



# Grid Connect Solar PV User Manual

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CEC Accreditation and Electrical Contractors numbers will be detailed on your Electrical Compliance Certificate attached to your invoice, please email us for a copy if required. This document has been prepared as a reference and maintenance manual for the owner of a 247 Energy supplied and installed Solar PV power system.

# Introduction

247 Energy congratulates you on the installation of your new grid connected solar PV system.

Great care has gone into the design, choice of components and installation of your system. Your solar PV generator has been designed specifically for Australian conditions; and, to meet the requirements of the current Australian electrical standards and building codes.

We have included information in this manual to assist you with the operation and maintenance of your new grid connected solar PV system.

It is imperative you observe all safety requirements when dealing with all elements of your new system. Please ensure you familiarise yourself with the safety requirements in this manual together with any local safety rules for your state.

Once your grid-connected solar PV system has been commissioned, it should provide you with trouble free automatic operation and web based monitoring via your internet wifi router.

All data sheets, equipment manuals and warranty information is available to view or downloadable on the 247 Energy website.

## Solar PV Power Explained

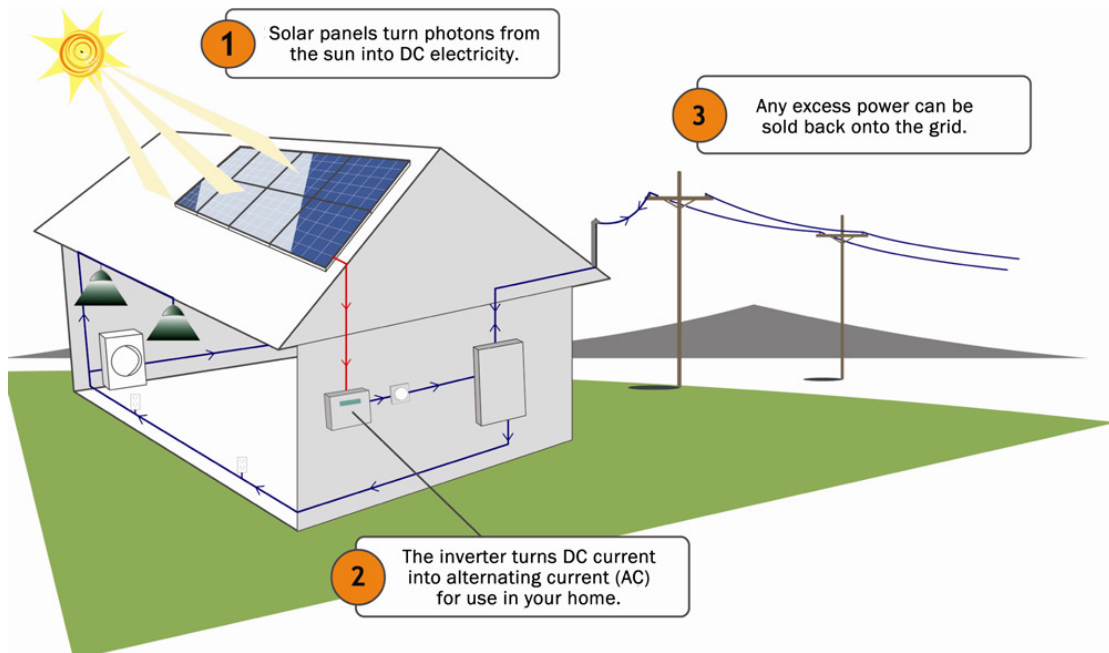
### How Solar Power Works

Solar electricity generation works by converting energy from the sun, in the form of light, into electricity.

Solar cells are made of semiconductors and work via what is known as the photovoltaic (PV) effect. In this process when light hits a conductor and semiconductor it transfers its energy to that conductor.

Light is actually a stream of energy particles called photons. When the photons hit the silicon surface in the solar cells they generate electricity by transferring energy and freeing electrons. In this way electricity is generated.

Put simply, photovoltaic cells are energy converters converting the energy from sunlight into electricity.



## How a Grid Connected Solar Power System Works

A grid-connected solar PV power system is an array of photovoltaic modules connected via an inverter to provide power for your home, with excess production feeding into the grid for a credit payment from your retailer.

In some instances the electricity utility restrict your export and a meter is installed to measure the load, and the inverter generation. This meter tracks the load to ensure no excess electricity is generated and send back to the grid, this is commonly called a zero export system or a an export restricted system.

At night, when the solar modules are not producing electricity, your electricity is sourced from the grid. This can be summarised as follows:

- Photovoltaic Modules, also known as solar PV panels, directly convert energy in the form of sunlight into direct current (DC) electrical energy.
- An inverter changes the solar DC power into alternating current (AC) ready to be fed back into the grid or be used in your home.
- AC power from the inverter connects to the switchboard for self-consumption as a priority.
- The power utility electrical meter records the energy exported to the grid from your solar system as well as the energy imported from the grid.
- Any surplus electricity being generated simply flows through into the mains grid for use elsewhere, unless restricted via a zero export system.

