Customer Guidelines for Grid Connection of Inverter Power Sources up to 10 kW

September 2008

Introduction and Purpose

These guidelines are intended to cover the installation of small private generating sources of capacity up to 10 kilowatts (kW) which customers wish to connect to the Powercor grid via electronic dc/ac inverters. The guidelines do not cover engine-driven generators.

It is intended that such renewable energy generating sources up 10 kW be allowed to be connected to the grid on the basis that:

- The purpose of the source is to reduce the customer's electricity bills and for environmental concerns.
- The customer still requires a supply of electricity from the Powercor grid.(ie Not Stand-alone System)

The guidelines have been prepared in order to:

- Promote customer installations which are safe for both the customer and for Powercor line maintenance personnel.
- Protect customer installations against damage under fault conditions.
- Ensure that other Powercor customers are not exposed to hazards or to disruptions of supply.

The primary concern of Powercor is with the mains wiring and inverter, which provide the interface with the Powercor grid, and which must be approved by Powercor. The DC wiring of the renewable energy system and any batteries are the customer's responsibility.

Sister documents provide guidelines for larger plant, up to one megawatt (1.0 MW = 1000 kW), and Above 1 MW in capacity, which are intended to export electricity into the Powercor grid.

Powercor Policy

Powercor recognises that many environmentally – conscious customers wish to play their part in the reduction of the nation's greenhouse gas emissions, much of which are attributable to large coal-burning power stations. One way that some customers seek to contribute is by the installation of small renewable electricity generating sources at their residences or premises. In order to obtain maximum utilisation of such sources, these customers often wish to connect their generating sources to the Powercor grid via a grid interactive inverter.

Powercor is supportive of such initiatives and will allow such installations to be interconnected with the grid provided that:

- Reliability and quality of the grid supply to other customers is not adversely affected.
- The safety of other customers and of Powercor employees and contractors is not put at risk.

Retailer's have already introduced various programs through which customers may support the use of renewable resources on a larger scale for the generation of electricity.

Customer Equipment Types

The types of generating equipment covered by these guidelines includes:

- Solar (photovoltaic) arrays.
- Small wind generators.
- Micro hydro generators.
- Fuel cells.

All of these generally produce direct current (DC) electricity and must transmit their generated electricity via DC to alternating current (AC) sine wave inverters.

When you are operating your generating equipment to reduce your power bills, a storage battery may not be necessary. However, you may install one for

independent operation.

Inverter Requirements

The electronic sine wave inverter should be of the grid-interactive type, be of good quality and performance in order to avoid mal-operation or damage to your household electrical appliances. Your inverter must generate an AC voltage having a good quality sinusoidal wave form with low harmonic distortion. Only Powercor approved models which satisfy the Australian Standard AS 4777. Grid Connection of Energy Systems via Inverters may be connected to the grid. Information on models of inverter which satisfy these guidelines are available from the Business Council for Sustainable Energy (BCSE).

http://www.bcse.org.au/default.asp?id=233

An important safety requirement for the inverter is that it must be prevented from back-feeding the Powercor network if the grid supply is externally de-energised. It should also be capable of restarting within a short period after the external grid supply is restored.

Planning and Selection

Powercor's main involvement with local generation is with the mains wiring and the sine wave inverter, which provides the interface with the grid. Powercor is not able to offer assistance in the planning and selection of your proposed generating equipment other than the inverter.

The Business Council for Sustainable Energy has details of Accredited Installers, Suppliers, and Consultants who are experienced in this area.

Relevant Standards and Guidelines are as follows:

- Electrical Safety(Installations Regulations) 1999.
- AS/NZS 3000:2000 – SAA Wiring Rules, published by Standards Australia.
- The Australian Standard AS 4777 Grid Connection of Energy Systems via Inverters, published by Standards Australia.
- The Business Council for Sustainable Energy(BCSE)

Installation and Connection to Grid

- The installation of the renewable energy generating sources should always be carried out strictly in accordance with the manufacturer's recommendations, and must meet the requirements of your local council's planning and building departments.
- The electrical cabling and connection to your switchboard must be carried out by a registered electrical contractor. The wiring and equipment must be in accordance with the Wiring Rules(AS/NZ 3000:2000), the Electrical Safety Regulations and the Service and Installation Rules.
- Your new installation must be checked by a licenced electrical inspector prior to connection to your main switchboard.
- The customer's inverter must be connected to a dedicated circuit on your main switchboard via a lockable isolating switch, protective device and cables which are suitably rated for at least the short time rating of the inverter. The switchboard busbar rating should also be checked by your registered electrical contractor.
- The switchboard must be clearly and permanently labelled as having an inverter energy system connected to it. The circuit breaker, fuse or switch must also be clearly labelled.
- It is recommended that surge protection if not included as part of the inverter be installed to prevent external network

surges from damaging your renewable energy generating source.

