

# Powering your savings: How solar, batteries and energy smarts and can slash bills

Top energy efficiency tips  
Other areas for energy efficiency  
& Solar

Gareth Huxham, Huxham Energy Consulting  
[www.huxham.com.au](http://www.huxham.com.au) [gareth@huxham.com.au](mailto:gareth@huxham.com.au)





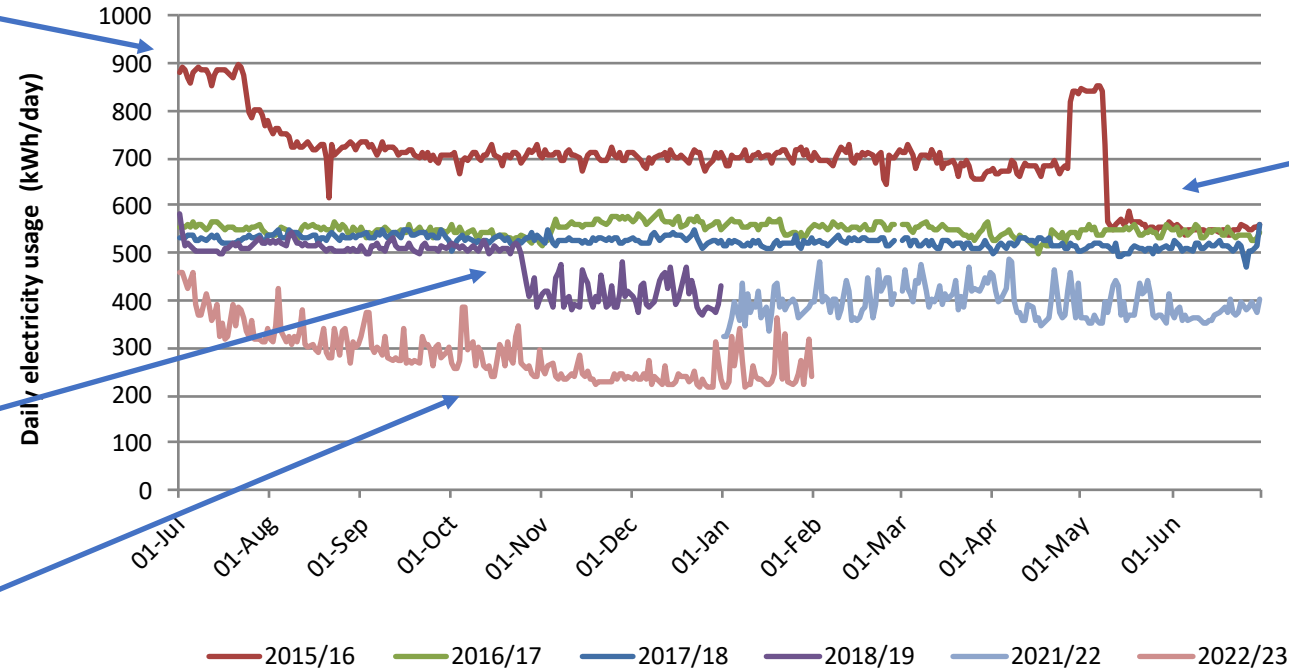
# First energy efficiency, then solar

1. Ventilation controls

2. Lighting upgrade

3. 1<sup>st</sup> Solar Array

4. 2<sup>nd</sup> Solar Array  
with battery



Savings > 70%

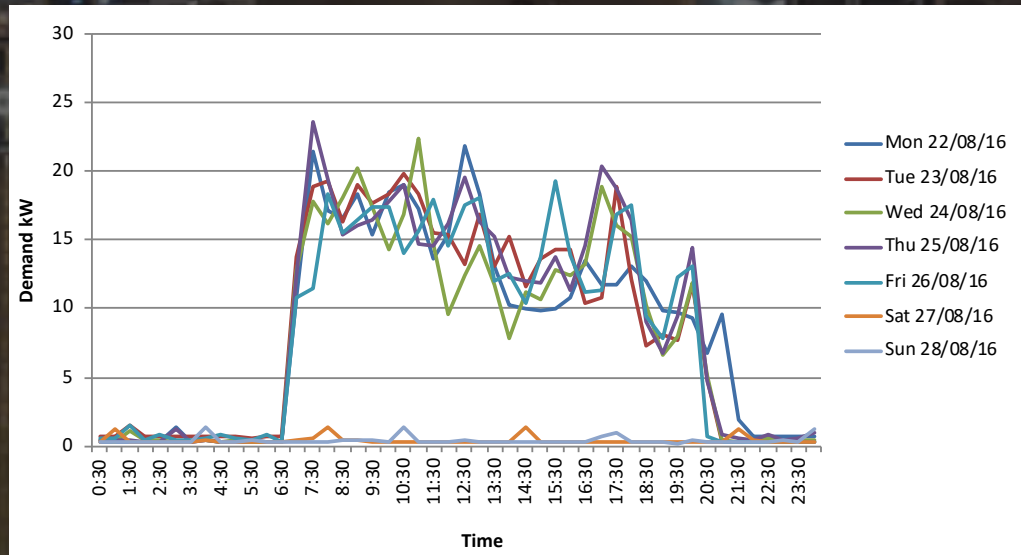
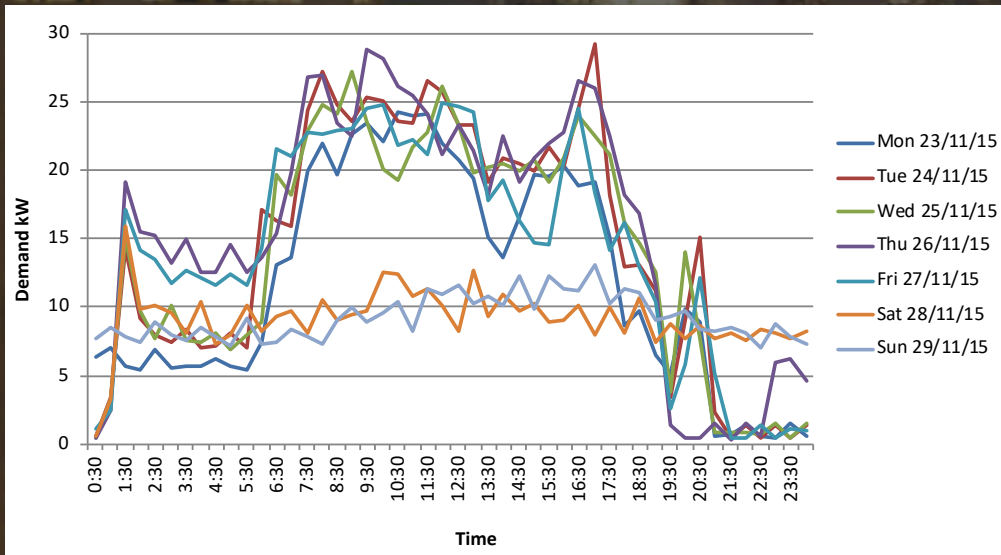
# After hours electricity usage

How much electricity is being consumed when your site is not being used?

- Equipment in standby.
- Lights and other equipment left on.
- Air-conditioning switching on automatically (time clock controls).
- Staff / cleaners switching on lights / air-conditioning and leave it running.

**Child care centre: Half of all electricity usage was consumed outside working hours**

Reduce electricity usage by 50,124 kWh pa (48%) and save \$5,000 Ex GST pa.





# Lighting

## Your business may have a wide range of lighting

- Office lighting
- Reception lighting
- Designer lighting
- Fire stair lighting
- Car park lighting
- Plant room lighting
- Corridor lighting
- Bathroom lighting
- Exterior lighting
- Warehouse lighting (high bay, low bay)

**All can be upgraded to LED**

## Lighting controls

Lighting can often be controlled by one switch.  
Lighting circuit layout may not be efficient.  
There may need a need to change lighting circuits.

Motion sensors in areas of low occupancy  
e.g. print rooms, lunch rooms, meeting rooms, offices.