## The Electricity Meter

Most homes will need to have their electricity meter changed to enable data to be collected by the electrical retailers and electrical distributors for your electricity

bills. The costs associated with the meter change are NOT covered by your solar system purchase price. Your electrical retailer will contact you and install a smart meter and these one-off charges will appear on your bill.

Note: If your meter has not been changed within 3 months of your installation contact your electrical retailer to establish why. Your meter can only be changed with a current electrical safety certificate that will expire after 12 months from the date of certificate issue and you will incur further cost to have these certificates re-issued.

## System Overview

- The solar panel array size and make will be detailed on your invoice.
- The grid connect inverter size and make will be detailed on your invoice

Data sheets manuals and warranty information is available on our web site, or email us for copies if required.

- The solar PV and electrical configuration will be detailed on your electrical compliance certificate attached as a PDF to your invoice.

Expected system yield information month by month would have been supplied to your during the quotation process. Please email us if you require a copy.

## System Performance

The system performance will depend on the geographical and atmospheric conditions of the installation site, the direction your panels face, the angle of tilt, the amount of dust and shading they encounter and the average weather conditions (cloud), this all affect the ability of the system to perform at its peak level.

The yield of the system will be affected by shading. Shading could be from trees, dust, bird droppings, buildings being built or extended onto, the installation of any structure or additions such as antenna, flues, plumbing pipe work, chimney, etc. Anything that projects a shadow on to the panels will affect its performance.

## Safety

The following safety instructions are important for your personal safety and for the optimum performance of your solar power system. Please take the time to go through the following checklist and contact us if any of this is unclear. The safety instructions must NOT be ignored.

- The service and maintenance of your newly installed solar power system must be carried out by a licensed electrical contractor in strict compliance with the

Australian building and electrical safety rules, you should always use a CEC accredited electrician who has experience with grid connected systems.

- If you are not a licensed electrical contractor or a qualified person do not attempt to do any modification and/or maintenance work on the solar power system. Doing so may put you in danger of electric shock, falling from heights, and may also void component warranties.
- Never pour cold water on solar module surfaces when the sun is shining and they are hot, doing so can shatter the solar module glass. This type of damage will not be covered by the solar module warranty. This activity could also expose you to the danger of electrocution as solar modules operate at high DC voltages.
- Never walk on the surface of the solar modules. Doing so may damage the solar module and will not be covered by warranty.
- Avoid working in the vicinity of the installed solar module area when raining or when the area is still wet, never walk on a wet or slippery roof. Always use a harness when working at heights and never work alone.
- Observe all safety signs installed as part of your system.
- Please note that DC voltages will be present on the solar module side of the inverter even if the isolating circuit breakers are completely switched off during daylight.
- Beware of the risk of death from touching electrical components! Do not open any of the components of your solar power system unless you are a qualified licensed electrical contractor with solar power experience and training.

# System Maintenance

SUGGESTED MAINTENANCE SCHEDULE				
Sub-system or component	Maintenance action 1)	Frequency 2)	Remarks	Check
General observations	Check that the inverter is working, and without fault lights The inverter will record the daily kWh production; this should on average correspond with the daily values for the same period in the CEC yield table in this manual.	Ongoing		
Site	Verify: (a) Cleanliness (accumulation of debris around and/or under array). (b) No shading of array.	Ongoing, Max Quarterly	Clean site as requested. Trim trees, if required.	
PV Modules	Verify cleanliness (accumulation of dust or fungus on array).		Clean if necessary	
	Check for visual defects including; (a) fractures (b) browning (c) moisture penetration (d) frame corrosion	1 year	Modules with visual defects should be further inspected for performance and safety to determine the need for replacement.	
	Inspect junction boxes for; (a) tightness of connections (b) water accumulation/build up (c) integrity of lid seals (d) integrity of cable entrances, glands and or conduit sealing (e) integrity of clamping devices Verify bypass diodes		Any defective seals, clamps and bypass diodes should be replaced.	
Wiring installations	Verify mechanical integrity of conduits.	5 years	Any damaged conduits should be replaced	
	Verify insulation integrity of cables installed without conduit.		Any damaged cable should be replaced	
	Check junction boxes for; (a) tightness of connection (b) high resistance (hot) connections (c) water accumulation/build up (d) integrity of lid seals (e) integrity of cable entrance, glands and/or conduits seals. (f) Integrity of clamping devices. Verify; (i) blocking diodes (ii) surge arresters for degradation	1 year		
	Check earthing connections for; (a) tightness of connections (b) corrosion (c) measure earth continuity		Replace or repair earthing system	
Electrical characteristics	Measure open circuit voltage Voc		According to AS 5033 clause 8.2	
	Measure short circuit current Isc			
	Measure "power curve" and compare to STC values.			
Protective devices	Verify integrity of fuses.			
	Verify and measure operation of CB's and RCD's.			
	Verify operation of earth fault protection system.			
	Verify operation of solar array isolation devices.			
Mounting system	Verify tightness and integrity of bolts and other fastening devices		Replace or repair as necessary	
	Inspect for corrosion and reseal roof penetrations if required			

1) This list of items is not exhaustive but are examples only

2) Values for frequency are examples. Frequencies may increase due to site or environmental conditions, corrosion checks should be performed during regular cleaning in locations close to salt water.

