

EVOENERGY SMALL EMBEDDED GENERATION TECHNICAL REQUIREMENTS

Technical requirements for connection of small-scale embedded generating units to the Evoenergy network

CONTENTS

1. INTRODUCTION	4		
1.1 About Evoenergy	4	4.10 Metering	22
1.2 Scope and Purpose	4	4.11 Quality of Supply and Generation	23
1.3 Obligations	5	4.12 Communication Systems	24
1.4 Statement of Compliance	6	4.13 Data and Information	24
		4.14 Cyber Security	24
		4.15 Technical Studies	24
2. DEFINITIONS AND ABBREVIATIONS	6	5. FEES AND CHARGES	25
2.1 Definitions	6	6. TESTING AND COMMISSIONING	25
2.2 Abbreviations	11	7. OPERATIONS AND MAINTENANCE	25
2.3 Terminology	12	1.2 Replacements	25
		1.3 Feed in Tariff (FIT) Replacements	26
3. RELEVANT RULES, REGULATIONS, STANDARDS AND CODES	12	VERSION CONTROL	27
3.1 Evoenergy Documents	12	DOCUMENT CONTROL	28
3.2 Standards and Codes	13	APPENDIX A – DEVIATIONS FROM THE NATIONAL DER CONNECTION GUIDELINES	29
3.3 Legislation and Regulation	14	APPENDIX B – CONNECTION ARRANGEMENT REQUIREMENTS	32
		APPENDIX C – MODEL STANDING OFFER	38
4. TECHNICAL REQUIREMENTS	15	APPENDIX D – STATIC DATA AND INFORMATION	38
4.1 Subcategories	15		
4.2 Maximum System Capacity	16		
4.3 Generation Control	17		
4.4 Inverter Energy System	18		
4.5 Network Connection and Isolation	19		
4.6 Labelling and Signage	20		
4.7 Earthing	21		
4.8 Protection	21		
4.9 Operating Voltage and Frequency	22		

Disclaimer

Whilst this document contains material relevant to the electricity industry legislation, codes of practice and standards, it is not intended to provide legal advice on how electrical contractors can meet their own statutory obligations or comply with legislation, codes of practice or industry standards such as AS/NZS 3000 (Wiring Rules). Whilst care has been taken in the preparation of this document, Evoenergy does not guarantee that the information contained in this document is accurate, complete, or up to date at time of publication. To the extent permitted by the relevant legislation Evoenergy will not be responsible for any loss, damage, cost or expense incurred as a result of any error, omission or misrepresentation in relation to the information contained in this document.

Note

Printed versions of this document are “uncontrolled copies” - the latest version is available on the Evoenergy [website](#).

This document was previously titled Evoenergy Micro Embedded Generation Technical Requirements. Any other Evoenergy documents referring to the old title are referencing this document. Change from micro to small is in line with ENA templates and to avoid confusion with micro inverters and conflicting NER definitions.

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1. INTRODUCTION

1.1 About Evoenergy

Evoenergy own and operate the electricity and gas distribution networks in the ACT, providing electrical power to over 220,000 residential and business customers. The electricity network delivers this power through 2,394 km of overhead lines, 2,694 km of underground cables, over 50,000 poles and over 4,700 distribution substations across a geographical area of 2,358 square kilometres.

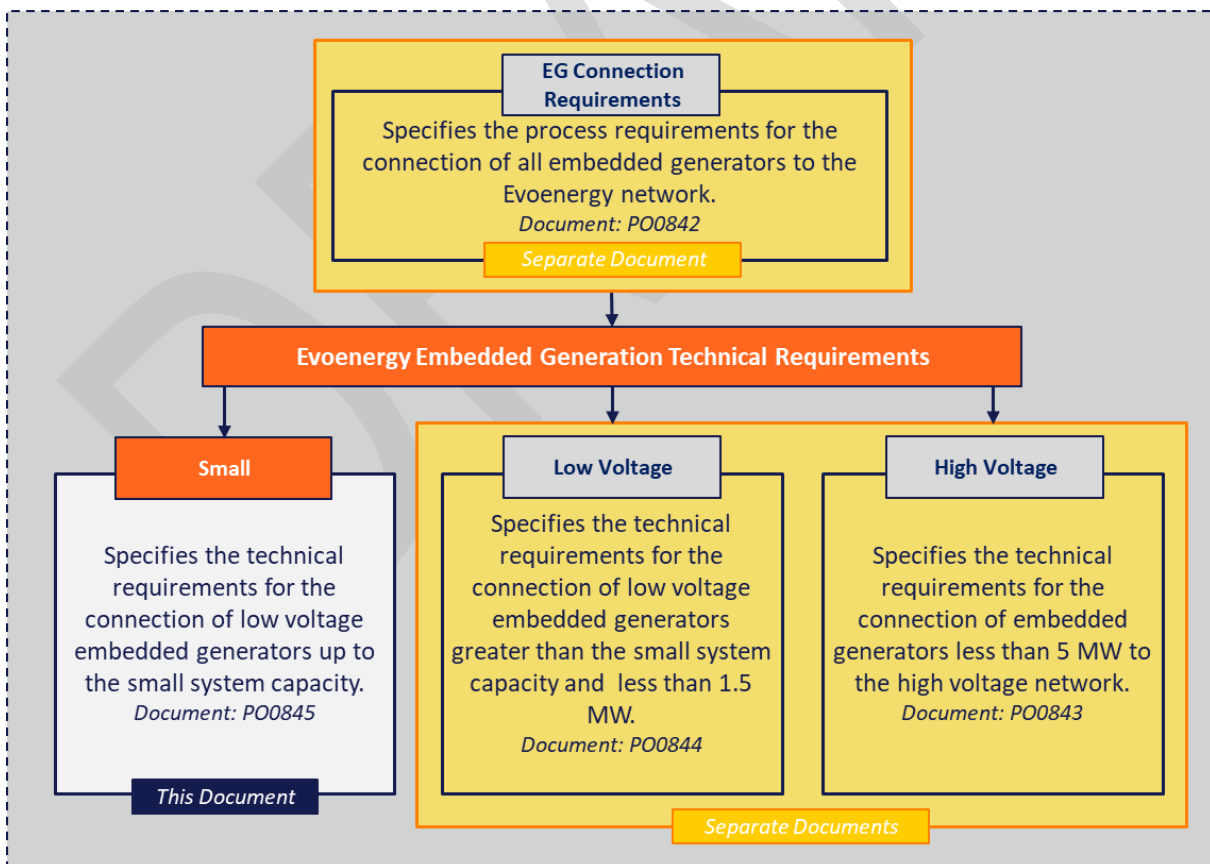
The Evoenergy network currently connects to more than 55,000 embedded generation systems, the majority of which are solar photovoltaic (PV) systems.

Evoenergy maintain and operate the network in compliance with relevant regulatory, technical and safety requirements. These requirements are adhered to in the long term interests of consumers particularly with respect to the price, quality, safety, reliability and security of the electricity supply system.

1.2 Scope and Purpose

Evoenergy has developed these technical requirements to provide proponents of Small Embedded Generation Connections information about their obligations for connection to, and interfacing with, Evoenergy’s low voltage distribution network. As outlined in Figure 1, this document is one of three documents defining the technical requirements for the connection of embedded generators to the Evoenergy network. These documents supersede the previous *Evoenergy Requirements for Connection of Embedded Generators up to 5MW to the Evoenergy Network (SM3201)* for the defined system capacities.

FIGURE 1. EVOENERGY EMBEDDED GENERATION DOCUMENT ARCHITECTURE



For the purposes of this document, a Small Embedded Generation Connection is defined as:

A small embedded generation system with a total system capacity less than or equal to 20 kVA for a single-phase IES (including ESS) network connection, and a total system capacity less than or equal to 60 kVA for a three-phase IES (including ESS) network connection that is:

- a) intended to be connected to, and capable of operating, in parallel with any part of the LV distribution network
- b) involving minimal or no augmentation of the distribution network
- c) meeting all other technical requirements set out in this document

All Small Embedded Generation Connections are subject to the requirements outlined in this document unless formally advised in writing by Evoenergy. These requirements are applicable to all new connections and modifications of existing systems where the system consists of an Inverter Energy System (IES), Energy Storage System (ESS) or combination of both.

Embedded Generation Systems that are outside the scope of these requirements include:

- Systems covered by Evoenergy's Low Voltage Embedded Generation Connection Technical Requirements
- Systems covered by Evoenergy's High Voltage Embedded Generation Connection Technical Requirements
- Electric vehicles, unless the on-board battery storage system is capable of exporting to the LV network (in which case the requirements shall apply)
- Distributed energy resource systems that do not generate electricity, including demand response / demand management systems, unless they impact on the ability of the small EG system to meet the technical requirements
- Systems that are off-grid or operate in a non-parallel configuration

This document does not administer the eligibility for any feed-in-tariff or any other tariff. The requirements set out in this document shall be read in conjunction with the Evoenergy Service and Installation Rules which are located on the Evoenergy [website](#).

This document contains technical requirements for the connection of small embedded generators to the Evoenergy network. Additional information regarding the connection process and associated timelines is available on the Evoenergy [website](#).

1.3 Obligations

Embedded Generation Proponents and Evoenergy have certain obligations to ensure the purpose of these requirements is met. Proponents are required to:

- Comply with these technical requirements as well as relevant national standards, industry codes, legislation and regulations. In the event of inconsistency, legislation and regulations, followed by these technical requirements, followed by national standards and industry codes shall prevail
- Withhold from connecting additional inverters, undertaking system modifications or installing additional embedded generation units, including ESS, without prior written agreement from Evoenergy
- Maintain compliance with the Evoenergy Model Standing offer as detailed on the Evoenergy [website](#)
- Ensure the requirements are met with regard to the design, installation and operation of Small Embedded Generating systems

Evoenergy has an obligation to ensure the safe and reliable operation of the distribution system for operating personnel, customers and the general public.

1.4 Statement of Compliance

This document complies with the National DER Connection Guidelines for Small EG Connections developed by ENA, with the exception of the deviations presented in Appendix A: Deviations from the National DER Connection Guidelines.

2. DEFINITIONS AND ABBREVIATIONS

2.1 Definitions

TABLE 1. DEFINITIONS

ACT Government – Electrical Inspectorate	The ACT Government Electrical Inspectorate is the inspecting authority in the ACT and is responsible for inspecting and approving the consumer’s electrical installation <i>Contact number is (02) 6207 7775</i> <i>Email: electrical.inspections@act.gov.au</i>
Active power limiting	Where the electricity exported from an IES at the AC output terminals of the inverter(s) is limited below a defined threshold. See also Generation Limit.
Amp (A)	A unit of electrical current
Anti-islanding protection (Loss of mains)	A protection system to detect islanded conditions and disconnect the IES from the distribution network
Backup load	Any load to be supplied by an embedded generating unit during customer islanded mode
Basic Micro embedded generation connection	A connection between a distribution network and a retail customer’s premises for a embedded generating unit of the kind contemplated by AS 4777, for which a model standing offer is in place.
Bi-directional metering	A meter capable of registering energy supplied to the premises and energy exported from the premises as separate data streams
Connection point	The point where the IES is connected to the rest of the customer’s installation. This is generally at the consumer’s main or distribution switchboard
Demand response	The alteration of an inverter’s normal mode of operation in response to an initiating signal originating from or defined by a remote agent
Distributed energy resources (DER)	Power generation or storage units that are connected directly to the distribution network
DRED (Demand response enabling device)	A device applying demand response signals to the inverter as documented in AS/NZS 4755.1
Embedded generation system	A system comprising of one or multiple embedded generating units. The system rating is defined based off the combined AC output nameplate rating of each generating unit
Embedded generating unit	A generating unit connected within a distribution network and not having direct access to the transmission network

