



# Small Embedded Generation Network Connection

Customer Guide

5 September 2012

**SA Power Networks**

[www.sapowernetworks.com.au](http://www.sapowernetworks.com.au)

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# Small Embedded Generation Network Connection

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# Small Embedded Generation Network Connection

## 1. Introduction

### 1.1 Background

This Guideline has been prepared by SA Power Networks to provide owners and *Proponents* of *embedded generation installations* information about their rights and obligations for the connection to and interfacing with the *distribution network*. *Embedded generating units* are defined as *generating units* connecting directly to the *distribution network* and not having direct access to the *transmission network*. This Guideline covers *small-embedded generating unit installations*.

### 1.2 General requirements

All Proponents must advise SA Power Networks of any installation where they contemplate the connection of an *embedded generating unit* to the *distribution network*. Negotiations with SA Power Networks for the possible connection of an *embedded generating unit* must precede any detailed design, placement of orders for equipment and letting of contracts to avoid costs to the *Customers* and / or *Proponents* arising from designs or equipment identified by the SA Power Networks to be unsuitable for connection to the *distribution network*.

### 1.3 Definitions and terms

**“AEMO”**

means the Australian Energy Management Operator (or its successor);

**“approved inverter”**

means inverters that have been tested by an authorised testing laboratory and certified as being in compliance with AS 4777 and issued with an accreditation number;

**“applicable regulations”**

means any law, Code, Rule or other regulatory instrument which binds participants in the South Australian electricity industry, as amended from time to time. A reference to applicable regulations, including specific instruments, remain a reference to all other applicable regulations even where that instrument ceases to exist;

**“connection point”**

means the agreed point of *supply* established between SA Power Networks and the Customer and/or *Embedded Generator*;

**“Customer”**

means a person who engages in the activity of purchasing electricity supplied through the *distribution network* to a *Connection Point*;

**“distribution network”**

means the South Australian Electricity Distribution Network operated by SA Power Networks pursuant to the licence granted under Part 3 of the Electricity Act 1996 (SA);

**“Electricity Distribution Code”**

means the South Australian Electricity Distribution Code made by ESCOSA pursuant to Section 28 of the Essential Services Commission Act, 2002;

**“embedded generating unit”**

means a *generating unit* connected within a *distribution network* and not having direct access to a *transmission network*.

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### **“ESCOSA”**

means the Essential Services Commission of South Australia (or its successor).

### **“generating unit”**

means the actual generator of electricity and all related equipment essential to its function as a single entity.

### **“Generator”**

means a person / entity who engages in the activity of owning, controlling, or operating a generating system that supplies electricity to, or who otherwise supplies electricity to, a *transmission or distribution network*.

### **“large-embedded generation installation”**

for the purpose of this Guideline, a *large-embedded generation installation* is defined as:

All other embedded generation installation not covered by the requirements of the Australian Standard AS 4777-2005, Grid connection of energy systems via inverters.

This definition includes but is not necessarily limited to such initiatives as:

- photovoltaic (PV) installations greater than 10 kVA (single phase) or 30 kVA (three phase);
- large fuel-cell installations;
- wind turbine generating units;
- synchronous and asynchronous generating units driven by hydro turbines; and
- synchronous generating units driven by gas engines, gas turbines or diesel engines.

The final mentioned category includes any commercial plant which is operated and connected in parallel with the *distribution network* by arrangement with SA Power Networks for the purpose of demand management or for routine on-load testing.

### **“National Electricity Rules (NER)”**

means the rules as defined in the National Electricity Law as set out in the Schedule to the National Electricity (South Australia) Act 1996.

### **“Proponent”**

means the *Generator, Customer* or developer or their agent (i.e. Consulting Engineers).

### **“Retailer”**

means the holder of an electricity retail licence granted under the Electricity Act, 1996, who is contracted to sell electricity to the *Customer* at the *Supply Address*.

### **“small-embedded generation installation”**

for the purpose of this guideline a *small-embedded generation installation* is defined as:

An embedded generation installation complying with the requirements of the Australian Standard AS 4777-2005, Grid connection of energy systems via inverters, Parts 1, 2 & 3:

- Part 1: Installation Requirements;
- Part 2: Inverter Requirements; and
- Part 3: Grid Protection Requirements.