Daylight harvesting and motion sensors in warehouses

**Best practise is LED lights with in-built motion sensors,  
Not motion sensors controlling banks of lights**



# Air-conditioning energy savings tips - Cooling

- Set-point temperature.
- Clean filters.
- Use blinds or window films to reduce solar gains.
- Can fans / ventilation be used?
- How is air-conditioning zoned? Conduct an air balance.
- How is air-conditioning controlled?
  - Time clocks? What are the set times?
  - Does air-conditioning run on public holidays?
  - Is it controlled by staff? (on/off, fan speed, temperature).
  - What about after hours air-conditioning?
- Can fresh outside air be used to cool?
- Can heat exchangers be used to pre-cool outside air supply?

It is recommended to maintain temperature set points of 19°C to 20°C in winter and 23°C to 24°C in summer. Changing set point by 1° can provide energy savings of 5% to 10%



# Air-conditioning energy savings tips - Heating

Is your air-conditioning reverse cycle?

Does it provide heating using the refrigeration cycle. Or does it use heating elements?

Switch direction of ceiling fans. Ceiling fan direction in the winter should be clockwise, and the fan should run at the lowest speed. This pulls cool air up toward the ceiling and displaces the warm air that rises and collects near the ceiling.

Radiant or convection electric heaters?

- Radiant heaters: use to heat individuals not to heat a room. A good choice to provide directional heat in a draughty room.
- Convection: good at heating an enclosed room.



# Air-conditioning - Ventilation

Ventilation can be a major energy user

However many businesses do not know the size of the fans, or how they are controlled, run-times.

Fans may be hidden, or on the roof.

Example of ventilation. fans are:

- Kitchen exhaust
- Bathroom exhaust
- Supply air fans
- Exhaust air fans
- Car park ventilation
- Fire services fans



EcoPower fan is a hybrid wind-powered and high efficiency EC electric motor



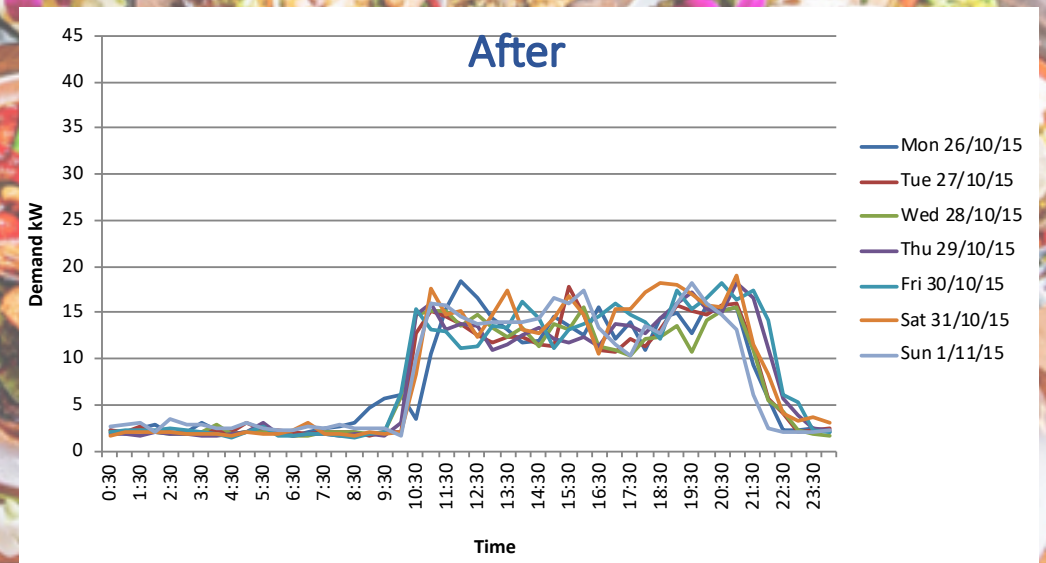
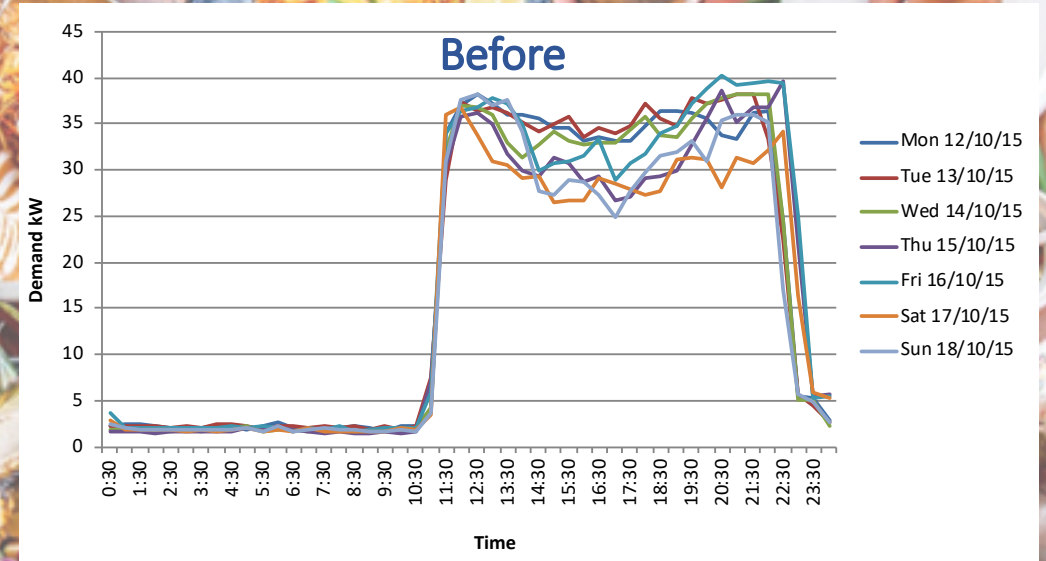