Embedded Generation Point of common coupling	The point where embedded generation is connected to the customer's electrical installation. The point of common coupling shall have no upstream loads apart from those related to the embedded generation, such as batteries or power supplies for embedded generation control systems.
Embedded Network	Where an Embedded Network Manager manages the electrical connection of multiple child meters located behind a parent/gate meter.
Energy Source	Voltage or current source requiring conversion from one kind of electrical power to another kind suitable for connection to the electrical installation. E.g. battery energy storage, fuel cell, hydro turbine, photovoltaic or wind turbine.
Energy storage system (ESS)	A system comprising one or more batteries that store electricity generated by distributed energy resources or directly from the grid, and that can discharge the electricity to loads. The Energy Storage System rating is defined based off the total AC output nameplate rating of IES where batteries are the only energy source. Inverters with multiple energy sources (such as batteries and PV) will be counted towards the installed system capacity but will not be considered as ESS for the purposes of determining maximum system capacity.
Evoenergy	Evoenergy is the ACT's principal Distribution Network Service Provider (DNSP) and is responsible for the distribution of electricity to all customers within the ACT under a regulatory framework. Evoenergy designs, installs, upgrades, repairs and maintains the infrastructure which makes up the distribution network carrying electrical energy to ACT homes and businesses.
Export capacity	Combined power that all embedded generation units installed at the consumer's premises are capable of exporting to the network
Export limit	Where the electricity exported from an IES to the distribution network is controlled so as to not exceed a specified limit. AS/NZS 4777.1 defines two types of export limitation function, namely (i) Hard limit: A limit that will require the IES to disconnect and (ii) Soft limit: A limit that will cause the IES to reduce its output, preventing ongoing export greater than the limit
Export Limit Control	Function to limit the active power from an embedded generation system that can flow from an electrical installation towards the grid.
Export limiting device	Additional hardware installed to perform export limit control. This typically involves an export meter to monitor the utility connection point.
Generating unit	The plant used in the production of electricity and all related equipment essential to its functioning as a single entity
Generation	The production of electrical power by converting another form of energy source in a generating unit
Generation limit	Where the active power that can flow from an embedded generating unit towards the rest of the electrical installation is limited to not exceed a specified value less than the nameplate rating of the embedded generating unit.. AS/NZS 4777.1 defines two types of generation limitation function, namely (i) Hard limit: A limit that will require the IES to disconnect and (ii) Soft limit: A limit that will cause the IES to reduce its output, preventing ongoing generation greater than the limit
Generator	A person who owns, operates or controls a generating unit

High voltage (HV)	Any voltage greater than 1 kV AC
Hybrid inverter	An inverter which can simultaneously manage inputs from both solar panels and a battery, charging batteries with either solar panels or the electricity grid
Installed capacity	Combined nameplate rating of all IES installed at the consumer's premises. This may be equal to or greater than the export capacity.
Installer	For IES systems installed in ACT; a person who holds an unrestricted electrician's licence with Distributed Energy Resources (DER) endorsement. For IES systems installed in NSW; a person who holds an unrestricted electrician's licence and SAA accreditation.
Interface Protection	Interface Protection is the protection defined by AS/NZS 4777.1 (grid connection of energy systems via inverters). Combination of protection relay functions that opens the disconnection device of the inverter energy system (IES) and prevents its closure, whichever is appropriate, in the case of: <ul style="list-style-type: none"> (a) A fault on the grid; (b) An unintentional islanding situations; or (c) Voltage and frequency being outside the continuous operating range Interface Protection was previously referred to as Central Protection. Any references to Central Protection in other Evoenergy documentation is referring to Interface Protection.
Inverter	A device that uses semiconductor devices to transfer power between a DC source(s) or load and an AC source(s) or load
Inverter energy system (IES)	A system comprising one or more inverters together with one or more energy sources (which may include batteries for energy storage) including controls and one or more grid protection devices and where the inverter(s) satisfies the requirements of AS/NZS 4777.2 connected at a single point in an electrical installation
Inverter Power Sharing Device (IPSD)	A device used to share power from one IES between multiple electrical installations. E.g. Solshare.
Islanding	Any situation where the electrical supply from the distribution network is disrupted and one or more IES maintains any form of electrical supply, be it stable or not, to any section of that distribution network
kVA	kilo-Volt Amp, product of voltage and current; a measure of apparent power (combined real and reactive power)
kVAr (Reactive power)	kilo-Volt Amp Reactive; the rate at which reactive energy is transferred. Reactive energy is integral in an alternating current system with inductive or capacitive components. Although it is not useful energy it assists in regulating the local system voltage
kW	kilowatt or 1000 Watts; the rate at which active or real (useful) energy is transferred
Low Voltage (LV)	The mains voltages as most commonly used in any given network by domestic and light industrial and commercial consumers (typically 230 V)
Market generating unit	A generating unit whose generation is not purchased in its entirety by a retailer (and receives payment for generation through the National Electricity Market or Wholesale Electricity Market)

Meter Protection Device (MPD)	A fuse or other protection and isolation device located on the unmetered side of the installation, intended for the isolation and protection of the meter and its associated customer installation
Micro embedded generation connection	Means a connection between a micro IES and a distribution network of the kind contemplated by Australian Standard AS 4777 (Grid connection of energy systems via inverters)
Small IES	Small inverter energy systems (IES) up to size limits as specified in this document.
Model standing offer	A document approved by the Australian Energy Regulator as a model standing offer to provide micro embedded generation connection services or standard connection services which contains (amongst other things) the safety and technical requirements to be complied with by the proponent. This definition also applies to an equivalent model offer for jurisdictions not subject to Chapter 5A of the National Electricity Rules
Negotiated connection	A connection of an embedded generation unit which is neither a micro EG connection or standard connection for which technical requirements are negotiated between the DNSP and proponent
Network	Evoenergy's distribution network
Point of supply	The junction of the installation's consumer mains with Evoenergy's low voltage distribution network, normally at a connection device (see Evoenergy service and installation rules)
Proponent	A person proposing to become a generator (the relevant owner, operator or controller of the generating unit (or their agent))
Rated apparent power	Output apparent power of the generating unit, which is a product of the rated current and rated voltage.
Registered generator	A person who owns, operates or controls a generating unit that is connected to, or who otherwise supplies electricity to, a transmission or distribution system and who is registered by the Australian Energy Market Operator as a Generator under Chapter 2 of the National Electricity Rules
Retailer	The holder of a retailer authorisation issued under the National Energy Retail Law in respect of the sale of electricity
Service Protection Device (SPD)	The first protection device located on the network side or forming part of the connection point.
Single phase	Connected between the active of a phase and neutral
Single wire earth return	Parts of the electrical distribution network that use a single live conductor to supply single-phase or split-phase electric power with higher network impedances, and with distribution supplying low voltages to premises
Small generation aggregator	A person who has classified one or more small generating units as a market generating unit
Small registered generator	A generator who elects to register a generator with the Australian Energy Market Operator as a market generating unit who would otherwise be entitled to an exemption to register based on size

Standard connection	A connection service (other than a micro embedded generation connection service) for a particular class (or sub-class) of connection applicant and for which an Australian Energy Regulator approved model standing offer is in place or for which an equivalent model offer is in place in jurisdictions not subject to Chapter 5A of the National Electricity Rules
Stand-alone mode	A generating unit capable of stand-alone mode will have the ability to supply electricity to a section of the customer's installation when disconnected from the Evoenergy network.
Supply, alternate	A supply system intended to maintain the functioning of an electrical installation or a part or parts thereof, in case of interruption of the normal supply. For example, a multiple-mode inverter which typically operates in grid connected mode but will swap to stand-alone mode during a network outage.
Supply, grid	Where an electrical installation is supplied with electricity from the electrical distribution network.
Supply, independent	Supply system intended to supply the functioning of an electrical installation or part thereof, as an islanded operation instead of the grid supply, whilst the grid supply remains connected to the electrical installation. For example, a stand-alone inverter with grid input.
Supply, Supplementary	A supply system intended to operate in conjunction with the normal supply. For example, an inverter operating in grid connect mode.
System Capacity	The combined AC output nameplate rating of all embedded generating units connected to the generator's electrical installation.
Three phase	Connected to all phases and neutral (star) or connected between phases (delta)
Utilities Technical Regulation Team	The ACT Government team responsible for the technical administration of utility requirements and administration of the <i>Utilities (Technical Regulation) Act 2014</i>
Volt (V)	Volt; the measure of electrical potential

2.2 Abbreviations

TABLE 2. ABBREVIATIONS

AC	Alternating Current
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AS	Australian Standard
AS/NZS	A jointly developed Australian and New Zealand Standard
CBD	Central Business District
CEC	Clean Energy Council
DC	Direct Current
DER	Distributed Energy Resource
DNSP	Distribution Network Service Provider
EG	Embedded Generation or Embedded Generating
ENA	Energy Networks Australia
ESS	Energy Storage System
HV	High Voltage
IEC	International Electrotechnical Commission
IES	Inverter Energy System
IPSD	Inverter Power Sharing Device
LV	Low Voltage
MW	Megawatt
NEM	National Electricity Market
NER	National Electricity Rules
NMI	National Metering Identifier
PV	Photovoltaic
ROCOF	Rate of Change of Frequency
SAA	Solar Accreditation Australia

SCR	Special Connection Request
SWER	Single Wire Earth Return
UTR	Utilities Technical Regulation Team

2.3 Terminology

To assist with the interpretation and application of the requirements specified in this document, the following instructional terms have been used:

- The word 'shall' indicates a mandatory requirement
- The word 'may' indicates a requirement that may be mandatorily imposed on the proponent
- The word 'should' indicates a recommendation that will not be mandatorily imposed on the proponent

3. RELEVANT RULES, REGULATIONS, STANDARDS AND CODES

3.1 Evoenergy Documents

Table 3 lists the relevant Evoenergy documents that shall be considered in the application of the Small EG technical requirements.

TABLE 3. RELATED EVOENERGY DOCUMENTATION

Evoenergy Service and Installation Rules	Sets out the requirements and associated obligations and procedures for the safe, reliable and efficient connection of electrical installations to an electricity network
Evoenergy Connection Policy	Sets out the circumstances in which connection charges are payable and the basis for determining the amount of such charges. The policy has been prepared in accordance with the requirements in Chapter 5A of the National Electricity Rules (Rules) and the Australian Energy Regulator's (AER's) Connection charge guidelines for retail electricity customers, under Chapter 5A of the National Electricity Rules, version 1.0 (AER connection charge guidelines)
Evoenergy embedded generation connection requirements	Sets out the requirements of the connection application process for embedded generation.

3.2 Standards and Codes

There are a number of Australian and International Standards which specify technical requirements for network connections of generating units and performance requirements. These are outlined in Table 4.

TABLE 4. RELATED AUSTRALIAN AND INTERNATIONAL STANDARDS

STANDARD NUMBER	STANDARD NAME	STANDARD TYPE
AS 3011	Secondary batteries installed in buildings	Australian Standard
AS 4086	Secondary batteries for use with stand-alone systems	Australian Standard
AS 60034.1	Rotating electrical machines, Part 1: Rating and performance	Australian Standard
AS 60034.22	Rotating electrical machines, Part 22: AC generators for reciprocating internal combustion (RIC) engine driven generating sets	Australian Standard
AS 60038	Standard voltages	Australian Standard
AS 60044	Instrument transformers (multiple parts)	Australian Standard
AS/NZS 3000	Electrical installations (known as the Australian/ New Zealand Wiring Rules)	Australian/ New Zealand Joint Standard
AS/NZS 3008.1.1	Electrical installations - Selection of cables. Part 1.1: Cables for altering voltages up to and including 0.6/1 kV – Typical Australian installation conditions	Australian/ New Zealand Joint Standard
AS/NZS 4755.1	Demand response capabilities and supporting technologies for electrical products –Part 1: Demand response framework and requirements for demand response enabling devices (DREDs)	Australian/ New Zealand Joint Standard
AS/NZS 4777	Grid connection of energy systems via inverters (multiple parts)	Australian/ New Zealand Joint Standard
AS/NZS 5033	Installation and safety requirements for photovoltaic (PV) arrays	Australian/ New Zealand Joint Standard
AS/NZS 61000.4.3	Electromagnetic compatibility testing and measurement techniques – Power quality measurement methods	Australian/ New Zealand Joint Standard
AS/NZS IEC 60947.6-1	Low-voltage switchgear and control gear - Multiple function equipment - Automatic transfer switching equipment	Australian/ New Zealand Joint Standard

IEC 60255-12	Electrical relays - Part 12: Directional relays and power relays with two input energizing quantities	International Standard
IEC 60255-127	Measuring relays and protection equipment - Part 127: Functional requirements for over/under voltage protection	International Standard
IEC 60255-26	Electrical relays - Part 26: Electromagnetic compatibility requirements	International Standard
IEC 60255-27	Electrical relays - Part 27: Product safety requirements	International Standard
IEC 62109	Safety of power converters for use in photovoltaic power systems	International Standard
IEC 62116	Utility-interconnected photovoltaic inverters – Test procedure of islanding prevention measures	International Standard
IEC 62786	Distributed energy resources connection with the grid	International Standard
IEEE standard 1547-2018	IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems	International Standard
SA/SNZ TR IEC 61000.3.14	Electromagnetic compatibility (EMC), Part 3.14: Limits – Assessment of emission limits for harmonics, interharmonics, voltage fluctuations and unbalance for the connection of disturbing installations to LV power systems	AU/NZ Technical Report
SA/SNZ TR IEC 61000.3.15	Electromagnetic compatibility (EMC), Part 3.15: Limits – Assessment of low frequency electromagnetic immunity and emission requirements for dispersed generation systems in LV network	AU/NZ Technical Report

In the event of an inconsistency between the Evoenergy technical requirements, Australian standards, international standards and industry codes, the Evoenergy technical requirements shall prevail.