This definition includes but is not necessarily limited to such initiatives as:

- photovoltaic (PV) installations;
- small wind turbine generating units
- small fuel-cell installations;

which are connected to the customer’s loads and to the *distribution network* by an *approved* (dc/ac sine wave) *inverter*.

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## Small Embedded Generation Network Connection

### **“Small-Embedded Generator”**

for the purpose of this guideline means a *Generator*, who owns, operates or controls a *small embedded generating unit*.

### **“small-embedded generating unit”**

for the purpose of this guideline a small-embedded generating unit is defined as:

An embedded generating unit less than 10 kVA (single phase) or 30 kVA (three phase) and complying with the requirements of the Australian Standard AS 4777-2005, Grid connection of energy systems via inverters;

### **“Supply”**

means the delivery of electricity.

### **“supply address”**

means the address at which SA Power Networks supply the *Generator* and / or *Customer* with electricity.

### **“transmission network”**

means ElectraNet’s electricity transmission network.

## 1.4 Structure of this Guideline

This Guideline provides guidance on the Technical and Commercial considerations and requirements for all *small-embedded generating unit installation* and defines the standard connection requirements for such installations.

## 1.5 Purpose and principles

The purpose of this Guideline is to ensure that “due process” is followed for the installation of *small-embedded generating units*. The Guideline aims to:

- Outline the technical requirements for a *small embedded generation installation* in accordance with the applicable Codes, Australian Standards, SA Power Networks’ Service and Installation Rules, and SA Power Networks *small-embedded generating unit* connection requirements;
- Provide assistance to identify the *Embedded Generator’s* responsibilities in regards to a *small-embedded generating unit(s)* connection and interface requirements to the *distribution network*; and
- Provide assistance to the *Embedded Generator* to apply for a *small-embedded generation installation* connection to the *distribution network*.

## 1.6 Interpretation

In this Guideline the words “shall” and “must” indicate mandatory requirements.

This Guideline seeks to provide definitions consistent with those given in the Electricity Act, ESCOSA Electricity Distribution Code and the *National Electricity Rules*.

## 1.7 Revisions

SA Power Networks may amend and expand this guideline from time to time where it may be necessary to meet the requirements of the applicable regulations and to suit the needs of the *distribution network*.

A revision number and date will identify every version of SA Power Networks Guideline “SA Power Networks Customer Guide to Small Embedded Generation Network Connection”.

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## Small Embedded Generation Network Connection

### 2. Embedded generator's (proponent) obligation to advise

The *Proponent* of any *small-embedded generation installation* must advise SA Power Networks of all proposed installations where they contemplate the connection of a *small-embedded generating unit* to the *distribution network*. Negotiations with SA Power Networks for the possible connection of an *embedded generating unit* must precede any detailed design, placement of orders for equipment and letting of contracts to avoid costs to the *Proponent* arising from designs or equipment identified by SA Power Networks to be unsuitable for connection to the *distribution network*.

SA Power Networks will undertake all necessary investigations to confirm that the proposed connection of an *embedded generating unit* to the *distribution network* will not have any adverse impact on the safety and security of the network.

### 3. Embedded generator connection enquiries

SA Power Networks has established procedures in place to process requests for connection of *small-embedded generation installations* to the *distribution network*.

The *Proponent* wishing to install a *small-embedded generating unit* must submit a request to SA Power Networks for permission to connect to the *distribution network*. Requests should be submitted by completing the on-line application form located on the SA Power Networks website at [www.sapowernetworks.com.au](http://www.sapowernetworks.com.au).

The Application to Connect must include the following information:

- *Small Embedded Generator (Customer)* name;
- *Small Embedded Generator (Customer)* address of installation;
- *Small Embedded Generator (Customer)* email address;
- National Metering Identifier (where the proposed installation address already has an electricity supply);
- AS 4777 compliant Inverter details, including make, model and accreditation number;
- Capacity of photovoltaic array or other energy source;
- Contractors / installers name;
- Contractors / installers Electrical License number;
- Contractors / installers BCSE accreditation number;
- Contractors / installers email address; and
- Customer's signed acceptance of the terms and conditions of the Small Embedded Generator Connection Agreement.

Electronic applications are SA Power Networks preferred method of receipt of network connection requests. For proponents that do not have access to internet facilities written applications can be sent directly to SA Power Networks addressed to:

**Manager Works Co-ordination** (1 Anzac Highway, Keswick SA 5035)  
Facsimile: (08) 8404 9344

On receipt of a *Proponent's* Application to Connect and acceptance of the terms and conditions by the *Embedded Generator* of the Small Embedded Generator Connection Agreement, the *Proponent's* proposed inverter details are checked against the list of type tested and *approved inverters*.

