GRID TIED PV SYSTEMS

User Guide

Version 2.2

Freenergy Ltd

67B Ferry Road, Clive, 4102, Hawkes Bay

Ph: (06) 6510924

Mobile: 021375013

info@freenergy.co.nz.co.nz

www.freenergy.co.nz

CONTENTS

1.0 SYSTEM CONFIGURATION

System Type	Grid connect
Grid Connect Inverter(s)	
Monitoring	Online Monitoring – web or app

1.1 Location of Essential Services on Your Property:

Your Inverter is located:	
Your DC Isolator is located:	
Your AC Isolator is located:	
Your Electrical Switch Board is located:	

2.0 START-UP AND SHUT-DOWN PROCEDURES

Under normal circumstances, your system should not need any intervention. In an emergency, or should your electrician need to work on wiring in the house, the system may need to be shut-down.

The following procedures should be followed:

Refer to Section 2.1 and your system schematic in Appendix E for location of equipment.

2.1 System Shut-down:

1. Turn OFF the inverter AC SOLAR SUPPLY MAIN SWITCH.
2. Turn OFF the solar PV ARRAY DC DISCONNECT.
3. Check the inverter display for visual confirmation.

Power must be interrupted for at least five minutes to allow for a complete shut-down of the inverter.

Do not open plug and socket connectors or PV string isolators under load.

2.2 System Start-Up Procedure:

1. Turn ON the solar PV ARRAY DC DISCONNECT.
2. Turn ON the inverter AC SOLAR SUPPLY MAIN SWITCH.
3. Check the inverter display for visual confirmation.

3.0 INTRODUCTION TO YOUR PV SYSTEM

3.1 The Environmental Benefits:

Grid sourced electricity (unless sourced from a certified renewable source) will release carbon dioxide and other pollutants into the atmosphere.

By installing a PV system, you can reduce the amount of grid sourced energy used in your home and therefore your CO^2 emissions, by collecting the sun's energy, which is a 100% renewable energy source.

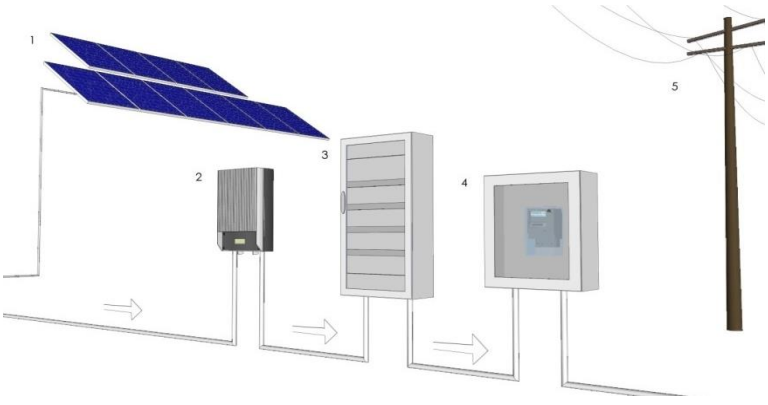
3.2 How it Works:

Your grid connected solar power system generates electricity directly from solar energy for use in your building. Generated electricity is supplied directly to the switch board in your building, where it directly supplies the appliances and other users of electricity. Where the PV array output is not enough to supply all of the requirements of your home, additional electricity is supplied from the main grid, supplementing the solar electricity. When your system is generating more electricity than is being used in the building, the excess electricity is exported to the main grid. This energy is metered and will be purchased by your electricity retailer.

Your grid connected solar power system is comprised of:

- Photovoltaic (PV) modules;
- Inverter(s);
- Roof mounting hardware; and
- Electrical disconnects and optional communication and monitoring software (if installed).

1. PV Modules & Mounting Hardware
2. Inverter (with integrated disconnects and monitoring)
3. Distribution Board
4. Utility Meter
5. Utility Grid



Solar Modules/Photovoltaic Array:

Solar modules are made up of interconnected PV cells, which convert sunlight to directly create electricity. The solar modules are linked together to make up an array. Optimal performance is obtained with direct sunlight; however the modules still generate electricity on cloudy days; less light results in less power. Full or partial shading of the PV array by trees, other structures, or build-up directly on the modules will lead to a drastic reduction in performance and should be avoided.

Refer to your PV Module Data Sheet in Appendix A for more details.

Inverter:

The inverter converts the direct current (DC) electricity generated by the PV array to 230V alternating current (AC) electricity for use in your building.

Australian and New Zealand standards require the inverter to shut-down in the event of a grid power outage in order to protect utility workers from harm when they believe the grid to be de-energised. Once the grid returns to normal operating conditions, the inverter will automatically start-up and reconnect to the grid.