3.3 Legislation and Regulation

This section provides a list of the relevant legislation and regulations which shall apply to the design, manufacture, installation, testing, commissioning, operations and maintenance of all plant and equipment for Small EG connections to the Evoenergy distribution network.

- Electrical Safety Act 1971
- Electrical Safety Regulation 2004
- Utilities Act 2000
- Utility Networks (Public Safety) Regulations 2001
- Utilities (Technical Regulation) Act 2014
- Electricity Feed-in (Renewable Energy Premium) Act 2008

- Electricity Feed-in Code 2020
- Electricity Service and Installation Rules Code Determination 2013
- Electricity Network Boundary Code Determination 2013
- Electricity Distribution Supply Standards Code Determination 2013
- Work Health and Safety Act
- Work Health and Safety Regulation
- National Electricity Rules (Chapter 5A)

In an event where there is any inconsistency between legislation and regulations and these technical requirements, the legislation and regulations shall prevail.

4. TECHNICAL REQUIREMENTS

This section specifies the detailed technical requirements for Small Embedded Generators. The technical requirements specified in this section should be interpreted as applying to all subcategories of small EG connections unless otherwise specified.

4.1 Subcategories

To assist proponents in the clear identification of what technical requirements that are applicable to a specific system, Evoenergy have defined several sub-categories. The definitions for each subcategory are outlined in **Error! Reference source not found.**

For the purpose of this document ESS shall be defined as any inverter where batteries are the only generation source. Inverter ratings are taken as the inverter AC rating as listed on CEC list of compliant inverters and power conversion equipment.

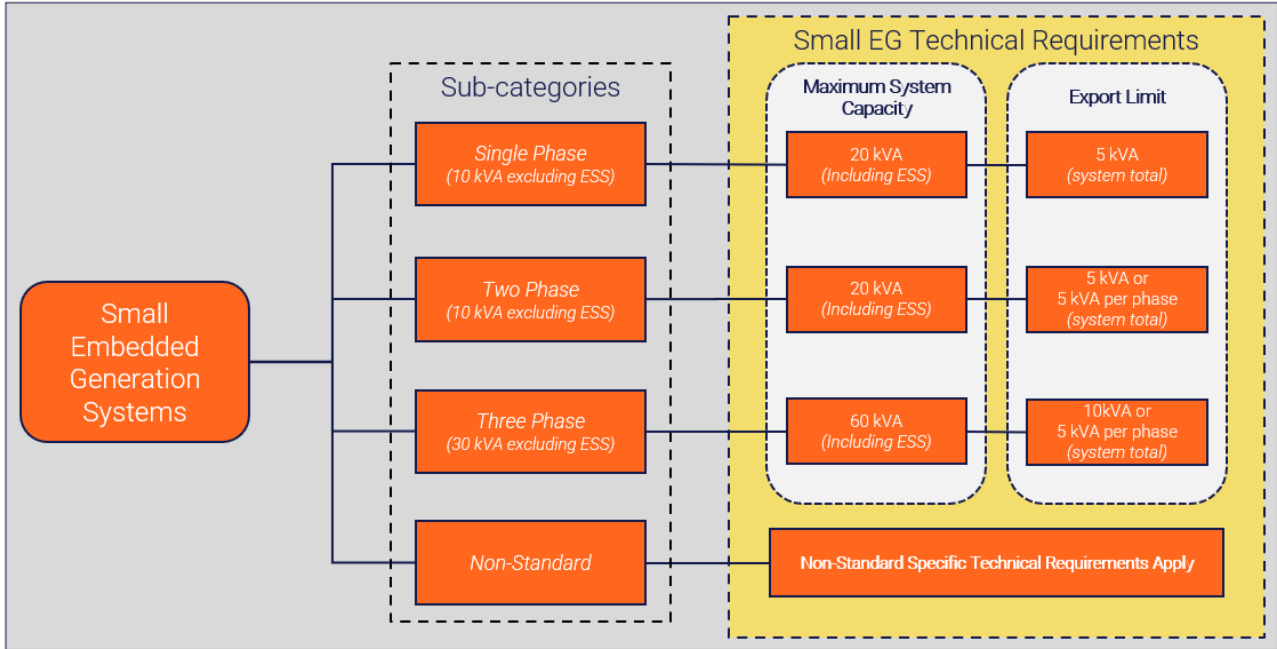
TABLE 5. SUBCATEGORY DEFINITIONS

Single Phase	Any small EG IES system installed at a site with single phase site supply, with an IES system capacity less than or equal to 10 kVA (excluding ESS) and meeting all technical requirements for small EG connections set out in this document. Up to 20kVA total system capacity including ESS can be installed as part of a single phase small EG system.
Two Phase	Any small EG system installed at a site with two phase supply, with an IES system capacity less than or equal to 50kVA per phase (10kVA total, excluding ESS) and meeting all technical requirements for small EG connections set out in this document. Up to 10kVA per phase total system capacity including ESS (20kVA total) can be installed as part of a two phase small EG system.
Three Phase	Any small EG system installed at a site with three phase site supply, with an IES system capacity less than or equal to 10kVA per phase (30 kVA total, excluding ESS) and meeting all technical requirements for small EG connections set out in this document. Up to 20kVA per phase total system capacity including ESS (60kVA total) can be installed as part of a three phase small EG system.
Non-Standard	Non-standard small EG connection – Any small EG system connecting to a non-standard part of the network including (but not limited to) SWER networks, isolated networks, and CBD networks

There are currently no geographical network restrictions on the Evoenergy distribution network that require a non-standard system classification. If future network conditions result in non-standard geographical locations, the information clearly identifying these areas will be provided on the Evoenergy website.

The relationship between the sub-categories and the associated technical settings is displayed in Figure 2.

FIGURE 2. SUBCATEGORY HIERARCHY



4.2 Maximum System Capacity

This section specifies the maximum system capacity of the Small EG connections for each sub-category. These values are inclusive of all generating sources including ESS. Generation limits as outlined in section **Error! Reference source not found.** Subcategories shall also be met.

TABLE 6. MAXIMUM SYSTEM CAPACITY FOR EACH SUBCATEGORY

SUB CATEGORY	MAXIMUM SYSTEM CAPACITY
Single Phase	Any small EG system connected to a site with single phase site supply, with a system capacity less than or equal to 20 kVA (including ESS) and a system capacity less than or equal to 10kVA (excluding ESS) and meeting all technical requirements for small EG connections set out in this document
Two Phase	Any small EG system connected to a site with a two phase site supply, with a system capacity less than or equal to 10 kVA per phase (20kVA total, including ESS) and a system capacity less than or equal to 20kVA (10kVA per phase, excluding ESS) and meeting all technical requirements for small EG connections set out in this document
Three Phase	Any small EG system connected to a site with three phase site supply, with a system capacity less than or equal to 20 kVA per Phase (60kVA total, including ESS) and a system capacity less than or equal to 30kVA (10kVA per phase, excluding ESS) and meeting all technical requirements for small EG connections set out in this document Please note any EG system using an IPSD, with a system capacity exceeding 30kVA, must be applied for as an LV system and is not covered by this document.
Non-Standard	As there are currently no geographical areas requiring non-standard systems for connection to the Evoenergy network this limit shall be specified on a case by case basis

The system capacity is to be measured at the connection point, usually the retail meter. For embedded networks please refer to the embedded network section in PO0842.

TABLE 7. MAXIMUM SYSTEM CAPACITY

SUB CATEGORY		MAXIMUM PV INVERTER CAPACITY	MAXIMUM INVERTER CAPACITY
Single Phase		10 kVA	20 kVA
Two Phase		10 kVA (5 kVA per phase)	20 kVA (10 kVA per phase)
Three Phase	No IPSD	30 kVA (10 kVA per phase)	60 kVA (20 kVA per phase)
	IPSD	30 kVA (10 kVA per phase)	30 kVA (10 kVA per phase)

4.3 Generation Control

4.3.1 Export Limits at Connection Point

This section specifies the power export limits for small embedded generation connections against each category. These limits are defined in Table 8. Please note that embedded network managers and/or owners corporations may impose lower export limits for customers connected to an embedded or shared network.

TABLE 8. EXPORT LIMITS

SUB CATEGORY	EXPORT LIMIT	EXPORT LIMIT (SYSTEM TOTAL)
Single Phase	5 kVA	5 kVA
Two Phase	5 kVA or 5kVA per phase	5 kVA or 10 kVA
Three Phase	10 kVA or 5 kVA per phase	10 kVA or 15 kVA
Non-Standard	<i>defined on a case by case basis</i>	

Export limitation shall be achieved through the use of a dedicated export limiting device; details of the configuration shall be provided on the single line diagram submitted to Evoenergy. The export limiting functionality shall be of the “soft” limitation type as defined in section 6.3 of AS/NZS 4777.1.

For single phase sites, export limit will be measured on the connected phase.

For two or three phase sites, there are two options to manage export:

1. An aggregate reading across all phases can be implemented, and this will have a lower value of 5kVA for a two phase site, or 10kVA for a three phase site. This will be the default option for new applications where inverter rating exceeds 15kVA, given that aggregate export limits are covered by AS/NZS 4777 series and can be achieved by all inverters complying to this standard. If you wish to use a per phase export limit, please add a note to your application.
2. Alternatively, per phase export control may allow a higher level of export for the site while ensuring phase balance is maintained. If choosing this option, export limit devices shall be set to reduce generation when export exceeds 5kVA on any phase. This includes battery systems that may export on one phase to offset a load on a different phase. For example, three phase systems using this export option are not permitted to export more than 5kVA on a single phase, even if the total active power level at the point of supply across all phases is less than 15kVA.

Please note, where there is 5kVA or less of inverters installed per phase (for example a three phase 15kVA inverter), this is considered as meeting option 2, and an export limit will not be required.

If export above the limits listed above is desired, then an application can be made for an LV EG system which includes an individual export assessment (fees apply). This assessment may determine a higher level of export is not possible.

Where export limitation settings can be changed via a keypad or switches, adequate security must be employed to prevent any tampering / inadvertent / unauthorised changes. Suitable locks or a password system shall be used.

The export limit is a maximum limit and the ability to export at the defined limit is not guaranteed as it depends upon network characteristics which change over time. Several instances can result in the need for the limit to be constrained, for example, the operation of power quality response modes.

For small embedded generation connections undergoing modification, Evoenergy may allow the proponent to maintain the previously approved export limit (which may be per phase) provided a dedicated export limiting device is installed and configured to prevent the system from exceeding this limit. For more information regarding this process please contact Evoenergy via the contact details on the [Evoenergy website](#).

4.3.2 Site Generation Limit Downstream of Connection Point

Evoenergy does allow soft generation limits to be used for replacement systems to be considered like-for-like, such as with the replacements of fixed feed in tariff systems as detailed in section 1.3 Feed in Tariff (FiT) Replacements.

Evoenergy does allow the use of soft generation limits to meet per phase size limits. For example: a single phase customer already has a 6kVA single phase PV inverter and wishes to install another PV inverter on the same phase. A 5kVA inverter is proposed with a generation limit of 4kVA to meet the 10kVA single phase size limit. In this case a generation limit may be used if the installer can confirm the following:

- An inverter of the appropriate size is not available from the preferred manufacturer for sale in Australia.
- The size of PV panels connected to the inverter must not exceed 1.4x the generation limit setting, unless a DC battery is connected to the same inverter, or adequate design justification is provided.

Evoenergy does allow the use of soft generation limits to be used to meet phase balance requirements. For example, a 10kVA single phase inverter installed at a three phase site with a 5kVA generation limit.

If a generation limit is to be used for any other purpose as part of a small IES, special approval must be sought from Evoenergy as per PO0842 clause 4.6 and may not be granted.

If a generation limit is a condition of your approval, evidence of the generation limit shall be provided with the commissioning form, such as a photo of the setting.

4.4 Inverter Energy System

The IES shall comply with the following technical requirements:

- shall be tested by an authorised testing laboratory and be certified as being compliant with AS/NZS 4777.2 with an accreditation number
- shall comprise of inverters that are registered with CEC as approved grid connect inverters or multiple mode inverters and shall have generation sources in line with the CEC listing. Stand-alone inverters with grid input will need to meet the relevant sections of this document shall comprise of inverters that are tested by an authorised testing laboratory and certified as being compliant with IEC 62116 for active ant islanding protection as per AS/NZS4777.2
- shall comprise of inverters installed in compliance with AS/NZS 4777.1
- shall comprise of inverters that have both volt-var and volt-watt response modes enabled.