- In order that maintenance work can be carried out on your equipment and on the grid connection, a manually-operated switch or circuit breaker must be provided in an accessible location and have the ability to be locked on and off.

- In order to limit an in-rush of damaging current from the grid if a fault develops in your equipment, a fuse or circuit breaker is required for automatic disconnection. These are most conveniently fitted at your main switchboard where the mains connection is made, or at the inverter.

Installation Approvals

Information on models of inverter which satisfy the Australian Standard are available from the Business Council for Sustainable Energy.

The electrical wiring will need to be approved by a licensed electrical inspector(S Class). Energy Safe Victoria maintains a listing of licensed electrical inspectors. For any further information please telephone the Powercor Call Centre or the local customer connection officer.

Powercor and Customer Responsibilities

Powercor Responsibilities

- Powercor is responsible for the reliable transport of electricity to your premises and to the premises of all its other customers.

- Powercor must safeguard the safety of its employees and others who carry out work on its distribution network. Powercor therefore reserves the right to inspect your installation by prior arrangement, to ensure that it does not pose a hazard.

Customer Responsibilities

- The customer is responsible for the safe installation, operation and maintenance of the renewable energy generating source. The installation must conform to Australian standards(AS/NZ 3000:2000).

- Your equipment should be regularly inspected and maintained in accordance with the manufacturer's instructions.

- The customer is responsible for the safety of any person operating or maintaining generating equipment and accessories which are on the premises.

- The customer is responsible for fitting adequate protective devices to prevent damage to their renewable energy generating equipment under conditions of short circuit, voltage surge or other faults.

Energy Pricing

The value to the customer of kilowatt hours (kWh) electricity generated by their power source will be determined by the relevant Electricity Retailer.

The Retailer likewise should be contacted on tariffs for a supply of electricity from the Powercor Grid.

Fees

A project fee of $160.60 (GST inclusive) will need to be paid to Powercor and contact needs to be made to your Retailer regarding Metering fees. For first time connected premises, the standard Service to Property charge still applies in addition to the project fee.

Metering

For existing premises your meter will need to be replaced. Ask your Retailer to arrange for a new electronic meter. The Retailer is also responsible for arranging the Metering for new installations.

Insurance

Most household insurance policies do not cover the failure of electrical devices such as inverters. The generation equipment may need to be separately specified on your insurance policy.

You are advised to contact your own insurance company to check coverage.

Application Form

Customers seeking to install inverter-connected generating sources must fill out the Application for Network Connection of an Inverter Energy System.

Please provide all relevant details requested on the form in order to avoid delays in approval.

Information and Queries

Refer Information Sheet.