Provided the proposed inverter has been tested by the authorised test laboratory and is certified as complying with AS 4777 at the time of application as an *approved inverter*, the

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*Customer's (Embedded Generator)* data is registered in the Small-Embedded Generation Installation Register.

New connection applications with an approved grid connected inverter, are advised in writing by email of SA Power Networks permission to connect the specified *small-embedded generating unit* and *approved inverter* combination. Should the *Proponent* or their installer wish to change either the type or output capacity of the *small-embedded generating unit* or the *approved inverter* specified in the original application approval request, the *Proponent* must reapply to SA Power Networks for approval to connect the new *small-embedded generating unit*.

Approval from SA Power Networks to connect a *small-embedded generating unit* to the *distribution network* is only an acknowledgement that the *small-embedded generating unit* is suitable to be connected to the *distribution network* at the location requested at the time of your application. SA Power Networks' approval **does not** in any way indicate, guarantee, or approve the *Small-Embedded Generator* is or will be eligible to receive payments, credits or other forms of entitlements from any Government or *Retailer* sponsored energy feed-in rebate schemes. The *Proponent's* eligibility should be determined with the relevant agencies responsible for the payment or provision of such entitlements.

Before connecting the *small-embedded generating unit* to the *distribution network*, the *Proponent* must submit an application to their relevant electricity Retailer to have the appropriate import / export metering installed at the site of the *small-embedded generating unit installation*. Refer to section 4.8.

### 4. Small-embedded generation installation

#### 4.1 Application of small-embedded generation installations guideline

This Guideline for *small-embedded generation installations* connected via Grid Connected Inverters (*approved inverter*) apply to any inverter energy systems as described in Section 4.3 **Energy Sources**, connected to the low voltage *distribution network*.

This Guideline provides the framework for connection to the *distribution network* and has been developed to achieve the following aims:

- to detail the principles governing connection and access to the *distribution network* for an *Embedded Generator* proposing a *small-embedded generation installation*;
- to establish the process to be followed by an *Embedded Generator* application for the connection of a *small-embedded generation installation* to the *distribution network*;
- to establish processes to ensure ongoing compliance by an *Embedded Generator* with the technical requirements of this Guideline and the applicable regulations.

#### 4.2 Obligations of proponents of small-embedded generation installations

The *Proponent / Embedded Generator* proposing to install a *small embedded generating unit* connected to the *distribution network* must seek permission from SA Power Networks to connect the *small embedded generating unit* to the *distribution network*. An *Embedded Generator* must maintain and operate all *small-embedded generation installations* in accordance with:

- Applicable Regulations and relevant laws;

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- the Essential Services Commission of South Australia (ESCOSA) Codes (Electricity Distribution, Metering, Retail, etc);
- Electricity Act of SA and Technical Regulations;
- the requirements of this Guideline;
- Good electricity industry practice and applicable Australian Standards; and
- the Small Embedded Generator Connection Agreement.

In particular the *Proponent / Embedded Generator* must:

1. submit an Application to Connect in respect of new or altered equipment owned, operated or controlled by it;
2. enter into an approved<sup>1</sup> Network Connection Agreement with SA Power Networks in accordance with the requirements of *Electricity Distribution Code* and this Guideline prior to that equipment being connected to the *distribution network* or altered (as the case may be);
3. comply with the reasonable requirements of SA Power Networks in respect of design requirements of equipment proposed to be connected to the *distribution network*;
4. permit and participate in reasonable inspection and testing of facilities and equipment;
5. permit and participate in reasonable commissioning of facilities and equipment which is to be connected to the *distribution network* for the first time;
6. operate facilities and equipment in accordance with any reasonable direction given by SA Power Networks;
7. give notice in writing of intended voluntary disconnection; and
8. arrange through their nominated *Retailer* for the installation of import / export metering in compliance with the relevant Code.

### 4.3 General

#### Energy Sources

Network connected inverter energy systems (excluding motor drive inverters). Single phase systems from 0 to 10 kVA or three phase systems from 0 to 30 kVA, connected at the nominal interconnection voltage and frequency. Herein referred to as inverter energy system(s).