4.5 Network Connection and Isolation

There shall be a visible method of ensuring the EG system is disconnected from the distribution network for all residential and commercial systems. The method of isolation shall be safely accessible to Evoenergy personnel at all times. The location shall not be located behind fences and shall always be kept clear. If access is obstructed, the embedded generator shall remove the obstruction or relocate the method of isolation. The isolation switch may be stand alone, or part of a distribution board, and shall not disconnect any loads not associated with the generation plant. The isolation point shall be clearly identified with permanent labelling. If not located in or adjacent the metering panel, labelling will be attached at the metering location describing where the embedded generation isolation point is located.

Switches designated as main switches for inverter supply shall be as per AS/NZS 4777.1. As a minimum, mechanical isolation shall be as per AS/NZS 3000 and lockable in the open position.

Where an ESS and IES are physically integrated, the isolation switches and isolation arrangements shall also comply with AS/NZS 5033.

In the case where premises, such as townhouse complexes, are supplied by the same service cable to connect several consumers via dedicated service fuses, links and metering equipment located at the point of common coupling (PCC), the inverter main switch may be installed at the individual consumer's residence. This switch must be located in an accessible location that is external to the residence.

If the requirement for access as specified in this section cannot be achieved, special approval for the connection of the IES shall be sought from Evoenergy via the contact details on the Evoenergy [website](#), or as part of the SCR application process.

4.5.1 Embedded Generation consisting of Multiple EG Systems

Evoenergy considers the system capacity based on the connection point to our network, usually the retail meter. In some situations, embedded generation is connected to multiple places within a customer's electrical infrastructure, or added in multiple stages. Evoenergy looks at the total connected generation capacity when determining the fees and technical requirements that will apply.

In cases where multiple small EG systems are connected to separate premises within an embedded network, Evoenergy may choose to apply the small technical requirements in this document regardless of the total system size. Please refer to Evoenergy Embedded Generation Connection Requirements PO0842 for more information.

1.1.1 Phase Connection of IES and ESS

Installations of single phase inverters at multi-phase sites must meet phase balance requirements as per AS/NZS 4777.1 appendix C and the limits outlined in Phase Balance of Single Phase Inverters. These limits may be met with a generation limit. Larger capacities of single phase inverters are permitted at three phase sites if current balance protection across all three phases is implemented with a limit of 21.7A in accordance with Clause 5.2 of AS/NZS4777.2.

For example:

- A 5kVA single phase PV inverter and a 5kVA single phase battery only inverter installed on the same phase is permitted at a three phase site.
- A 10kVA single phase hybrid PV and battery inverter is not permitted at a three phase site, unless a generation limit of 5kVA is programmed.
- If there is an existing 10kVA single phase hybrid inverter at a three phase site, and an alteration is being made, such as the addition of a battery, a generation limit of 5kVA will need to be programmed in the existing inverter.
- 3x 10kVA single phase inverters at a three phase site (one per phase) is permitted if they have current balance protection enabled. Similarly, groups of micro inverters (spread across all phases) with current balance protection are permitted.
- 3x 10kVA single phase inverters at a three phase site (one per phase) that are unable to have current balance protection implemented (such as inverters of different brands) is not permitted.
- 2x 10kVA single phase inverters at a three phase site (on different phases) with current balance protection is not permitted as the third phase will be out of balance.

TABLE 9. PHASE BALANCE OF SINGLE PHASE INVERTERS

SITE SUPPLY	MAXIMUM RATING OF SINGLE PHASE PV CAPABLE INVERTERS	MAXIMUM RATING OF SINGLE PHASE BATTERY ONLY INVERTERS *	TOTAL RATING OF SINGLE PHASE INVERTERS
Single Phase	10kVA	10kVA	20kVA
Two Phase	5kVA per phase	5kVA per phase	10kVA per phase
Three Phase	5kVA per phase	5kVA per phase	10kVA per phase

* Battery only inverters are those that do not have energy ports. V2G inverters are considered as battery inverters and will contribute to this limit. Hybrid inverters with only a battery connected will contribute to the PV capable inverter limit.

Additionally, for systems with a system capacity >50kVA, the difference between the aggregate single phase inverter(s) capacity on each phase shall differ by no more than 10% of the total system capacity.

It is recommended wherever possible, to use three phase products for new installations at a three phase property.

Single phase PV IES installed in multi phase installations must be installed on the phase with the lowest recorded voltage.

Where multiple single phase PV IES are installed at a multi phase property, the installation should be as balanced as possible. For example: micro inverters connected to all three phases instead of just one. Where single phase inverter outputs are unbalanced, the largest inverter shall be connected to the phase with the lowest voltage, and the next largest inverter connected to the phase with the next lowest voltage etc. Evoenergy may direct PV inverters to be installed in a specific phase arrangement as part of the approval process.

Where installing a new three phase inverter would trigger the need for an export limit, and there is an existing single phase inverter on site, it is recommended to apply the export limit to the existing single phase inverter rather than the new three phase inverter. Proponents may be asked to provide design justification if proposing an export limit for a three phase inverter where there are fully exporting single phase PV inverters as part of the same installation.

Where ESS and PV are installed at the same site, the ESS must be connected to the same phase as PV generation. Where the PV IES has an imbalance, and the ESS is single phase, the ESS shall be installed on the phase with the highest PV inverter rating to maximise charging from PV.

Where multiple ESS systems are being installed, these shall be installed in a configuration that will allow maximum balance between ESS consumption and PV generation. Evoenergy will review the phase connection arrangement and may direct ESS (including DC connected batteries) to be installed in a specific phase arrangement. If the customer wishes to have their ESS connected to a different phase, please contact Evoenergy to discuss your options. Increased capacity for backup power is not considered as a valid design justification for an unbalanced IES.

The installer must take phase to neutral voltage measurements of all available phases prior to installing the EG system and record these measurements as part of the commissioning information supplied to Evoenergy. The phase of the installed EG system must be documented and provided to Evoenergy upon submission of the final commissioning information.

4.6 Labelling and Signage

The labels and signs on the installation, including cables, shall be as per the labelling requirements specified in AS/NZS 4777.1, AS/NZS 3000 and AS/NZS 5033. In the event the installation requires an external

isolation switch to enable network isolation (as outlined in Section 4.5) the isolation switch shall be labelled as per the requirements specified in AS/NZS 4777.1

Where inverter serial number(s) are not visible without removing covers, a permanent label will be attached to the outside cover of the inverter clearly indicating the serial number. Appropriate label type will be selected to withstand degradation from weather. This does not apply to micro inverters mounted on or adjacent PV panels.

4.7 Earthing

For IES earthing requirements shall be as per AS/NZS 4777.1 and AS/NZS 3000 and for ESS earthing requirements shall be as per AS 3011.

4.8 Protection

Protection systems for Small embedded generators shall be designed in accordance with the relevant Acts, Regulations and Evoenergy requirements. IES protection shall comply with the requirements of AS/NZS 4777.2.

4.8.1 Inverter Integrated Protection

In the case of additions to the system, or replacement of any inverter, all existing inverters should be brought as close as possible to the inverter integrated protection settings as listed below, and have power quality response modes programmed as close as possible to those listed in section 4.11.1. This may require firmware updates, or other reprogramming of existing inverters. The proponent shall advise Evoenergy if when changing settings, any of the below settings are unable to be met by the existing inverters.

At any time, inverter integrated protection settings may be changed to our currently listed requirements. If one setting is changed, all settings shall be brought as close as possible to the currently listed requirements, including power quality response modes. Evoenergy shall be notified of any changes to inverter integrated protection settings or power quality response modes, so records can be updated including those in the AEMO DER register.

Where small embedded generating units can be remotely accessed by the manufacturer to adjust the inverter settings, we may direct the manufacturer to remotely adjust inverter settings to comply with these technical requirements. Inverter integrated protection shall be as per AS/NZS 4777.1 and AS/NZS 4777.2 for Small embedded generators. Passive anti-islanding protection set points are defined in Table 10.

TABLE 10. PASSIVE ANTI-ISLANDING INVERTER PROTECTION SET-POINT VALUES (AS PER AS/NZS 4777.2 SECTION 4.4 AUSTRALIA A)

PROTECTIVE FUNCTION	PROTECTIVE FUNCTION LIMIT	TRIP DELAY TIME	MAXIMUM DISCONNECTION TIME
Undervoltage (V<<)	70 V	1 s	2 s
Undervoltage (V<)	180V	10s	11s
Overvoltage (V>)	265 V	1 s	2 s
Overvoltage (V>>)	275 V	-	0.2 s
Under-frequency (F<)	47 Hz	1 s	2 s
Over-frequency (F>)	52 Hz	-	0.2 s

Active anti-islanding protection shall be implemented as per section 4.3 of AS/NZS 4777.2 and shall operate the automatic disconnection device within two (2) seconds of disruption to the power supply from the grid.

Limits for sustained operation shall be enabled as per section 4.5 of AS/NZS 4777.2 using Australia A set points.

4.8.2 Interface Protection

Interface Protection is not required for small EG systems.

4.8.3 Interlocking

Single phase inverters installed in a three phase arrangement with system capacity above 5 kVA per phase (such as micro-inverters) shall be interlocked and configured to behave as an integrated multiphase inverter providing balanced output (maximum unbalance between phases of 5 kVA) to all connected phases.

Three phase inverters shall have integrated phase balance protection as per Clause 2.11 of AS/NZS 4777.2.

4.8.4 Stand-Alone Mode

Generators with multiple mode inverters can seek approval from Evoenergy to operate in stand-alone mode. In addition to Evoenergy approval, the following operational conditions must also be satisfied:

- Embedded generating unit is electrically disconnected from the distribution network, either manually or as the result of automatic disconnection from a loss of supply, prior to becoming a customer island
- Reconnection of the customer island to the distribution network must not occur until the network supply has been fully restored and stabilised such that synchronisation from within the generator's installation can occur
- The islanded embedded generating unit must only supply the generator's installation, or a section of the generator's installation (backup loads), which have also been electrically disconnected from the distribution network
- The disconnection point and any backup loads must be clearly identified on the SLD

Generators with stand-alone inverters that do not connect to the Evoenergy network do not require approval from Evoenergy. Stand-alone inverters with grid input must meet the following conditions:

- The islanded embedded generating unit must only supply a section of the generator's installation (backup loads), which have been electrically disconnected from the distribution network
- The disconnection point and any backup loads must be clearly identified on the SLD

4.9 Operating Voltage and Frequency

The system shall be designed and installed to limit voltage rise to 2% from the point of supply to the inverter terminals. Regardless of the connection method applied, the voltage rise for an embedded generation system shall be calculated based on the maximum current imbalance permitted by the inverter control in accordance with AS/NZS 4777.1 Appendix C3.

The operating voltage and frequency shall be within the limits specified in Section 4.8.1.

4.10 Metering

Small embedded generators shall not be energised without the correct metering arrangement in place. The consumer shall contact the retailer to ensure metering requirements for grid connected IES installations are fulfilled prior to energising the system.

4.11 Quality of Supply and Generation

The National Electricity Rules & Utilities (Electricity Distribution Supply Standards Code) Determination 2013 place certain responsibilities on Evoenergy for maintaining the quality of supply within the network.

Evoenergy are responsible for adhering to relevant jurisdictional based regulations and licence conditions regarding power quality parameters including:

- Network Voltage Control
- Voltage Fluctuations and Step Voltage
- Harmonics
- Voltage Balance

The Small EG connection shall not adversely impact Evoenergy's ability to meet these requirements and shall comply with the applicable power quality requirements as well as relevant state based regulations and licence conditions.

4.11.1 IES Power Quality Response Modes

All IES small embedded generating units shall comply with section 3.3 of AS/NSZ 4777.2 Inverter power quality response modes.

All IES small embedded generating units shall have volt-watt power quality response enabled as per AS/NZS 4777.2 Clause 3.3.2.2 with the Australia A settings detailed in Table 11.

TABLE 11. VOLT-WATT RESPONSE

AS/NZS 4777.2 REFERENCE	VOLTAGE	GENERATION POWER LEVEL (% RATED POWER)
V1	253 V	100%
V2	260 V	20%

In addition, small IES generating units with energy storage shall have volt-watt power quality response enabled as per AS/NZS 4.777.2 Clause 3.4.3 with the Australia A settings detailed in Table 10. This will apply to all gid connect, multiple mode, and stand-alone inverters with grid input.

TABLE 12. VOLT-WATT RESPONSE

AS/NZS 4777.2 REFERENCE	VOLTAGE	CHARGING POWER LEVEL (% RATED POWER)
V1 _{ch}	207 V	20%
V2 _{ch}	215 V	100%

In addition, IES small embedded generating units shall have volt-var power quality response enabled as per AS/NZS 4777.2 Clause 3.3.2.3 with the Australia A settings detailed in Table 13.