# Thai Restaurant

The site saved \$23,300 Ex GST pa.

Moved onto the correct network tariff, and onto the best rates.

Identified and resolved an issue with air-conditioning / ventilation controls.

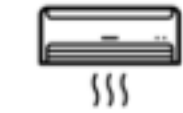




# Appliances



[www.energyrating.gov.au](http://www.energyrating.gov.au)



Air Conditioners



Battery Chargers



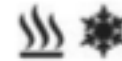
Distribution Transformers



External Power Supplies



Refrigeration - Commercial



Space Heating and Cooling



Water Heating



Refrigeration - Domestic



Televisions



Swimming Pool Pumps



Lighting



Electric Motors



Clothes washers



Dishwashers



Clothes dryers



Computers and Computer Monitors

# Hot water

## First – Reduce

- Reduce hot water usage. I.e. lower flow taps and shower heads.
- Reduce heat losses

## Second - Upgrade

- Instantaneous gas
- An electric heat pump – up to 4 times less electricity than a standard electric hot water system
- Solar hot water, with electric or gas boost



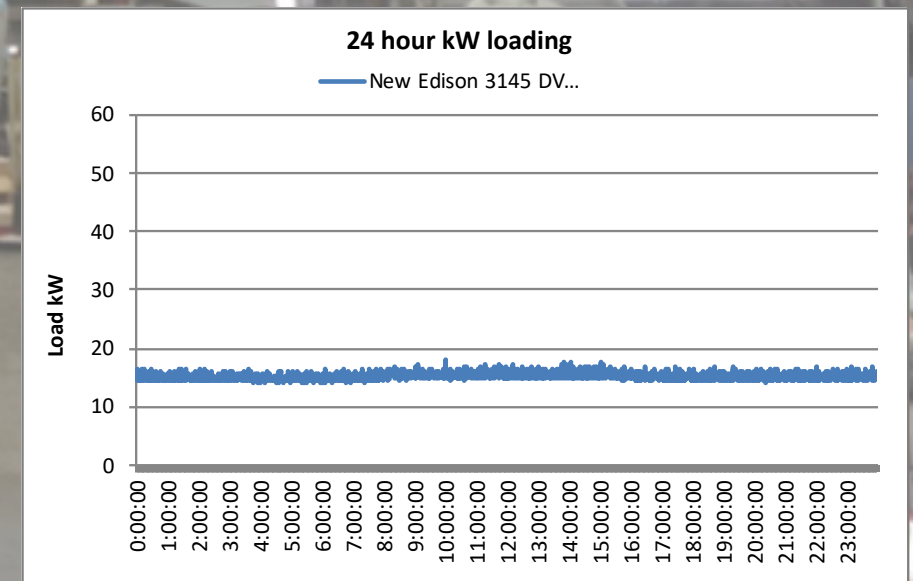
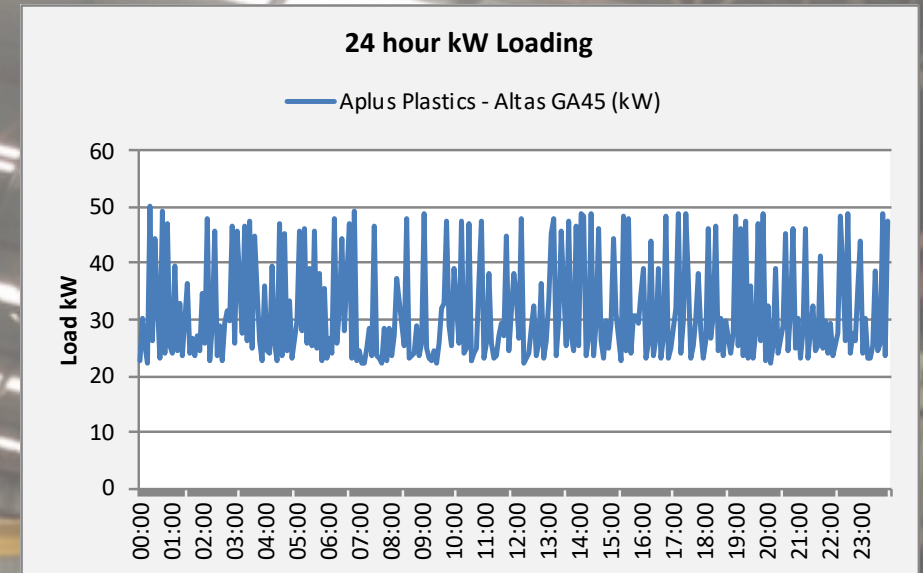


# Air-compressors

Electricity reduced by 48%

Saving 92,000 kWh pa

- Energy efficiency VSD controlled air-compressor.
- Upgraded air reticulation system.
- Fix air leaks.





# Refrigeration

## First – Reduce

- Clean filters & maintenance
- Reduce heat increases e.g. plastic curtain

## Second - Upgrade

- Energy efficiency compressors
- Cool rooms with insulation



Example of dirty coils



# Solar

3 key issues when first looking into solar:

1. Roof condition / roof membrane condition.
2. Electrical infrastructure.
3. Roof access.

Roof condition:

- Are there any leaks?
- Have there been any historical issues?
- When was the roof / membrane last maintained,
- When is the roof due for an upgrade?