Energy sources above 10 kVA single phase systems or 30 kVA three phase systems will be subject to the requirements of the National Electricity Rules, Chapter 2 ESCOSA Electricity Distribution Code and SA Power Networks Guideline for *large-embedded generation installations*.

#### Nominal Interconnection voltage

Voltages as defined in AS 60038 apply. The nominal supply voltage for the low voltage network is 230 Volts, phase to neutral, and 400 Volts phase to phase with a tolerance of +10% and -6%.

Grid connected inverters and grid protection devices shall be capable of operation within these parameters.

#### Nominal Interconnection frequency

50 Hz.

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<sup>1</sup> Network Connection Agreements for Embedded Generators with small-embedded generation installations must be approved by ESCOSA

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### Network Characteristics

SA Power Networks' Network is operated as a solidly earthed system.

### Approved inverter

Only inverters that have been tested by an authorised testing laboratory and certified as being in compliance with AS 4777 and issued with an accreditation number will be regarded as an *approved inverter*.

### Lockable switch

Lockable switch means that the switch or circuit breaker must as a minimum have provision for insertion of a mechanical device or wire seal to prevent operation of the switch.

### Electricity Distributor

SA Power Networks is the owner, lessor and operator of the South Australian electricity distribution network.

### Islanding

Islanding of inverter systems in the context of this Guideline means any situation where the *distribution network* fails or is tripped and one or more inverters maintains a supply of any description (be it stable or not) to any section of the *distribution network* outside the consumer's installation (i.e. on the *distribution network* side of the connection point).

### Power Flow Direction

Both directions of power flow allowed i.e. from inverter to *distribution network* and from *distribution network* to inverter.

### Power Factor

Allowable range is from 0.95 lagging to 0.8 leading for outputs from 20% to 100% of rated Volts-Amperes.

Unless the device is approved by SA Power Networks to control power factor beyond the above range for the purpose of providing voltage support at the point of connection. Alternatively under special circumstances SA Power Networks may require the inverter to operate at a specific power factor.

**Note:** Lagging power factor is defined to be when reactive power flows from the grid to the inverter; that is, when the inverter acts as an inductive load from the grid perspective.

## 4.4 Connection and installation requirements

### General

Connection between the *small-embedded generating unit* (PV Array) and the *distribution network* must be via an *approved inverter* otherwise the connection must be undertaken in accordance with Chapter 2 of the ESCOSA Electricity Distribution Code and SA Power Networks Guideline for *large-embedded generation installations*.

SA Power Networks will generally connect single phase *small-embedded generating units* via *approved inverters* up to 10 kVA and three phase up to 30kVA.

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## Small Embedded Generation Network Connection

All three phase *small-embedded generation installations* must be configured such that no *small embedded generating unit* inverter shall connect or remain connected to the *distribution network* unless all phases of the *distribution network* are energised at the *connection point*.

The *small embedded generating unit* inverters must be configured to ensure that in the event of a fault on a single inverter connected in a 3 phase arrangement will isolate the remaining inverters of the *small embedded generating unit* in that 3 phase arrangement.

SA Power Networks will only connect up to 5kVA where a *Proponent / Small-Embedded Generator* is proposing to install a *small embedded generating unit* connected to a SWER system within the *distribution network*.

Either current or voltage source energy sources via *approved inverters* may be connected to the *distribution network* provided they comply with the requirements of this Guideline. Inverter energy systems must satisfy the requirements listed in the subsections below to satisfy these Guideline.

### **Electrical Safety**

The inverter and grid protection device shall comply with appropriate electrical safety requirements of AS/NZS 3100.

The installation shall comply with the appropriate requirements of AS/NZS 3000 (Wiring Rules) and AS 4777.1 (Grid connection of energy systems via inverters).

### **Inverters and Grid protection devices**

The inverter shall comply with the requirements of AS 4777.2.

The inverter energy system shall incorporate a grid protection device, which shall comply with the requirements of AS 4777.3. The grid protection device may be integral with the inverter. The protection settings of the grid protection device shall not exceed the capabilities of the inverter.

All inverters and grid protection devices must be tested by an authorised testing laboratory and certified as being in compliance with AS 4777 and issued with an accreditation number.

### **Connection Point**

The inverter energy system shall be connected by fixed wiring to a dedicated circuit on a switchboard.

It is preferable that an inverter energy system be connected directly to the main switchboard. In installations where this is not possible or desirable the nearest distribution board shall be used and all distribution boards between the inverter energy system and the main switchboard including the main switchboard shall be labelled. See section on labelling/signage.