TABLE 13. VOLT-VAR RESPONSE

AS/NZS 4777.2 REFERENCE	VOLTAGE	VAR LEVEL (% OF RATED VA)
V1	207 V	44% Leading/Supplying
V2	220 V	0%
V3	240 V	0%
V4	258 V	60% Lagging/Absorbing

The ramping requirements for IES power quality response modes shall be the default values specified in AS/NZS 4777.2.

In some cases, Evoenergy may request alternate settings be enabled, including application of fixed power factor, for specific installations and will communicate these to proponents upon receiving a connection application.

Proponents shall ensure that power quality settings are uniform across systems with multiple inverters. The replacement of inverters, including warranty replacements, shall be configured to have power quality response modes enabled. IES power quality response modes and settings shall not be altered without written approval from Evoenergy.

4.12 Communication Systems

Evoenergy do not currently mandate communication requirements for Small embedded generators. However, Evoenergy do engage in demand management programs that are implemented through third party aggregators. More information regarding these programs can be found on the Evoenergy [website](#).

4.13 Data and Information

4.13.1 Static Data and Information

The static data and information required to be provided by the proponent to Evoenergy is specified in *Appendix D: Static Data and Information*.

4.13.2 Dynamic Data and Information

As outlined in Section 4.12 Evoenergy do not currently mandate the requirement for dynamic data and information for Small embedded generators.

4.14 Cyber Security

As outlined in Section 4.12 Evoenergy do not currently mandate communications for Small embedded generators and therefore do not specify cyber security requirements.

4.15 Technical Studies

Network technical studies are not required to be carried out by the proponent or at the proponent's expense to enable the connection of a Small embedded generator to connect to the distribution network.

5. FEES AND CHARGES

All fees and charges relating to network services and tariffs are located on the Evoenergy [website](#).

Small Embedded Generators compliant with the requirements specified in this document are considered as Class 1 systems for the purposes of fees and charges.

6. TESTING AND COMMISSIONING

Before being placed in service the IES installation shall be tested and commissioned in accordance with the requirements of AS/NZS 3000, AS/NZS 5033 and AS/NZS 4777.1. These tests shall be installation tests, not type tests.

The installation shall also be approved for connection by the ACT Government Electrical Inspectorate and the completed Certificate of Electrical Safety shall be included in the IES manual.

The proponent shall submit commissioning information to Evoenergy via the Evoenergy DER portal as specified in *Appendix D: Static Data and Information*.

7. OPERATIONS AND MAINTENANCE

The Small Embedded Generation system shall be operated and maintained to ensure compliance with the connection agreement and all legislation, codes and / other regulatory instruments at all times.

The generator shall be responsible for the following:

- Maintaining the electrical installation at the supply address in a safe condition
- Ensuring 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 holds a Certificate of Compliance issued in respect of any of the changes
- Seeking Evoenergy approval prior to altering the connection in terms of an addition, upgrade, replacement, extension, expansion, augmentation or any other kind of alteration, including changing inverter settings
- Perform periodic verification of the system every five years as per the Evoenergy periodic inverter test procedure. The test declaration and test records forms can be accessed via the Evoenergy [website](#). The consumer shall maintain records of periodic tests and provide Evoenergy with a copy of the test results

If Evoenergy wish to inspect a system at any time, they may do so at no cost to the generator.

In the event a system is deemed to be non-compliant, Evoenergy will contact the generator in addition to the ACT Electrical Inspectorate and request that the system is rectified within a specified timeframe. If the generator fails to adequately address the non-compliance within the timeframe, Evoenergy will take steps to have the system disconnected from the network to ensure its obligations regarding the safe and reliable operation of the distribution system for operating personnel, customers and the general public are met. This process may vary depending on the severity of the safety risk posed by the system.

1.2 Replacements

A replacement is considered like-for-like if the AC rating and DC rating of the replacement system is not increasing. If either the AC or DC rating is increasing, it is instead considered as an addition. The manufacturer and model number of new products may be different and still considered as a life-for-like replacement. All replacements require approval from Evoenergy.

It is preferred that any replacement products will be current on the CEC approval lists and meeting current versions of Australian standards and these technical requirements. If an older product is being proposed as part of a warranty replacement, the exact model number must be matching what was previously installed, and it must be programmed as close as possible to these technical requirements.

1.3 Feed in Tariff (FiT) Replacements

In the event of an inverter failure for a system with a fixed feed in tariff the generator shall replace the inverter with a compliant inverter with a generating capacity less than or equal to the failed inverter in accordance with the *Electricity Feed-in (Renewable Energy Premium) Act 2008*.

Where for technical reasons a “like-for-like” inverter compliant with the *Electricity Feed-in (Renewable Energy Premium) Act 2008* is not available, Evoenergy may consider an appropriately sized replacement inverter with a generation limit enabled as per soft limit requirements of section 6.2.2 of AS/NZS 4777.2. The generation limit must be set to be the same or less than the rating of the existing approved inverter capacity for the IES.

Where the existing FiT system is using single phase inverter(s) and is unable to meet the export and/or phase balance requirements in this document, you may be required to replace a single phase inverter with an equivalently sized three phase inverter.

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VERSION CONTROL

VERSION	DETAILS	APPROVED
1.0	Initial release version	W. Cleland – Asset Standards Mgr
1.1	Minor adjustment for final release	W. Cleland – Asset Standards Mgr
1.2	Updated connection diagrams	W. Cleland – Asset Standards Mgr
1.3	Template change	W. Cleland – Asset Standards Mgr
1.4	Volt Var/Watt – V1; 216 to 207	W. Cleland – Asset Standards Mgr
2.0	Changes to Section 4.5 Update document number from SM5061 to PO0845	W. Cleland – Asset Standards Mgr
2.1	Update to figures for change of document numbering	M Lloyd – Customer Technical Services Manager
2.2	Placed phase connection and earthing clauses back into document	M Lloyd – Customer Technical Services Manager
2.3	Definition updates Update inverter setting to match AS/NZS 4777.2:2020 Included information regarding embedded networks Included additional requirements around the phase connection of ESS Update of example SLDs including export limit devices and a gross system example. Clearer requirements for static data including SLDs Other minor changes	B Harvey – Market Transactions Manager
2.4 (26/09/2022)	Change Customer Islanded mode to stand alone mode. Added requirements for stand-alone inverters with grid input. Reduced the maximum system size of three phase systems to 30kVA inclusive of battery inverters. Updated SLD examples.	B Harvey – Market Transactions Manager

3.0	<p>Renamed document from Micro to Small.</p> <p>Updated definitions, including licencing requirements.</p> <p>Added information about when Inverter integrated protection is updated.</p> <p>Added clarifications for when generation limits can be used.</p> <p>Added clarifications about phase balance.</p> <p>Removed SLD requirement for replacements.</p>	B Harvey – Market Transactions Manager
3.1	<p>Updates to meet AS/NZS4777.1:2024</p> <p>Increased size limits for ESS</p> <p>Changes to phase balance, especially the use of single phase inverters at three phase sites</p> <p>Added the option of a aggregate export limit instead of per phase</p>	

DOCUMENT CONTROL

DOCUMENT OWNER	DOCUMENT CUSTODIAN	PUBLISH DATE	REVIEW DATE
Group Manager Customer Delivery	Embedded Generation Team Lead		

APPENDIX A – DEVIATIONS FROM THE NATIONAL DER CONNECTION GUIDELINES

TABLE 14. DEVIATIONS FROM THE NATIONAL DER CONNECTION GUIDELINES

SECTION	DESCRIPTION OF DEVIATION	TYPE OF DEVIATION	JUSTIFICATION
Introduction	Addition of subsections	Administrative	To improve ease of understanding and clearly state the context, scope, purpose obligations and compliance relevant to this document
Definitions and Abbreviations	Alignment of definitions to updated versions of AS4777, addition of extra definitions as appropriate, and removal of unused definitions.	Administrative	To remove ambiguity in the interpretation and application of definitions throughout the document
Subcategories	Relocation of subcategories section to Section 4 and inclusion in diagram	Administrative	To improve ease of understanding regarding the technical requirements applicable to each sub-category, especially system size requirements
Subcategories	Inclusion of two-phase subcategory to flow through the document	Promote improved benefits to Australia's electricity system	Specification of the requirements around two phase installations that often occur on brownfield sites provides clearer direction for proponents and improves efficiency of DNSP internal processes
Subcategories	Geographical reference not provided for non-standard connections	Jurisdictional	There are currently no geographical areas on the Evoenergy network requiring a non-standard connection
Labelling and Signage	Relocated to be further down in section 4	Administrative	Allows all requirements around maximum size limits to be kept together for easier reading
Relevant Rules, Regulations, Standards and Codes	Addition of Evoenergy Documents subsection	Jurisdictional	Identification of jurisdictional documentation that is applicable to the Evoenergy network
Maximum System Capacity	Alteration of Maximum System Capacity to include ESS	Promote improved benefits to Australia's electricity system	Enables proponents to AC couple existing systems when adding ESS without breaching identified limits through export limitation
Maximum System Capacity	Inclusion of assessment process for embedded networks	Promote improved benefits to Australia's electricity system	Assessment of these connections will enable customers sharing a connection point to access the maximum system capacity rather than applying a reduced limit

Inverter Energy System	Inclusion of multiple mode inverters as well as grid connect inverters	Promote improved benefits to Australia's electricity system	To be consistent with wording being used on CEC approved lists.
Inverter Energy System	Change volt-watt and volt-var response modes to be enabled rather than available	Promote improved benefits to Australia's electricity system	This will reduce over voltage and other power quality issues
Connection and Isolation	Inclusion to mandate and record phase connection of single phase IES in three phase installations	Promote improved benefits to Australia's electricity system	Recording and balancing of phases is important for system security and will provide greater benefits from VPP export in the future
Connection and Isolation	Inclusion of requirements for sites with multiple EG systems including embedded networks	Promote improved benefits to Australia's electricity system	Including this change will allow generators in shared complexes to uptake embedded generation
Connection and Isolation	Inclusion to mandate allowable phase arrangements for ESS	Promote improved benefits to Australia's electricity system	Will prevent batteries being installed on different phases to PV causing significant phase imbalance
Protection	sustained operating parameters are not duplicated, but referred back to AS/NZS 4777.2	Administrative	To improve ease of understanding by removing unnecessary information
Islanding Protection	Permitted customer islanding operation	Promotes improved benefit to electricity system	Inclusion of customer islanded mode to specify requirements allowing customers to safely retain supply during network outages
Interlocking	Allow appropriate export limit devices to be used instead of interface protection as per AS/NZS 4777.1	Promote improved benefits to Australia's electricity system	Provides greater flexibility to customer for equipment selection
Technical Studies	Removal of statement that technical studies will not result in any changes to the technical requirements for connections	Promote improved benefits to Australia's electricity system	Technical studies will inform the application of fixed power factor settings in addition to dynamic export limits and strata connection assessments
Operation and Maintenance	Inclusion of five yearly testing regime	Jurisdictional	This is an Evoenergy jurisdictional requirement
Operation and Maintenance	Inclusion of Feed in Tariff subsection	Jurisdictional	The rate of failures within the ACT for inverter replacements on jurisdictional FiT tariffs requires clear direction on how the technical replacement of these systems shall be achieved

General	Removal of New Zealand settings from protection tables	Administrative	New Zealand values removed for ease of interpretation
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APPENDIX B – CONNECTION ARRANGEMENT REQUIREMENTS

The figures in this Appendix display the common connections for Small Embedded Generating units. The connections shall comply with retailers metering requirements. For additional information regarding connection arrangements please contact Evoenergy via the contact details listed on the [website](#).

Please note that Single Line Diagrams are not required for like-for-like replacements.

Connection arrangements are shown for indication only with all loads shown as three phase for consistency. Actual connection arrangements are dependent on specific installation configurations.