39.9kW system  
Installed 2019

Energy savings > 30%  
Saving > \$12,000 pa



\*\*Solarpro



# Solar – Types of mounting

## Anchored / membrane piercing

- An anchored system is preferred for sites with high wind loading.
- Is the 'standard' installation.
- Accepted industry practices and best practice guidelines for installing solar systems on concrete roofs and waterproof membranes.



## Floating / ballasted

- Does not pierce water proof membrane.
- Weight down by blocks.
- Can be more expensive.



# Electrical infrastructure

How will a solar connect to your electricity supply?

Upgrades may be required to ensure electrical infrastructure can handle the load, is safe, and meets Australian Standards.

Does your switchboard look like this?



Or this?....





# Roof access



This site had easy access to roof through fire stairs. However one section was narrow and hand rails needed to be installed for safe work on the roof



This 20-storey had site had an un-safe roof that no solar suppliers were willing to work on



Many roofs are accessible by small hatches that can not fit a solar panel. Cranes are required to lift equipment to the roof

# How much solar can fit on your roof?

A solar array requires  $\sim 8\text{m}^2$  per kW

Your site may have a large roof, however the usable area can be restricted due to:

- Shading
- Ventilation equipment
- Access / anchor points
- Orientation





AUSTRALIAN SOLAR AND BATTERY CALCULATOR

# Discover the savings your roof can make with solar and batteries

Grab an electricity bill and try SunSPOT now

Solar online tool

<https://www.sunspot.org.au/>

**Not-for-profit SunSPOT solar and battery calculator estimates your system size, the cost, and how much you'll save, privately and simply.**

Built by UNSW for the APVI and supported by the Australian Government.