The rating of the inverter circuit cables and all the cables between any distribution boards and the main switchboard which carry inverter output must be rated for at least the full output of the inverter energy system in accordance with AS/NZS 3000.

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### Isolation Switches

There shall be a visible and accessible method of ensuring that the inverter energy system is disconnected from the *distribution network* and disconnected from the *Customer's* installation.

The main switch for the switchboard, to which the inverter energy system is directly connected, shall be a lockable switch in the OFF position, which operates in all live conductors. The operation of this switch shall isolate the inverter energy system from that switchboard.

**Note:** This switch is to provide isolation of the inverter energy system for persons working on other parts of the electrical installation.

The switch located on the main switchboard which controls the sub-circuit of the distribution board to which the inverter energy system connects must be lockable.

**Note:** This switch is for the use of utility staff working on the *distribution network* as means of isolation for inverter energy system.

The isolation switches shall be installed to the requirements governing main switches in AS/NZS 3000, irrespective of where the inverter energy system circuit emanates from.

### Residual current devices (RCDs)

The inverter energy system shall be connected to the electrical installation on the grid side of any residual current devices.

### Isolation of inverter from energy source

A suitable isolation device shall be provided between the energy source and the inverter unless the inverter is physically integral with the energy source. This isolation device shall comply with the requirements of AS/NZS 3000 for isolation and switching devices.

### Labelling/Signage

The *small-embedded generation installation* must include warning signage to clearly indicate that the electrical installation has multiple supplies and identify which circuits are affected by these supplies.

Signage shall as a minimum be placed:

- On the switchboard that has the inverter energy system directly connected to it.
- On all switchboards including main switchboard and distribution board(s) between the main switchboard and the board that has the inverter energy system directly connected to it.
- In all meter boxes containing the distributor's metering equipment.

Signage should describe the actual type of generation source installed.

The installer of the inverter energy system shall supply and install appropriate signage on the installation in accordance with requirements as required by AS 4777.2, and as outlined in Item 4.12 Signage.

The materials for the labelling/signage shall comply with AS/NZS 3100.

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### Reconnection Procedure

If voltage and / or frequency fall below set limits as defined in AS 4777, the inverter energy system must be automatically disconnected from the *distribution network*. Tests shall be carried out to confirm that there is a minimum 1 minute time delay before the inverter energy system is automatically reconnected onto the *distribution network* after the *distribution network* has returned to nominal voltage and frequency.

### Short Circuit Capacity

The plant must comply with AS/NZS 3000.

### Cables and Wires

The installation must comply with all appropriate Australian Standards including but not limited to:

- AS/NZS 3000 for all wiring
- AS/NZS 3100 for equipment requirements.

### Contribution to Fault Levels

It is expected that systems with inverters will not contribute significantly to network fault levels.

### Metering

Metering that measures both import and export energy is a requirement for all grid connected inverter installations (small-embedded generation) under the electricity regulations.

The *Embedded Generator* must pay the costs of the supply and installation of import / export metering and arrange the metering via their *Retailer*, refer section 4.8. Off-peak (hot water) metering is not affected by these connections.

## 4.5 Small Embedded Generator Connection Agreement

It is a requirement of the Electricity Distribution Code that a *Proponent / Embedded Generator* wishing to install and connect a *small-embedded generating unit* to the *distribution network* must enter into an ESCOSA approved Connection Agreement with SA Power Networks. The Small-Embedded Generator Connection Agreement covers each party's roles and responsibilities particularly as the *distribution network* connection of *small-embedded generation installations* has potential safety issues for both the *Customer* and the *distribution network*. A copy of the approved "Small Embedded Generator Connection Agreement" can be obtained from the SA Power Networks web site at [www.sapowernetworks.com.au](http://www.sapowernetworks.com.au).