FIGURE 3. METHODS OF DEPICTING PHASES

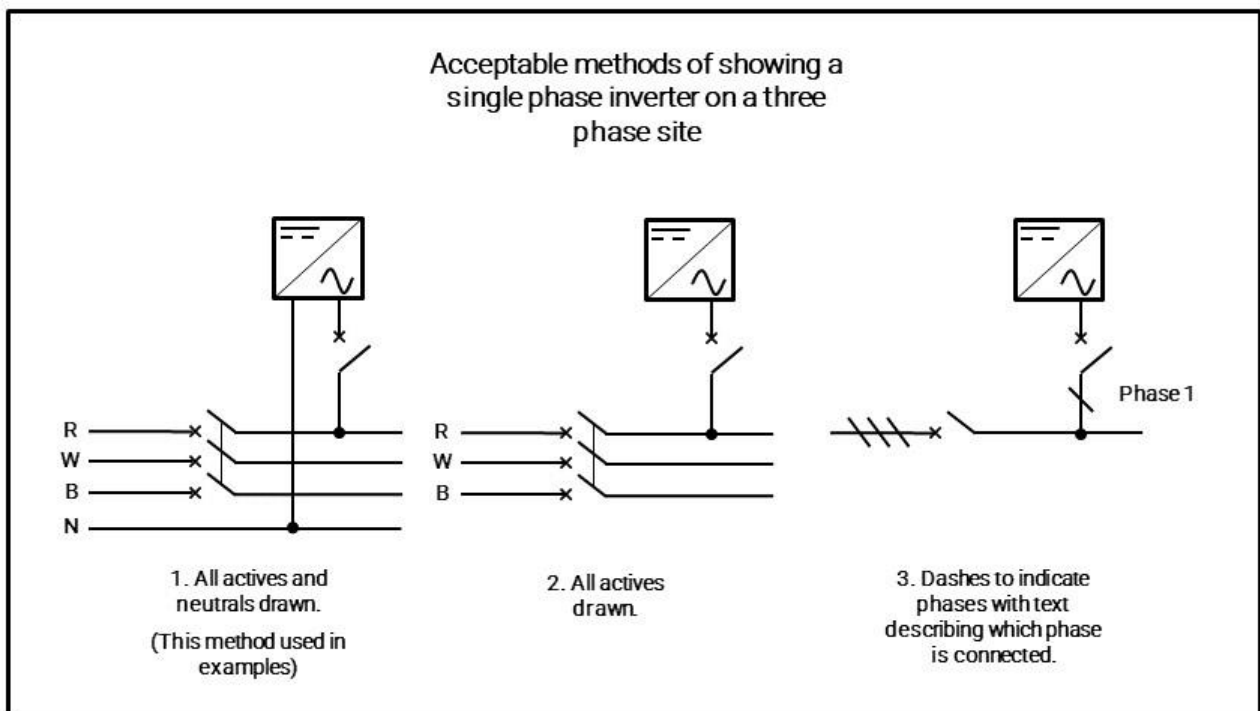


FIGURE 4. SINGLE PHASE PV CONNECTION

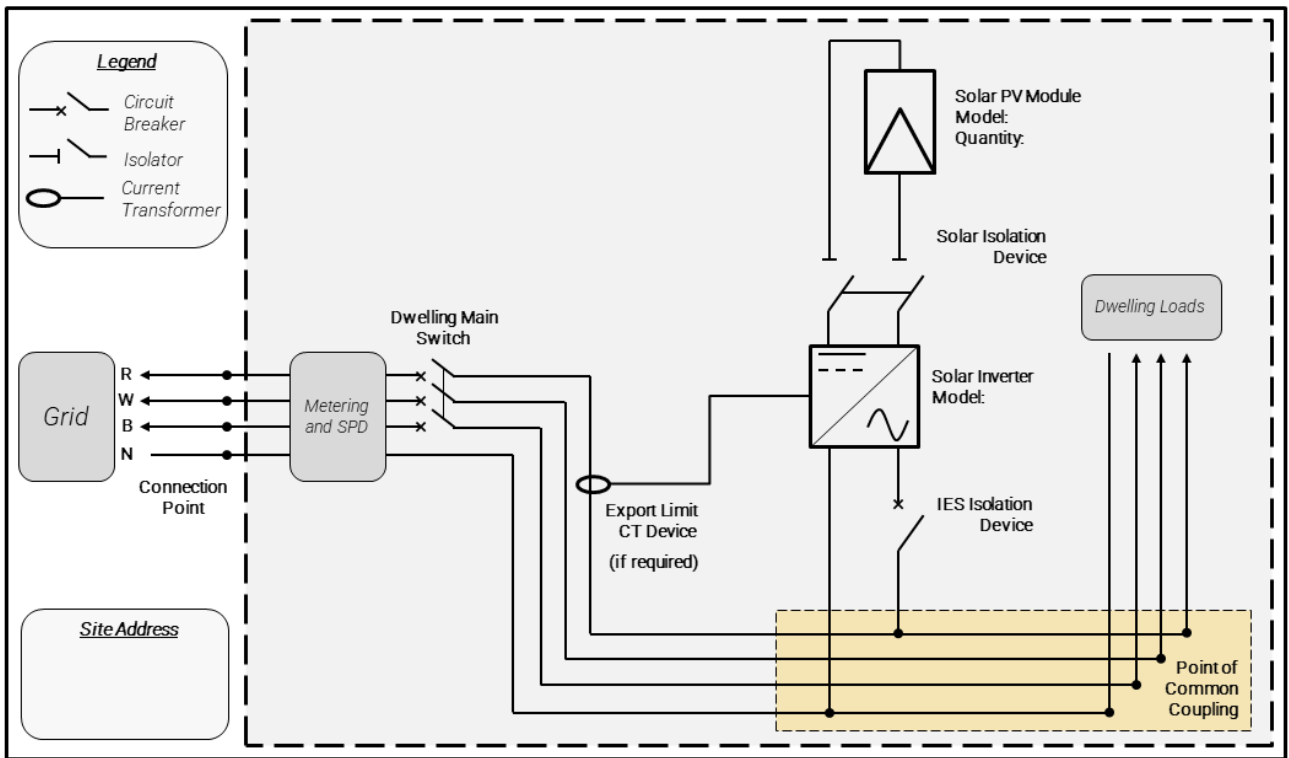


FIGURE 5. SINGLE PHASE HYBRID INVERTER CONNECTION

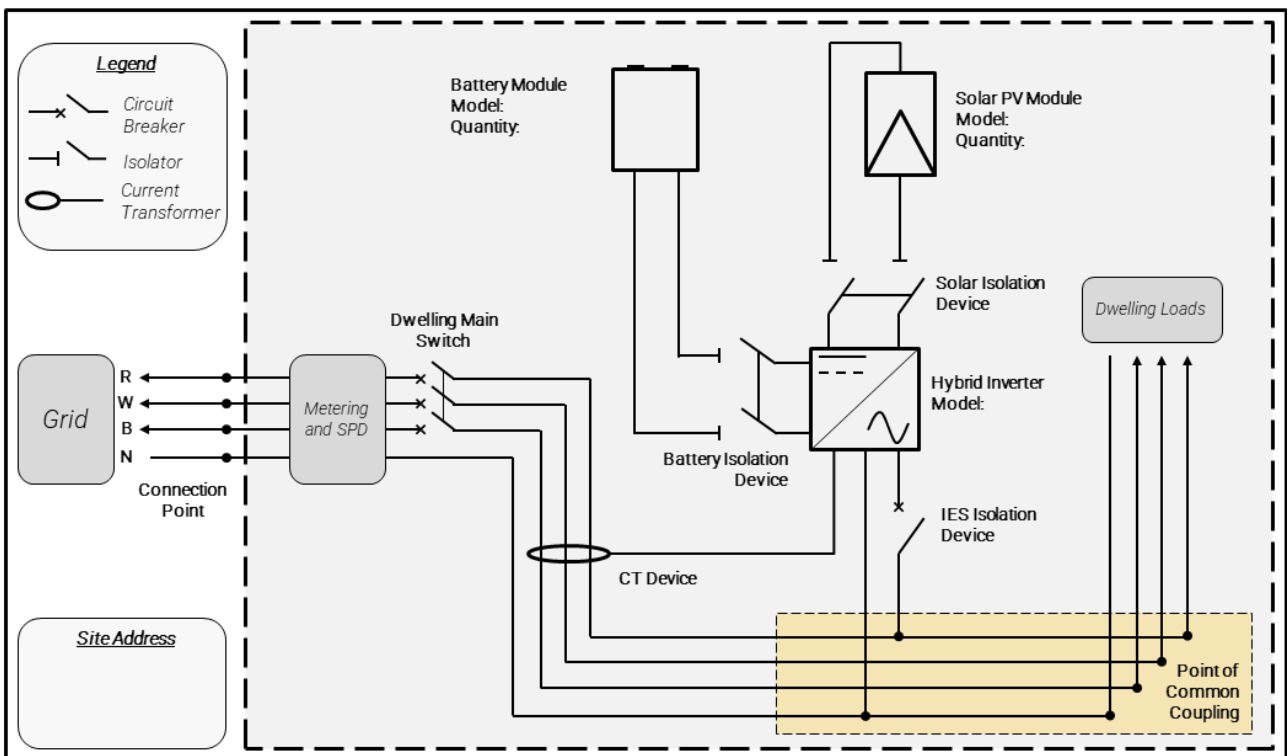


FIGURE 6. SINGLE PHASE ESS AND PV CONNECTION WITH DUAL INVERTERS

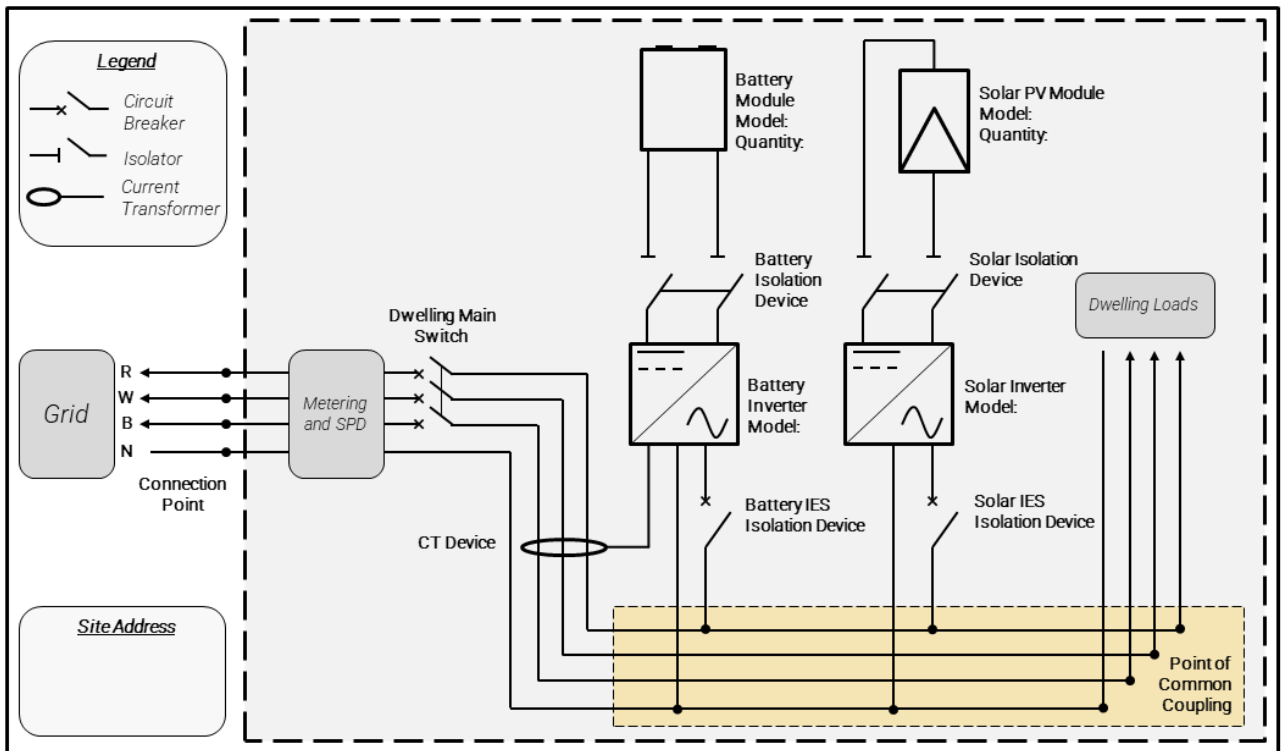


FIGURE 7. THREE PHASE PV CONNECTION

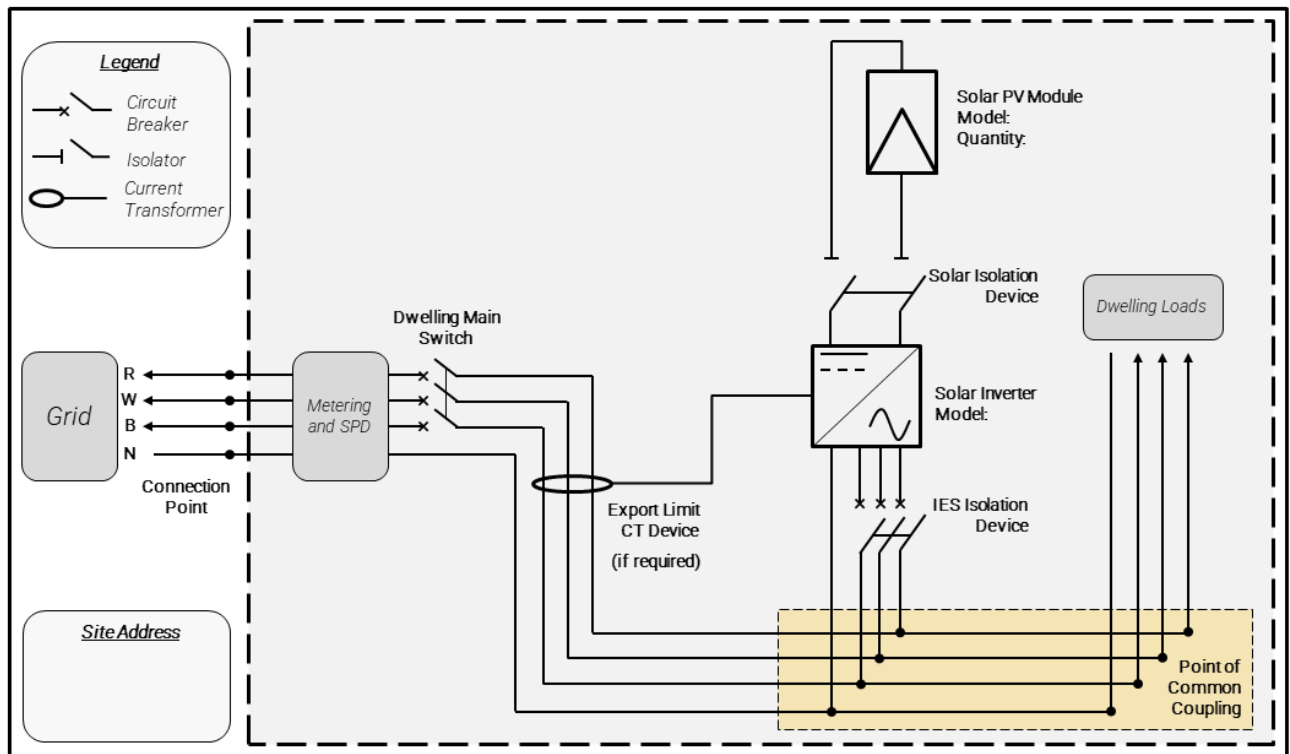


FIGURE 8. THREE PHASE HYBRID INVERTER CONNECTION

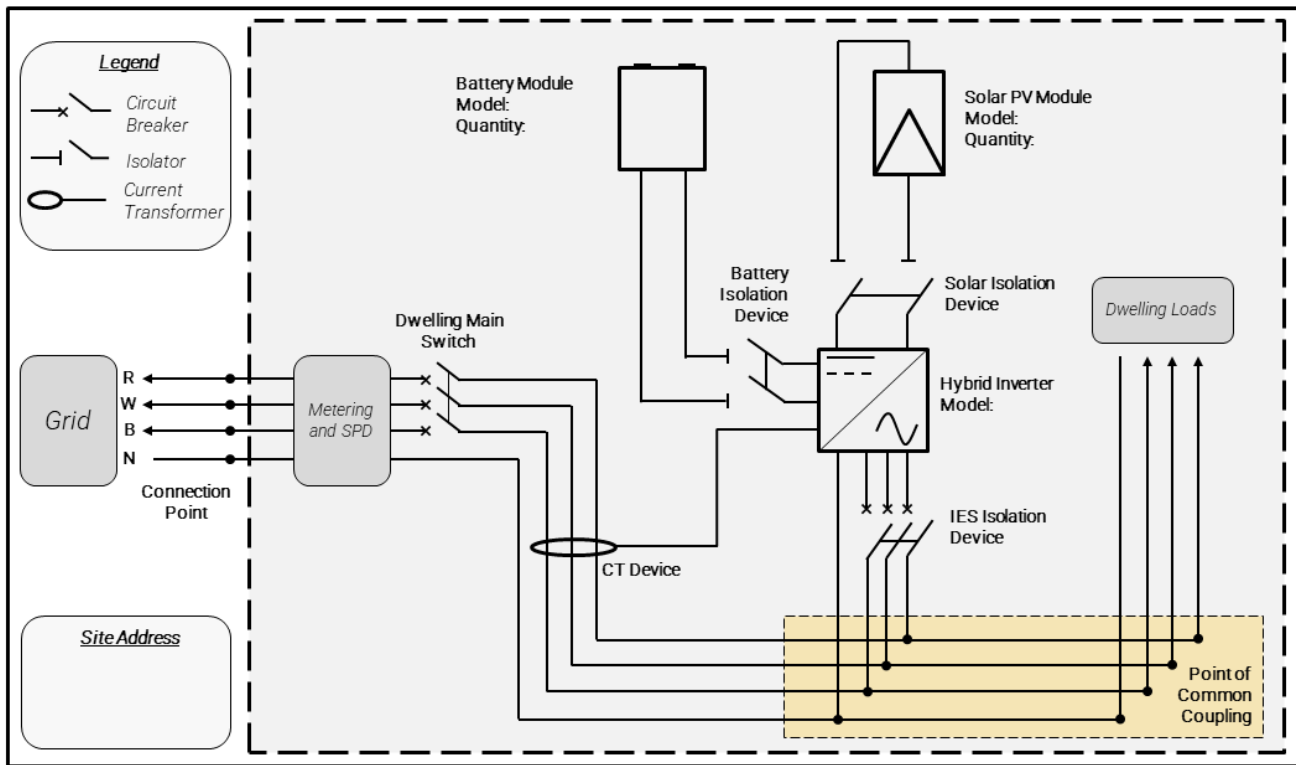


FIGURE 9. THREE PHASE ESS AND PV CONNECTION WITH DUAL INVERTERS

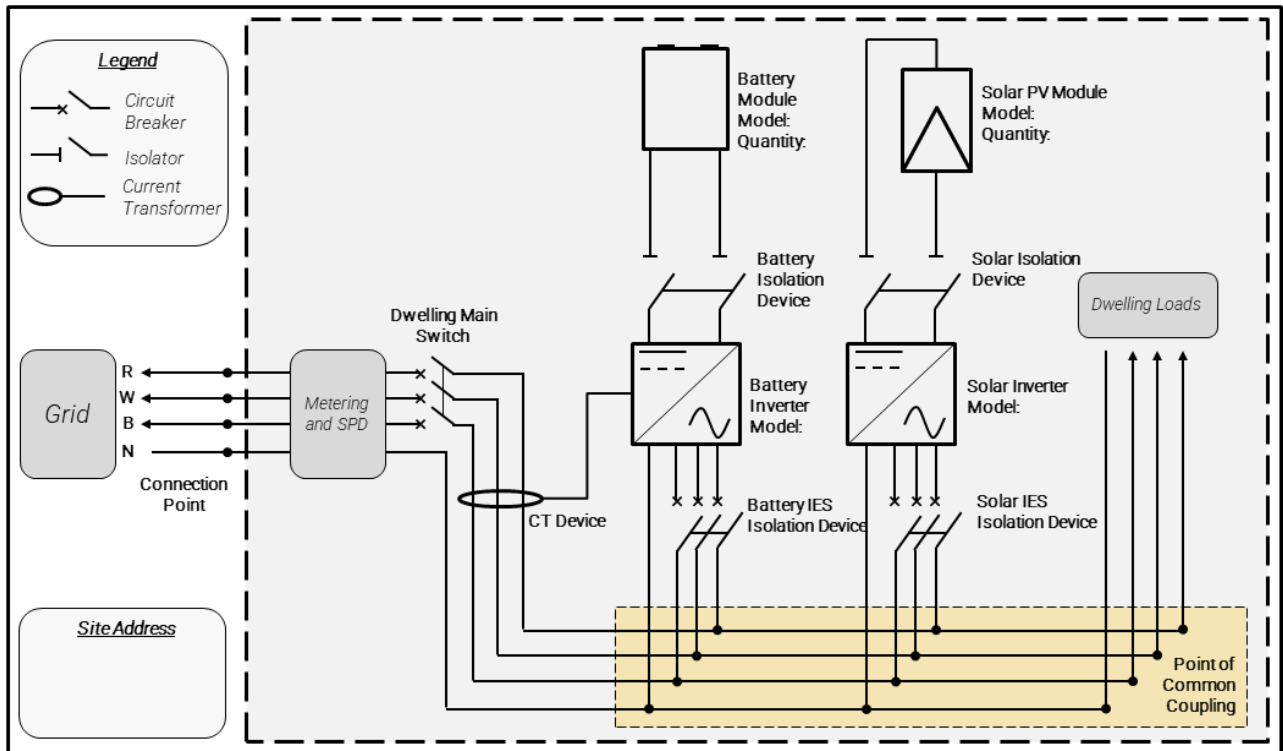


FIGURE 10. ESS SYSTEM WITH FULL SITE BACKUP

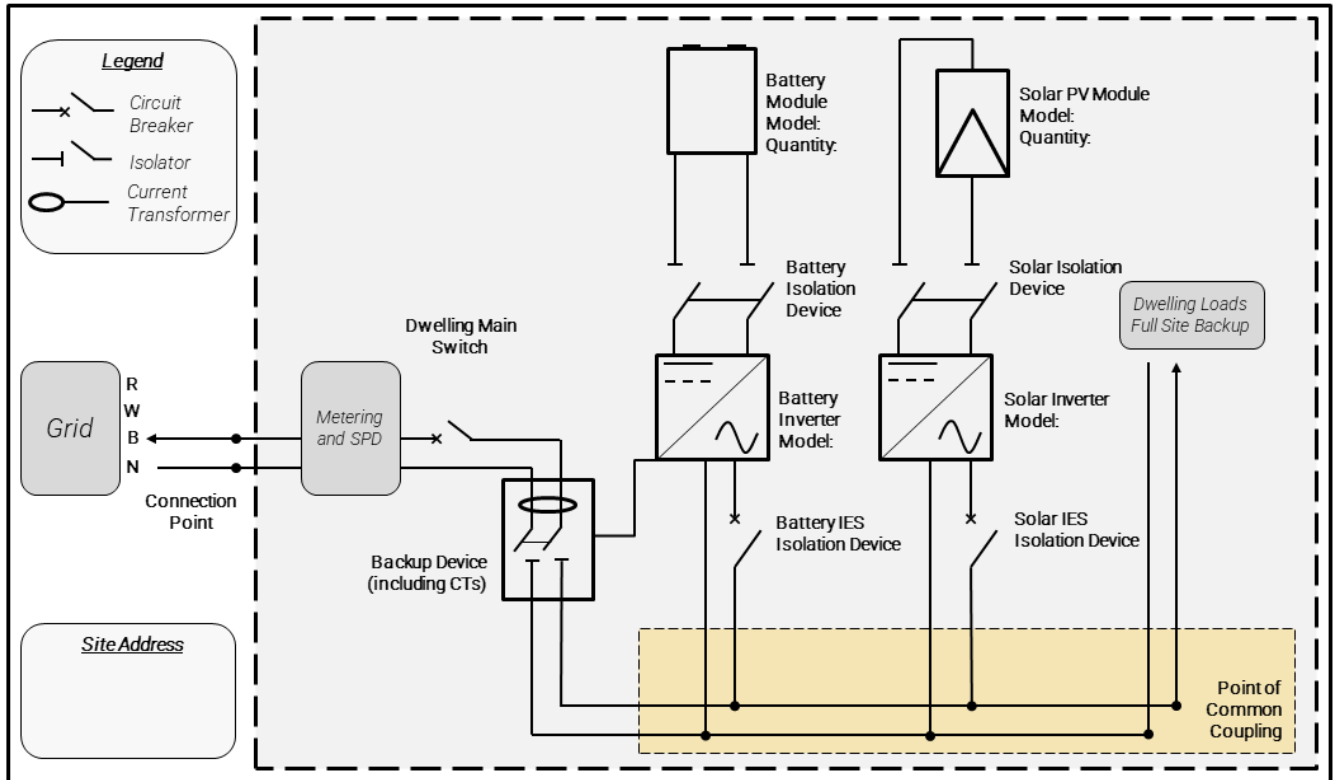


FIGURE 11. ESS SYSTEM WITH PARTIAL BACKUP

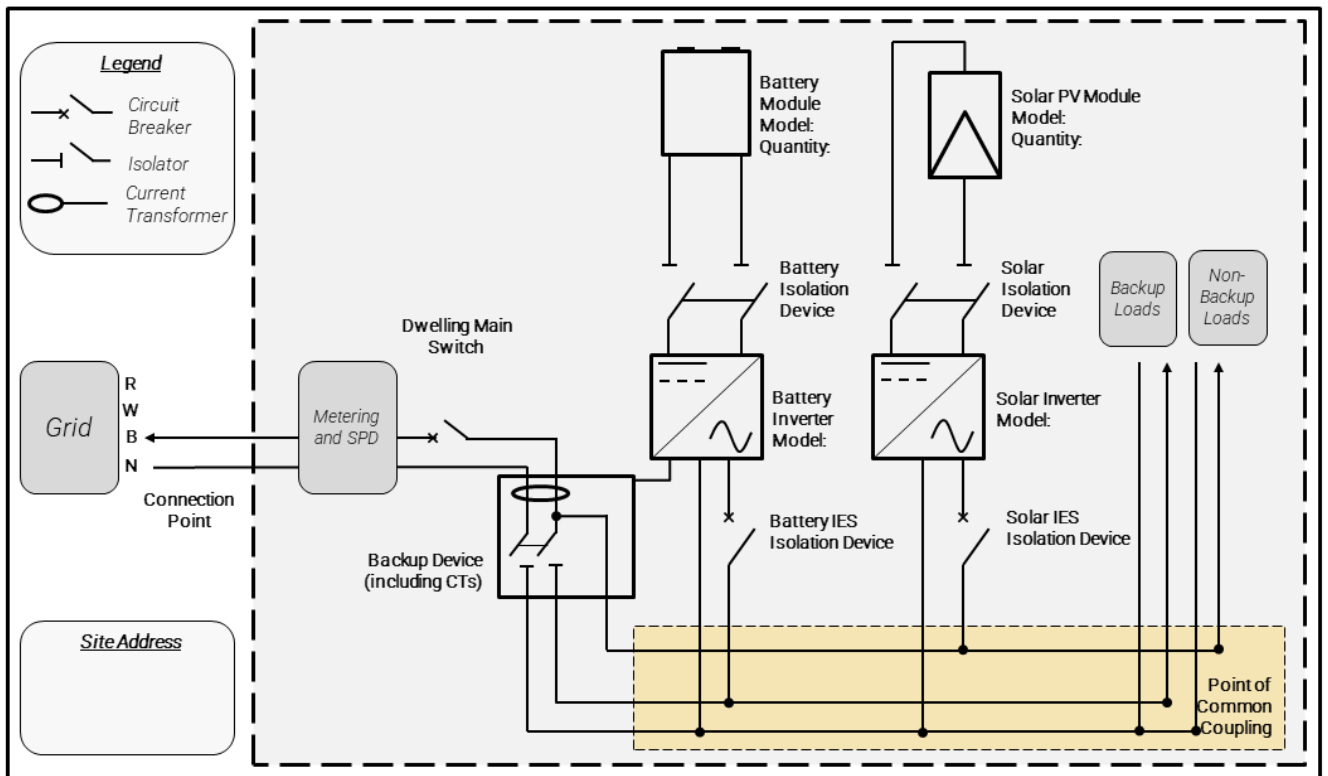


FIGURE 12. MICRO INVERTERS CONNECTED TO THREE PHASES

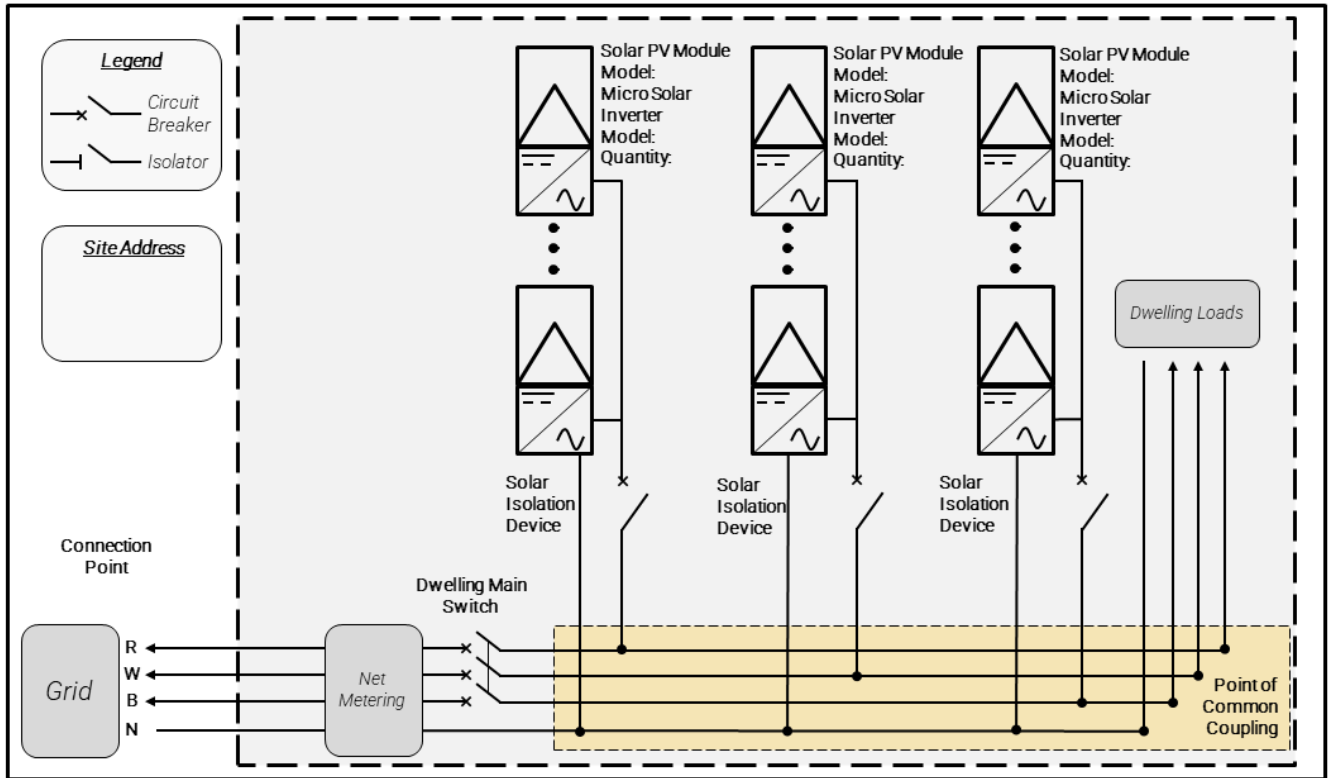
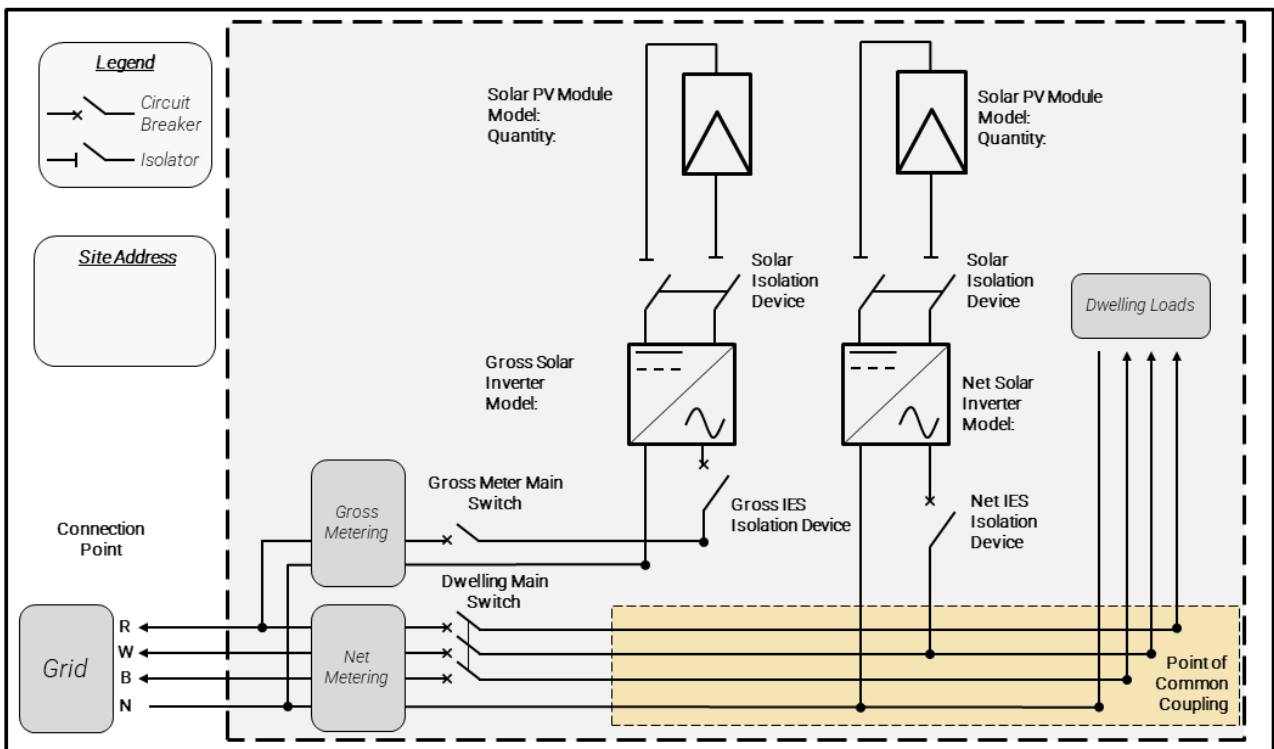


FIGURE 13. SINGLE PHASE GROSS METERED PV AND SINGLE PHASE NET METERED PV AT THE SAME SITE (TYPICAL ARRANGEMENT FOR ADDITIONS TO FIT SYSTEMS)



APPENDIX C – MODEL STANDING OFFER

The model standing offer for the connection of Small Embedded Generator connections to the Evoenergy network can be found on the Evoenergy [website](#).

APPENDIX D – STATIC DATA AND INFORMATION

The static data requirements are defined as per the SCR application form available on the Evoenergy [DER portal](#).

The information to be provided on the DER portal includes, but is not limited to:

- NMI meter number (10 digit)
- Generation source
- Make, model and manufacturer of all DER devices
- Equipment ratings (kW/kVA) and storage capacity (kWh) as applicable
- Installer details