Special components are required to enable your PV system to provide backup power in the event of a grid failure. Freenergy standard grid tie systems do not include backup. Refer to Section 2.0 to determine if your system includes a battery backup system.

Refer to your Inverter Data Sheet in Appendix B for more details.

Mounting:

The system is mounted using an anodized aluminum solar mounting system, which is designed to withstand harsh wind and marine conditions. The mounting system is compliant to AS/NZ 1170.2:2002 and the New Zealand Building Code.

Safety:

The system has been designed for safe, reliable operation. People maintaining or repairing the system must adhere to standard industry practice and appropriate safety guidelines. Only properly trained personnel should perform maintenance or repair of the system. You may feel competent to complete some of the basic maintenance operations yourself.

4.0 IMPORTANT SAFETY INFORMATION

Solar power systems are safe when operating correctly, however, there are potentially dangerous hazards associated with some system components.

Please read the following warnings before operating your system:

4.1 Warnings:

DC electrical:

The PV array can contain potentially lethal voltages, and should not be altered by anyone other than a registered electrician. At all times during daylight hours, the PV modules and all wiring between the modules and the DC disconnect, cannot be de-energised. It is important to note that the module plug and socket connectors should not be disconnected under load.

Electrical wiring:

This installation must be installed to the appropriate AS/NZS wiring standards by a registered electrician. Any unauthorized altering of the wiring presents the risk of high voltages being exposed, and the risk of death or serious injury being presented to users of the property where the system is installed.

Heights:

The PV modules on the roof of your property are situated at a height where serious injury could occur if a fall happens. If you wish to access your collector for maintenance purposes, please use appropriate access arrangements, e.g. ladders with the necessary reach and fall arrest systems. Roofing material may also be slippery after rain, so please take care.

Glass:

Your PV modules are fragile to man handling and high impact. Please DO NOT stand on the modules for any reason. If any damage occurs, please contact Freenergy Ltd at the earliest opportunity.

5.0 MAXIMIZING YOUR SOLAR INVESTMENT

Congratulation on your solar investment, you will start saving money as soon as your solar system is turned on.

You can maximize the amount you save by shifting as much of your electricity usage as practical to the daytime.

Any electrical demand in the house will consume your own generated electricity and only buy off the grid when you are not generating enough, for this reason the more you demand when the sun is shining, the less you are likely to buy off the grid.

Below is a number of energy saving ideas:

Appliance	Idea
Dishwasher, washing machine & clothes drier	Most modern machines have a timer function; time them to come on during the middle of the day, preferably at different times. Otherwise push the button when you are leaving for work.
Hot water cylinder	If you did not have a smart hot water management tool installed, you can have your hot water cylinder element on a 24 hr timer. Have it turn on mid morning, so most of the energy to heat your water is consumed during the daytime. You can leave it on till early evening. The amount of boost time needed will depend on your cylinder size and amount of demand from the home. Talk to your Freenergy energy expert if you have any questions. This type if timer must be hard wired by an electrician.
Chest Freezers	If you have a chest type freezer out in the shed that is rarely opened, you can fit a timer to run during daytime hours. As long as it is not opened it will remain frozen all night. This can be done with a simple plug in timer, available from most electrical stores.

Note: Don't turn them on too early when your solar system will have low output when the sun is still coming up. Remember the less the sun is shining; the more electricity you are buying from the National grid

6.0 MAINTENANCE OF THE SYSTEM

Your new PV system will, under normal circumstances, operate without any intervention. To ensure on-going optimal performance, a few simple actions can be taken to ensure that your system continues to perform safely, efficiently and has a long operating life.

You can easily perform the visual inspections outlined below, or contact a Freenergy service agent.

Regular rain is usually sufficient to keep PV modules clean, although if more than a fine layer of dust is present, cleaning is advised to maintain optimum performance. Only clean modules when cool; in the morning or in the evening. Use a soft brush and water to avoid scratching the module.

The system does not need to be shut-down to perform the cleaning and visual inspections listed below.

Do not clean solar modules with cool water during hot sunny days!

6.1 User Maintenance:

Maintenance should be carried out by trained and competent persons only. You may feel competent to carry out some work yourself, if doing so, you must follow standard industry practice and appropriate safety guidelines. Please contact Freenergy to have a service agent complete this maintenance on your behalf.

Sub System or Component	Maintenance Action	Period	Remarks
Site	Verify: a) Cleanliness (accumulation of debris around and/or under array). b) No shading of array.	Quarterly	Clean site as required. Trim trees, if required.
PV Modules	Verify cleanliness (accumulation of dust or fungus, etc. on array). Check for visual defects including: a) Fractures b) Browning c) Moisture Penetration d) Frame Corrosion	Quarterly 1 Year	Clean if necessary. Modules with visual defects should be further inspected by a Freenergy service agent for performance and safety.