## 4.6 Compliance and monitoring

The *Embedded Generator* is responsible for and must:

- maintain the electrical installation at the supply address in a safe condition;
- ensure that the *small-embedded generating unit* is inspected and maintained in accordance with the manufacturer's instructions. If there are no applicable manufacturer's instructions within at least 5 years after the date of installation and within 5 years after each previous inspection;
- ensure that any changes to the electrical installation at the supply address are performed by an electrician lawfully permitted to do the work and that the customer keeps a Certificate of Compliance issued in respect of any of the changes;

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- ensure that the electrical installation at the supply address, including the small-embedded generation installation, complies at all times with the requirements in the Connection Agreement;
- ensure the protection of SA Power Networks equipment located at the supply address;
- ensure that any structures and vehicles are kept clear of SA Power Networks equipment;
- seek approval prior to altering the *small-embedded generation installation* capacity or inverter. SA Power Networks will advise if additional work is required and the associated cost (if any);
- provide sufficient information to SA Power Networks, on request, so that the electricity used by any un-metered loads that the customer has installed can be calculated;
- ensure that the customer's employees, servants or agents who carry out any electrical maintenance function on the *small-embedded generation installation* or any other part of the customer's electrical equipment are appropriately qualified and licensed to perform such work.
- comply with all legislation, codes, Rules or other regulatory instruments (as amended);
- ensure that a Notice of Alteration form is forwarded to SA Power Networks or from the customer's electrician when the customer changes the electricity supply requirements by installing additional electrical appliances or equipment of capacity 2.5 kW or greater;
- seek approval prior to installing any additional appliances or equipment of capacity 5kW or greater, so that SA Power Networks can assess the ability of the network and the customer connection to the network to meet the additional requirements and advise the customer if additional work is required and the associated cost (if any).

### 4.7 Registration

*Embedded Generators* owning a *small-embedded generating installation* do not require a Generation Licence however these installations must be registered with SA Power Networks. This is both a safety issue and a network security issue; registration is not intended to restrict connection, but rather provide for safety and information for future planning requirements.

### 4.8 Metering installations

The ESCOSA Metering Code requires the installation of meters that measure both import / export electricity for *small-embedded generation installations* connected to the *distribution network*.

The *Embedded Generator* or the installer must submit an Application for Connection / Alteration / Removal of Supply" form to their chosen Retailer so that the installation of the appropriate meter can be arranged. The connection application must include SA Power Networks' SEG Approval Reference number for it to be accepted by the Energy Retailer or SA Power Networks. The *application to connect* form is available from the SA Power Networks web site at [www.sapowernetworks.com.au](http://www.sapowernetworks.com.au) or authorised registered electrical contractors and installation contractors can lodge electronic applications via SA Power Networks on-line REX system on the proponents' behalf.

SA Power Networks can not install an import / export meter for the *Embedded Generator* until their *Retailer* has provided SA Power Networks with an authorisation to undertake

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## Small Embedded Generation Network Connection

the work. After receipt of the *Retailers* authorisation the *Embedded Generator* or their installation contractor must either use the REX system or contact SA Power Networks' Builders & Contractors Line on 1300 650 014 to organise an appropriate meter installation booking appointment.

### 4.9 Import export metering charges

Costs associated with the supply and installation of an import / export meter, in compliance with the Code, are applicable to all *small-embedded generation installations*. The *Embedded Generator* is responsible for the payment of any charges levied by SA Power Networks for the supply and installation of the import / export meter. A copy of SA Power Networks Excluded Service Charges is available from the SA Power Networks web-site at [www.sapowernetworks.com.au](http://www.sapowernetworks.com.au).

### 4.10 Issues that may require further investigation by SA Power Networks

The following items are seen as potential issues for the connection of *small-embedded generation installations* in the *distribution network* and may require further investigation.

- Network Load Balance for local distribution feeders:
- Network Thermal Overload conditions:
- Harmonic Saturation:

SA Power Networks sees that the control and recording of *small-embedded generation installations* as imperative in managing quality of supply. It is envisaged that limits will need to be enforced on the total kVA of *small-embedded generation installations* connected per transformer, with lower limits applying on LV networks to minimise the impact of harmonic saturation.

### 4.11 Special proposals

All single phase *small-embedded generation installations* above 10kVA and three phase *small-embedded generation installations* above 30kVA must be analysed by SA Power Networks to determine their impact on the *distribution network*.