# What size solar array?

A solar array should be sized to meet your daytime electricity usage.

## How much electricity we use during the day?

Rough guide: A solar array kW size should be around 1.5 to 2 times your daytime kW demand for electricity.

Max output of a solar array is ~70% to 80% of its rated size.  
I.e. a 10kW solar array may only generate a maximum 7kW or 8kW during the middle of the day in summer, and much less in winter.

**Export ratio:** ratio of the electricity generated by the solar array that is exported back to the grid.

**Feed in tariff :** Much lower than the cost of electricity from the grid



24.6kW solar array. 18% export ratio.  
6,490 kWh pa exported to the grid

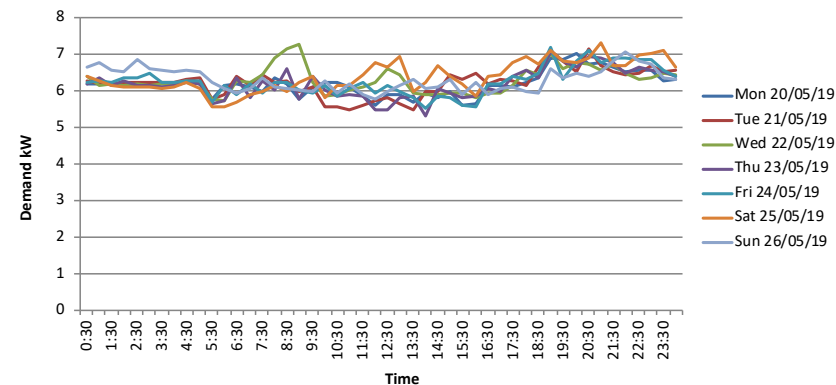


# Daytime electricity usage

Billing data	Interval data
<ul style="list-style-type: none"> <li>Only shows total electricity usage per month or per quarter.</li> <li>Should not be used to size a solar array.</li> <li>Bills are used to determine the <u>daytime</u> cost of electricity purchased from the grid.</li> </ul>	<ul style="list-style-type: none"> <li>Interval data is your electricity usage data in 30-minute intervals.</li> <li>Shows when and how you use electricity.</li> <li>Shows <u>daytime</u> electricity usage, this is required to work what size solar array you need. Your solar supplier will need this data to quote your system.</li> <li>Interval data can be requested from you energy retailer, or downloaded from your online account / web portal.</li> </ul>