6.2 Professional Servicing:

The following maintenance involves working on live and/or sensitive components, and should only be performed by a Freenergy service agent or a registered electrician.

Sub System or Component	Maintenance Action	Period	Remarks
Mounting Structures	Verify tightness and integrity of bolts and other fastening devices.	5 Years	Tighten any loose connections.
	Inspect for corrosion.	5 Years	Refer any serious corrosion to a Freenergy service agent.
PV Modules	Inspect junction boxes for: a) tightness of connection; b) water accumulation/build up; c) integrity of lid seals; d) integrity of cable entrance, glands and/or conduit sealing; and e) integrity of clamping devices.	3 Years	Any defective seals, clamps and bypass diodes should be replaced.
	Verify bypass diodes.		
Wiring Installation	Verify mechanical integrity of conduits.	5 Years	Any damaged conduit should be replaced.
	Verify insulation integrity of cables installed without conduit.	5 Years	Any damaged cable should be replaced.
	Verify: a) blocking diodes; and b) surge arresters for degradation.	3 Years	Any defective blocking diodes and surge arresters should be replaced.
	Check earthing connections for: a) tightness of connection; and b) corrosion.	3 Years	Tighten any loose connections. Replace/clean any corroded terminals.
	Measure open circuit voltages.	5 Years	

Electrical Characteristics	Measure short circuit currents.	5 Years	

7.0 TROUBLESHOOTING AND FAQS

In the event of a system fault, follow the troubleshooting suggestions below. Contact Freenergy if these tips do not resolve the problem. A service technician or registered electrician familiar with PV systems may be needed.

The inverter is the core component of the system and its display can often provide valuable information to aid in the troubleshooting process.

Inverter fault indicated:

- Check the inverter display for a fault code.
- Follow instructions in the Inverter Manual in Appendix D to resolve fault.

No AC output/low AC output:

- Check that there is power from the electricity grid and that the main switch and breaker in the circuit board is turned on.
- Check that all AC Solar Supply Main Switches are ON.
- Check that all DC PV Array Main Switches are ON.
- If any are OFF, shut-down the system completely and restart it by following the system shut-down and start-up procedure on page 3 of this Manual. Power must be disconnected for at least five minutes to allow for a complete shut-down of the inverter.

Inverter will not start:

- Check that all AC Solar Supply Main Switches are ON.
- Check that all DC PV Array Main Switches are ON.
- If any are OFF, shut-down the system completely and restart it by following the system shut-down and start-up procedures on page 3 of this Manual. Power must be disconnected for at least five minutes to allow for a complete shut-down of the inverter.

In the event of a grid power outage, the inverter will shut-down. This feature protects utility linesmen from harm when they believe the grid to be de-energised and is required by Australian and New Zealand standards. The inverter willstart-up automatically once the utility grid returns to normal operating conditions.

Low system DC power:

- Look for any shading.
  - Remove sources of obstruction if required.
- Check PV Modules for heavy dirt, dust or debris.
  - Clean modules if required.
- Look for damaged or broken glass, and damaged wiring between modules and DC switches.

Do not touch any damaged or exposed wiring. Risk of fatal electric shock!

If damage has occurred, please contact Freenergy immediately.

8.0 WARRANTY

8.1 Coverage:

1.1. Freenergy Ltd expressly warrants that, at the time of commissioning, the equipment it supplies will be in good working condition and will have been supplied as specified in our quote and accompanying documents, or as varied during the installation and agreed in writing with the Customer.

1.2. Subject to specific Warranty exclusions and conditions set out in this document, Freenergy Ltd warrants that the components of the system shall be free of manufacturing defects from the original purchase date for the periods specified in the manufacturer's warranty documentation extant at the time of installation. These periods are outlined in Table 1: Warranty Coverage. In the case of conflict or ambiguity between Table 1 and the manufacturer's warranty documentation, the manufacturer's documentation will govern. Refer to manufacturer's warranty documents for specific details of warranties.

1.3. Freenergy Ltd warrants all labour services required for two years from the date of installation for any component manufactured by Freenergy Ltd. Warranty for labour on the remaining system components vary based on manufacturer's warranty policy as outlined below.

Table 1: Warranty Coverage:

Refer to manufacturer's warranty documents for specific details of warranties. In the case of conflict or ambiguity between Table 1 and the manufacturer's warranty documentation, the manufacturer's documentation will govern.