Where a *Proponent* requests a connection for multiple *small embedded generation installations* SA Power Networks will assess the proposed connection based on the aggregate of the proposed *small embedded generation installations* rated capacity. As a minimum the following conditions shall apply for all proposed installations where the aggregated capacity of the *small embedded generation installations* connection exceed the 10kVA for single phase and 30kVA for 3 phase installations:

- The installation must incorporate additional islanding protection with a suitable protection relay with both Vector Shift and ROCOF protection elements incorporated within the relay to provide dual islanding protection. The backup islanding protection relay settings must be submitted to and agreed by SA Power Networks prior to the connection of the *small-embedded generation installations* to the *distribution network*.  
The backup islanding protection must be commissioned by a competent technician. The results of the commissioning tests must be retained by the *Small Embedded Generator* and made available to SA Power Networks as and when required.
- The *small-embedded generation installations* import / export meter shall include additional functionality to record quality of supply data that SA Power Networks may access for long term monitoring of the installation. The meters shall be capable of capturing and providing via a modem quality of supply data including:

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- THD (Volts and current) as a % of the fundamental / Individual (Voltage and Current) values from 2nd to the 50<sup>th</sup>; and
- Voltage Sag and Surge (both short and long term voltage flicker data measurements for compliance with AS/NZS61000).  
The *Proponent* must make all necessary arrangements with their *Retailer* to provide SA Power Networks with the necessary access to be able to remotely access the quality of supply data as specified, from time to time.
- The commissioning of the *small-embedded generation installations* shall include demonstration of the protection and quality of supply to ensure that the *small-embedded generation installations* comply with the Electricity Distribution Code and that the harmonic contribution from the *small-embedded generation installations* will not exceed the permissible limits as specified (individual odd harmonics 1.33%, individual even harmonics 0.67% and THD of 1.67%).

It is recommended that the data loggers be installed to measure the existing contributions at the *connection point* as a bench mark prior to connecting the *small-embedded generation installations* to the *distribution network*.

### 4.12 Sample signage

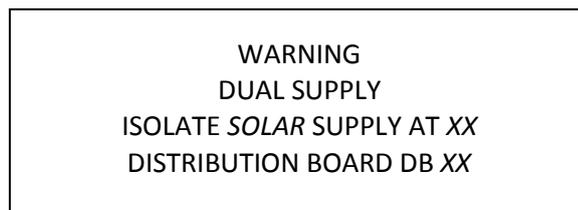
This is only a sample of appropriate signage. It is indicative of the type of appropriate signage required at the various locations specified.

**Note:** Words in italic can change to describe the type of generation (eg. photovoltaic, wind turbine generating unit, other renewable energy sources connected via grid connected inverter system.)

Size specifications are a minimum size.

#### **Main switchboard and distribution board(s) upstream of distribution board where the inverter energy system is connected.**

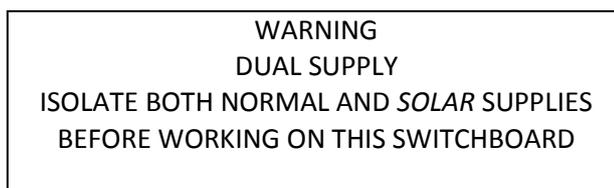
Qty: 1  
Lettering: 5mm,  
(8mm "WARNING")  
Colour: Red, white letters  
Size: 120 x 60mm



Where XX is the switchboard identification where the **inverter energy system** is directly connected

#### **Main switchboard and/or distribution board where the inverter energy system is directly connected.**

Qty: 1  
Lettering: 5mm  
(8mm "WARNING")  
Colour: Red, white letters  
Size: 120 x 60mm



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## Small Embedded Generation Network Connection

**Main switchboard and/or distribution board where inverter energy system is connected.**

### **NORMAL SUPPLY MAIN SWITCH**

Qty: 1  
Lettering: 5mm  
Colour: White, black letters  
Size: 75 x 30mm

NORMAL SUPPLY MAIN SWITCH

### **SOLAR GENERATOR MAIN SWITCH**

Qty: 1  
Lettering: 5mm  
Colour: White, black letters  
Size: 75 x 30mm

SOLAR SUPPLY MAIN SWITCH

## 5. Referenced documents

The following Australian Standards are referred to in this Guideline:

AS 1319	“Safety signs for occupational environment”
AS 1931 Part 1	“High voltage - Test techniques - General definition and test requirements”
AS 2279	“Disturbances in mains supply networks”
AS/NZS 3000	“Electrical Installations (known as the Wiring rules)”
AS/ZNS 3017	“Electrical installations – Testing Guidelines”
AS/NZS 3100	“Approval and test specification - General requirements for electrical equipment”
AS 4777 (Parts 1, 2 & 3)	“Grid connection of energy systems via inverters”
AS/NZS 61000	“Electromagnetic compatibility (EMC)”