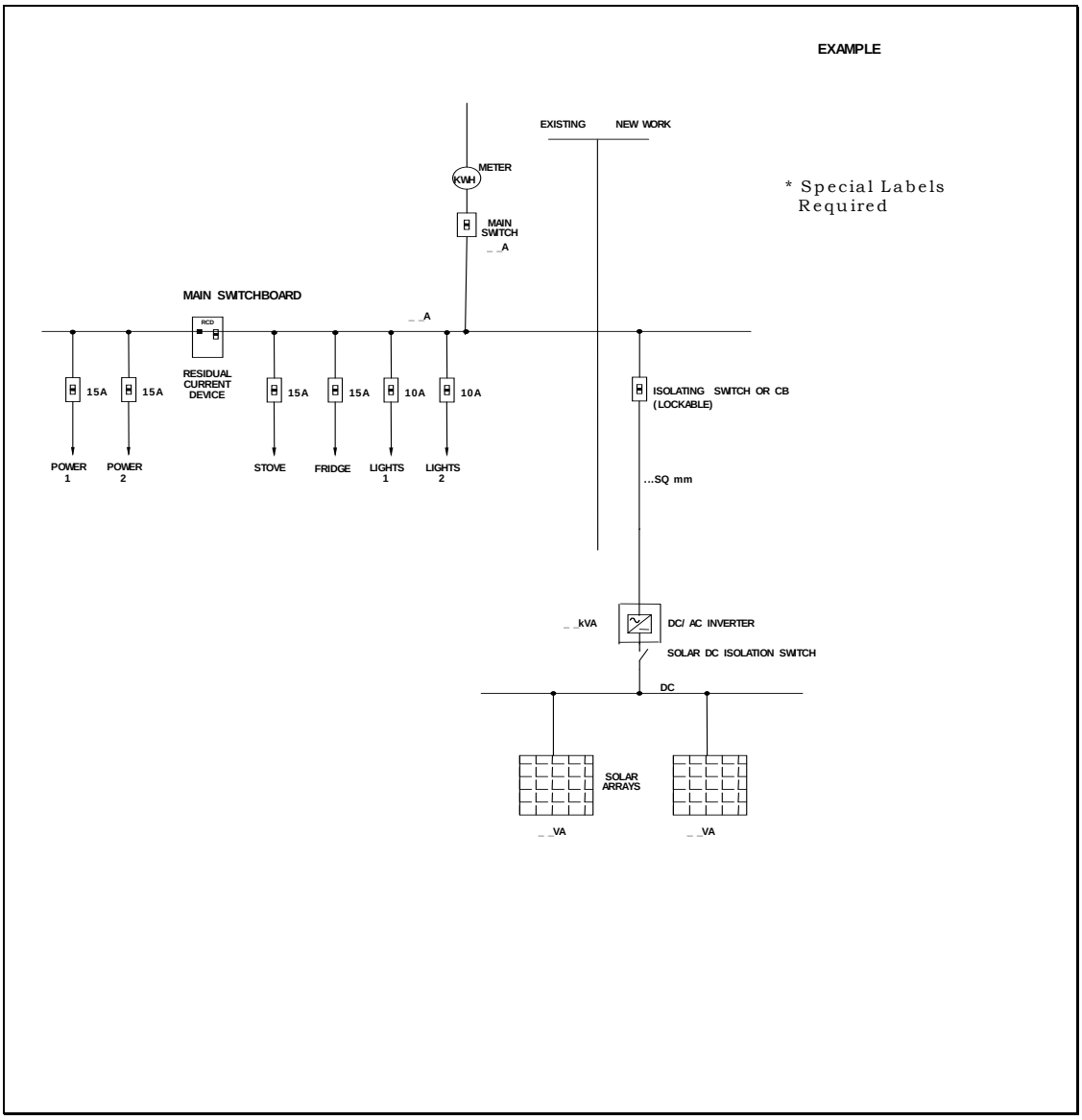
Disclaimer

While Powercor makes efforts to ensure that this information and material is current and accurate, the information and material is provided to you on the understanding that:

- Powercor makes no warranty, guarantee or promise, express or implied, in relation to the content or accuracy of this information and material.
- You will seek verification and/or professional advice from an independent source before relying on or acting upon any of this information and material.
- Powercor is not liable or responsible in any way for the results of any actions taken on the basis of this information and material.

To the fullest extent permitted by law, Powercor expressly excludes any and all liability whatsoever and responsibility to any person arising in connection with their use or reliance of the information and material in whole or in part.

Typical Customer's Installation(Circuit Diagram)



Typical label to be installed at Main Switchboard or Distribution Board where the inverter energy system is connected

WARNING

DUAL SUPPLY

ISOLATE BOTH NORMAL AND INVERTER SUPPLIES BEFORE WORKING ON THIS DISTRIBUTION BOARD

Typical labels to be installed adjacent to isolating switches at Main Switchboard or Distribution Board where the inverter energy system is connected

NORMAL SUPPLY MAIN SWITCH

INVERTER SUPPLY MAIN SWITCH

Information Sheet

For general advice and information on Accredited Installers, Suppliers, and Consultants for grid connection and stand-alone systems please contact the Business Council for Sustainable Energy(BCSE) on **03 93493077.**

To Contact Powercor
(For Grid Connection)

Customer Enquiries:	**132 206**
Service Difficulties & Faults:	132 412
New Connections:	1300 360 410
Interpreter Service:	131 450

Head Office
Powercor Australia Ltd
40 Market Street
Melbourne
Victoria Australia 3000
Ph: +61 3 9683 4444
Fax: +61 3 9683 4499

Postal Address:
Locked Bag 14090 MCMC
Melbourne Victoria 8001

Other Powercor offices are located at:

	Postal Address	Office Location
Ardeer	Locked Bag 6 , Sunshine 3020	740 -742 Ballarat Rd Ardeer Telephone (03) 8363 8285 Fax: (03) 8363 8201
Ballarat	PO Box 572, Ballarat 3353	Norman St, Wendouree Telephone: (03) 5327 2454 Fax: (03) 5331 9139
Bendigo	Private Bag 8004, Bendigo 3550	601-611 Napier St, Epsom Telephone: (03) 5440 5804 Fax: (03) 5440 5795
Geelong	PO Box 185, Geelong 3220	Roseneath St, North Geelong Telephone: (03) 5240 7511 Fax: (03) 5240 7751
Mildura	PO Box 544, Mildura 3502	Eleventh St, Mildura Telephone: (03) 5022 5902 Fax: (03) 5022 5991
Shepparton	PO Box 6141, Shepparton 3632	8-10 Wheeler St, Shepparton Telephone: (03) 5820 2601 Fax: (03) 5820 2695

Post or fax your completed Application to one of the above offices.

Electrical Measurement Units

Quantity	*Unit*	*Unit Symbol*
Current	ampere	A
Potential Difference	volt	V
Power	kilowatt	kW
Apparent Power	kilovoltampere	kVA
Frequency	hertz	Hz
Energy	kilowatthour	kWh

Glossary of Terms

grid	the electrical distribution network
DC	Direct current
AC	Alternating current. The grid operates at 50 Hz.
Inverter	An electronic device that converts DC power to AC power
Renewable electricity	Power that comes from a renewable source such as solar, hydro and wind.
Voltage Regulation	The drop in voltage between no load and full load.
Efficiency	Output power divided by input power.

Connecting an Inverter to the Powercor Grid

1/

Contact Powercor and request a copy of the "Customer Guidelines for Grid Connection of Inverter Power Sources" to be mailed to you. Alternately, this can be found on the Powercor Web Site www.powercor.com.au This document contains all the information you will need to know in order to arrange for the connection of your system to the Grid.

2/

Complete the application for Network Connection of an Inverter Energy System and return this to Powercor. Note, this form is contained in the back of the Customer Guidelines. You will need to have chosen your Retailer in order to complete this form.

3/

Powercor will assess your application and the impact of your proposed Inverter Energy system on the Network from the details you provide in your application.

4/

Please sign the Application and return to Powercor. If you have any questions about the application, please contact Powercor for clarification. Powercor will invoice you a project fee of $160.60 (GST inclusive) after we receive your application.

You will need to arrange for your Retailer to forward to Powercor, a metering request for Powercor to meter your installation.

5/

Powercor will meter your installation once it has the following documents:

- **A completed Application for Network Connection of an Inverter Energy System**
- **A metering request from your Retailer**
- **A Certificate of Electrical Safety from your Registered Electrical Contractor**

Note, the installation will require inspection by an Electrical Inspector (S class) prior to energisation.

6/

Powercor will inspect and test the installation and upon compliance with all standards approve the system for you to place into service. This can be done by placing the inverter main switch in the on position.

Application for Network Connection of an Inverter Energy System

Please print and complete all sections of this form and return to your nearest Powercor office. Note a project fee of $160.60 (GST inclusive) applies.

Part 1- Applicant Details				
Name: (electricity account holder)			**Phone No:**	
Postage Address:			**Mobile:**	
			Email Address:	
I / We named below make application to connect an inverter energy system to the electricity network. I / We acknowledge that connection will not occur until the Electrical Contractor and Electrical Inspector submit the relevant industry forms, upon which the installation will be inspected for compliance with all regulations.				
Title	**Given Name**	**Surname**	**Signature**	**Date**
				/ /
				/ /

Part 2 – Location of Installation		
Street address of proposed installation	Unit/House Number	Is permanent supply connected now? ☐ No ☐ Yes
	Street Name	
	Suburb Postcode	Is the switchboard located with meters? ☐ No ☐ Yes
Type of premise	☐ Domestic /Residential ☐ Commercial / Small Business ☐ Rural production ☐ Industrial ☐ Other	Is the applicant the property owner? ☐ No ☐ Yes
Current electricity retailer		Meter numbers
National meter identifier (NMI)		

Part 3 – Consultant/installer details		
Consultant/ Installer	Name:	BCSE Accreditation No:
	Company name:	Phone:
	Address:	Email:
Electrical Contractor	Name:	Contractor licence No:
	Company name:	Phone:
	Address:	Email:

Part 4 – System details	
Inverter Make:	Model:
Inverter Output capacity:	Number of phases:
Location of Inverter isolation switch ☐ On switchboard ☐ Other (specify)	
Location of main switchboard ☐ With meters ☐ Other (specify)	