## New charges and credits.

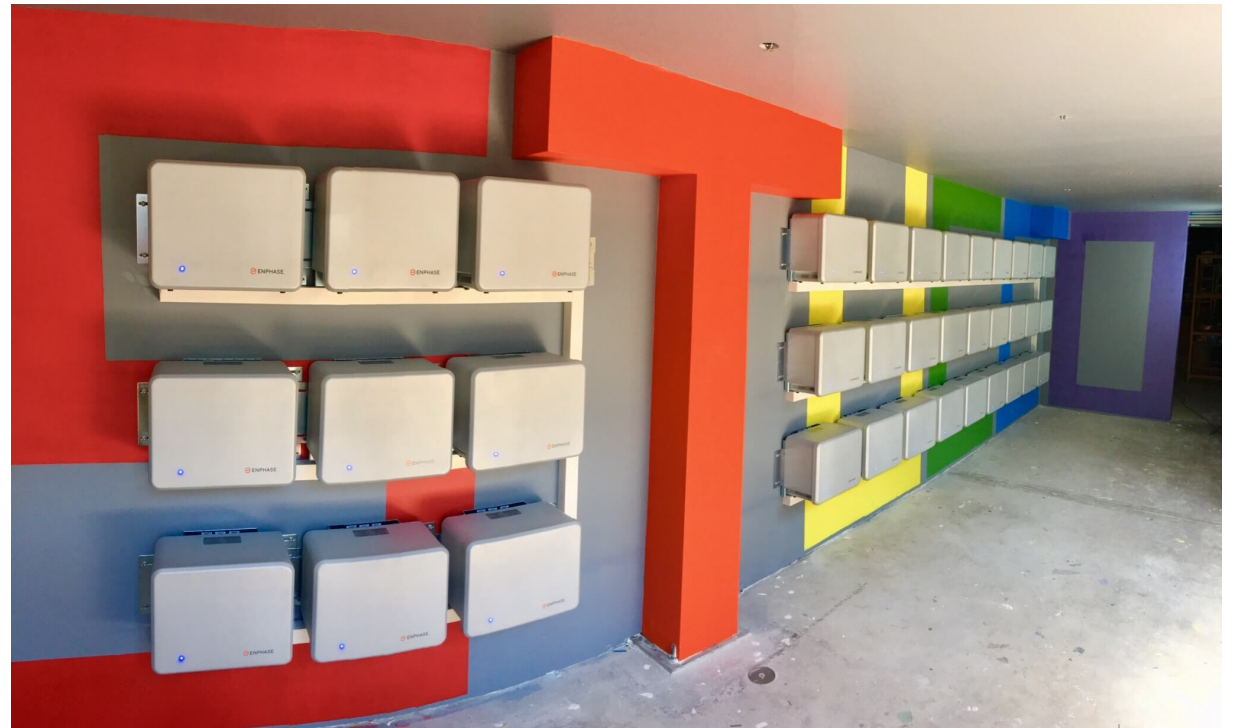
Usage and supply charges	Units	Price	Amount		
Peak	2232.756kWh	\$0.539	\$1,203.46		
Off peak	4894.386kWh	\$0.1495	\$731.71		
Shoulder	5827.724kWh	\$0.2295	\$1,337.46		
Supply charge	86 days	\$0.96	\$82.56		
Total charges				+	3,355.19
<b>Credits</b>					
Reversal - Debit(\$12.73 + \$0.00GST)			\$12.73cr		
32% Guaranteed Discount			\$1,047.25cr		
Total credits				-	1,059.98cr
Total new charges and credits				=	2,295.21
Total GST				+	230.79



# Batteries

Batteries are most cost-effective when there are fully utilised

This means fully charged, and fully discharged every day





# Getting a solar quotes

Recommended to obtain quotes for 3 suppliers.

Installer must have CEC accreditation (required to be eligible for STC Rebate).

Provide each solar supplier with:

- Recent electricity bills.
- Interval data (if possible).
- Note any site specific issues: roof condition, electricity infrastructure, roof access.
- Arrange a site inspection NOT just a desktop quote.

# Solar Quote checklist

- Size of system kW
- Cost
  - Not the most important factor.
  - Is it a firm cost? Has the installer conducted a site inspection?
- Product quality.
- Warranty:
  - Panel product warranty.
  - Inverter warranty.
  - Workmanship.
- Mounting type:
  - Anchored or ballasted.
  - Flat or tilt mounted.
- Installer:
  - Reputation.
  - Installer CEC accreditation (required to be eligible for STC Rebate).
- What is included?
  - Ausgrid approvals.
  - Access to roof, lifting equipment to roof, and working safely on the roof.
  - Switchboard / electrical upgrades.
  - Connecting the solar to the site e.g. cable run to meter.
- Monitoring.
  - Should be included in all installations.
  - Is there an annual subscription fee.
- Maintenance.



# Solar warranties

Warranty	Description	Range
Solar panel product warranty	For defects in materials and workmanship. From manufacturer.	10 to 25 years
Solar panel performance warranty	Panel output over a specific period From manufacturer.	Progressively reduced performance guarantee of 25 years. Can be around 80% to 82% over 25 years
Inverter warranty	For defects in materials and workmanship. From manufacturer.	5 to 12 years
Workmanship	From installer. Standard 5yr warranty for CEC approved installer on the operation and performance of the whole solar system including workmanship and products.	5 to 10 years

Solar cant supply all your energy, or solar may not be viable for your business. You can still supply your business with 100% renewable carbon neutral energy

## Power Purchase Agreement (PPA)



[www.greenpower.gov.au](http://www.greenpower.gov.au)

GreenPower is 100% accredited new renewable energy.

**Costs for GreenPower** ~5 c/kWh





A scenic landscape featuring a paved road that curves through a lush green field. The road is flanked by trees and a wire fence. In the background, there are rolling hills and a small body of water under a bright blue sky with scattered white clouds.

Final tip

Conduct an energy audit