Component	Warranty Coverage
String Inverters	5 year manufacturer's materials and workmanship warranty **Contact: Freenergy Ltd 021375013**
Enphase Micro Inverters	10 year manufacturer's materials and workmanship warranty **Contact: Freenergy Ltd 021375013**
Solar Panels	10 year manufacturer's materials and workmanship warranty **Contact: Freenergy Ltd 021375013**
Solar Panels	25 year manufacturer's power output warranty **Contact: Freenergy Ltd 021375013**
Mounting Frames	10 year manufacturer's materials and workmanship warranty **Contact: Freenergy Ltd 021375013**
Electrical Components	2 year manufacturer's materials and workmanship warranty **Contact: Freenergy Ltd 021375013**

8.2 Warranty Conditions:

2.1 Upon installation of the Products, a copy of the Customer Installation Record Form containing the Customer's contact details, product installation date, product serial numbers, licensed Installer contact details, summary of system format and contact phone number(s) of the merchant and/or group provided by the Installer must be lodged with Freenergy Ltd.

2.2 The solar photovoltaic system must be installed in accordance with the manufacturer's installation instructions, the local/national authority regulations and all relevant statutory requirements.

2.3 Installation may only be completed by registered Installers and electricians that are licensed in the area in which the installation is completed.

2.4 This Warranty applies only to those components provided as part of the Freenergy Ltd solar photovoltaic system and not any electrical or general parts provided by the Installer or other components already existing in the installation.

2.5 The coverage period is valid from the date of installation. Should any part of the complete solar photovoltaic system be replaced during the warranty period, the balance of the original Warranty will continue to remain effective.

2.6 Prescribed electrical work must be completed by a person certified to undertake such work in accordance with current New Zealand Electrical Regulations.

2.7 Component manufacturers are at liberty to alter the design or construction for the products notwithstanding that the product may have been sold by description or sample, even though

alterations may have been introduced for the date of Contract and the date of delivery, provided that the products are of the same or similar quality and are fit for the purposes for which they are purchased. Such alterations shall not constitute a defect in design or construction under this Warranty.

2.8 Dated proof of purchase is required prior to commencement of warranty work.

2.9 The Warranty shall be limited to the replacement or repair, at the option of Freenergy Ltd of any defective products and of such parts as have been damaged in consequence of the defect. Freenergy Ltd is excluded to the extent allowable by law from responsibility for consequential loss including:

- injury to persons;
- damage to property;
- economic loss;
- pain and suffering; and
- any legal or other damages resulting from any manufacturing fault or defect.

2.10 Freenergy Ltd shall be under no obligation to return parts replaced at its option pursuant to this Warranty.

2.11 All Freenergy Ltd customers will submit Warranty claims to Freenergy Ltd in accordance with the Warranty Claim Procedure.

8.3 Warranty Exclusions:

The following exclusions will cause the Warranty to become void, and any service charge and cost of parts that may be required will not be covered and will be payable by the Customer.

3.1 Accidental damage, acts of God, failure due to misuse, incorrect installation and/or attempts to repair the system other than by a Freenergy Ltd approved registered Installer. Damage resulting from accidental or intentional loss or out of tolerance fluctuation of electricity supply to the system.

3.2 Damage resulting from the removal or dislodgement of plant, plugs, sensors or any other parts and/or damage resulting from changes of settings in controllers or other equipment whether accidental or intentional.

3.3 Failure of the property's roof structure to comply with local codes and standards.

3.4 Damage to the photovoltaic modules from impact by any object.

3.5 Damage to the photovoltaic modules, wiring or other components from rodent or other animal activity

3.6 Where the solar photovoltaic system as a whole, or a system component, has failed directly or indirectly as a result of excessive temperature, corrosive atmosphere, faulty electrical wiring, or out of tolerance variations in electrical energy supply.

3.7 Any serial details on any of the components are removed or defaced.

3.8 The product is relocated from its original point of installation unless by Freenergy Ltd or its approved agents operating under its express instructions so to do.

3.9 Subject to statutory provisions to the contrary, Freenergy Ltd shall not be liable for consequential damage or any incidental expenses resulting from any breach of this Warranty.

8.4 Warranty Claim Procedure:

4.1 For all Warranty Claims regarding Freenergy Solar Photovoltaic Systems please call Freenergy Ltd direct on 0800 765242 or 06 8701088. Please ensure that you have all information regarding the Warranty Claim available including, Installer details, Customer details, system details and information regarding the faulty component.

4.2 A Freenergy Ltd Installer will be allocated to your Warranty Claim.

4.3 In the case that the Warranty is not valid, the labor and parts will be charged by the agent/merchant/Installer based on the Non-Warranty Schedule of Rates.

If you have any doubts or questions around weather conditions that may threaten the cover of this Warranty, please contact Freenergy Ltd to clarify before the condition arises. These exclusions do not limit any rights you may have under the Consumer Guarantees Act 1993.

● 9.0 APPENDICES

See Appendices attached to this User Manual:

- **Appendix A - PV Module Data Sheet**
- **Appendix B - PV Module Warranty**
- **Appendix C - Inverter Data Sheet**
- **Appendix D - Inverter Warranty**
- **Appendix E - Inverter Manual** (provided with your inverter)