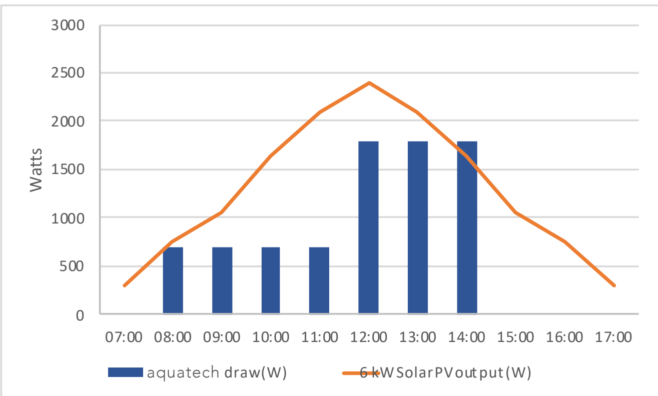
aquatech Recommendations	
Min. Solar PV Array	3kW
Timer Periods	11:00 - 14:00
Set Temperature	60°C
Reheat Temperature	55°C
Annual Heat Pump draw down	734kW
Annual Element draw down	0kW
Annual Running Cost (Continuous tariff)	$212.00
Annual Running Cost (Shoulder tariff)	$213.00
Annual Running Cost (Solar PV tariff)	$147.00

Medium hot water load – peak winter



aquatech Recommendations	
Min. Solar PV Array	3kW
Timer Periods	10:00 - 14:00
Set Temperature	60°C
Reheat Temperature	55°C
Annual Heat Pump draw down	1208kW
Annual Element draw down	0kW
Annual Running Cost (Continuous tariff)	$350.00
Annual Running Cost (Shoulder tariff)	$350.00
Annual Running Cost (Solar PV tariff)	$241.00

Large hot water load – peak winter



aquatech Recommendations	
Min. Solar PV Array	6kW
Timer Periods	08:00 - 15:00
Set Temperature	70°C
Reheat Temperature	55°C
Annual Heat Pump draw down	1208kW
Annual Element draw down	1622kW
Annual Running Cost (Continuous tariff)	$821.00
Annual Running Cost (Shoulder tariff)	$821.00
Annual Running Cost (Solar PV tariff)	$566.00