- Site Supply

The proponent shall inform Evoenergy as part of their application if any of the below are true for any DER device connected at the application NMI:

- registered for ancillary service provision
- part of an aggregated control
- remotely controllable
- Islanded operation
- Inverter or protection settings different to those specified in this document

Photos of all existing inverters greater than 1kVA shall be provided for all sites not part of an embedded network. These photos shall clearly show:

- Full inverter name plate
- Inverter model number
- Inverter serial number

Photos or other proof of existing remain panel model numbers and ratings may be requested on a case by case basis, such as when panel quantities are not matching Evoenergy records, or for validation of gross metered systems.

For commercial properties a site plan shall be provided to Evoenergy as part of the SCR application. These shall:

- Identify locations of panels, inverter(s) and any relevant switchboards
- Identify a lockable AC isolation point in 24-hour accessible location
- Show access path from street to AC isolation point, and detail access arrangements through any obstructions such as gates.

For all applications other than like-for-like replacements, the proponent shall provide at least one single line diagram (SLD) to Evoenergy as part of the SCR application. These single line diagram(s) shall:

- Be site specific and display the site address
- Match what is submitted in the connection application
- Be in an electronic format (i.e. not hand drawn/ written)

The contents of the single line diagram(s) shall contain the following information at a minimum:

- Quantity, manufacturer, and model number (as shown on relevant Clean Energy Council Approved List if applicable) for all new embedded generation equipment including inverters, panels, batteries and other equipment.
- As much information as is known about existing embedded generation equipment. Quantity of existing panels and inverter model number(s) at a minimum must be provided.
- Clearly show how panels are distributed between multiple inverters if present.
- Identify phases involved in proposed system and all phases at each switchboard. It should be clear if the site has a single or three phase supply, and if inverters are connected to the same or different phases. SLDs shall use a consistent method of identifying phases throughout.
- Location of site loads.
- All current transformers (CTs) used for export monitoring or limiting devices and where they are taking readings from. It should be clear which inverter(s) each device controls. All export limits and/or active power limits shall be clearly stated.
- Clearly show metering arrangement as gross, net or both as applicable.
- Include the wiring from the embedded generation to the connection point or retail meter. All points where the customer's embedded generating unit and the Evoenergy distribution network can be connected/disconnected (such as circuit breakers and isolators / load break switches) must be clearly shown.

After the installation is complete, the following commissioning information shall be provided to Evoenergy within 20 business days.

- Date of installation
- Inverter serial numbers of new inverters and photo of inverter nameplate
- Voltage readings (phase to neutral) of all present phases (with inverters switched off)
- Phase connection of new inverters