- Professional system performance and maintenance check

Note: Please check with the original roofing manufacturer for any specific additional maintenance requirements due to the installation of solar panels.

# Basic Inspection Procedure

## **Inverter**

Check the inverter during the day as described in your inverter manual. Take regular readings of the total energy produce (total kWh) and the date to compare to the yield estimates supplied to you or download via your online monitoring app. Keep the inverter clean, dust free and check for any infestation by insects or wildlife.

## **Check for shading**

Trees can grow quickly and they may have grown since your solar PV system was installed. If they are shading your panels, you will be able to see this by checking the array for shading across several hours during the day. Check at 10am, 12 noon and 3pm. If you detect shading, the trees may need to be trimmed. Be sure to check with your local council to ensure you comply with local laws before trimming or removing trees.

## **Check for tree litter behind modules and framing**

If you are in a fire risk area, or have trees surrounding your system, ensure tree litter is not lodged behind the panels and frames. This maintenance is particularly important to include as part of your fire readiness plan. Flying embers in a bush fire could ignite tree litter behind panels.

## **Check for build-up of dust or bird droppings**

A build up of dust or bird droppings on your solar panels will reduce the systems output performance. Refer to the section in this manual on cleaning the panels and safety warnings.

247 Energy does not recommend you climb on to your roof. This should only be undertaken by suitably qualified and equipped person, following Occupational Health and Safety procedures and a Risk Assessment.

## **Check for nesting or den construction under or around your panels.**

It is possible wildlife may construct a nest or den around or under you equipment. This is dangerous for the wildlife due to shock, it may increase the fire risk or impair the performance of your system. In many instances removal of wildlife requires a licensed and specialist operator, always contact you local authorities before relocating wildlife and have the system checked for damage by a qualified CEC accredited electrician.

# Trouble Shooting

## **Inverter**

The inverter is considered to be the "heart" of the solar system as it controls every aspect of the power generation within the system and provides system status indication.

Your inverter manual contains information on identifying problems.

If the inverter does not respond:

- Check there has not been a power outage, if there is the Inverter will reconnect when power is restored.
- Check 'Solar Supply Main fuse Switch' (MCB) in your fuse board is in the ON position.
- Check 'AC Isolator Switch' next to your inverter is in the ON position.
- Check 'Array DC Isolator(s)' next to your inverter (or under with Fronius) is in the ON position (you may have other Array DC Isolator(s) on your roof check these have not been turned off).
- If your inverter has an attached switch or a 'pull down' isolator, check these are ON or have been pushed into place..
- Check for alarm or fault alarm messages on the inverter or via email from your monitoring system. Make a note of these or any error codes and contact 247 Energy, the inverter manufacturer or a qualified CEC accredited electrician for a service or warranty callout.

## Shutdown / Start up Procedure

### System Shutdown Procedure

The system does not need to be turned off unless maintenance or repair is scheduled on the system or on the switchboard.

#### **Step 1**

Turn off the AC Isolator output next to the inverter (or in the fuse board if adjacent). A circuit breaker labeled "Solar Supply Main Switch" is installed in the switchboard. Turn this off by flicking the tab to the down (off) position. The inverter will go into a fault condition as there will be no AC applied to the inverter.

#### **Step 2**

Turn off the DC Isolator input to the inverter. An Isolator labeled "Array DC Isolator" located next to the inverter (or under with a Fronius). Turn this to the off or "O" position.

The inverter will power off once the stored power in the inverter has discharged.

### System Start Up Procedure

To turn on the system it is the REVERSE of the shutdown procedure (step 2 then step 1). NEVER switch the DC isolators or disconnect the DC plugs under load.

## System Components

### Panels

See compliance certificate for quantity, make, watt rating, system watt rating and part number. A datasheet for your panel is available on our website.



## Inverter

See compliance certificate for quantity, brand, watt rating and part number.

A datasheet for your inverter is available on our website

## Balance of System and racking

Component and racking datasheets for your system are available on our website

## Warranties

Installation Workmanship	2 years
Panels	Product 10 years
Panels LG	Product 25 years
Panels all	Output performance 25 years
Inverter	5 years (extendable if required)
Inverter Fronius	10 Years see Fronius website for terms
Mounting system	12 years

Please note, you may void your warranty if the system is not maintained, is part of an insurance claimable incident, had been altered in any way or worked on without notice.

## System Performance Estimate

Energy Production Estimates were supplied with the quotation, copies can be supplied on request.

# Wiring

Diagram of installed system

