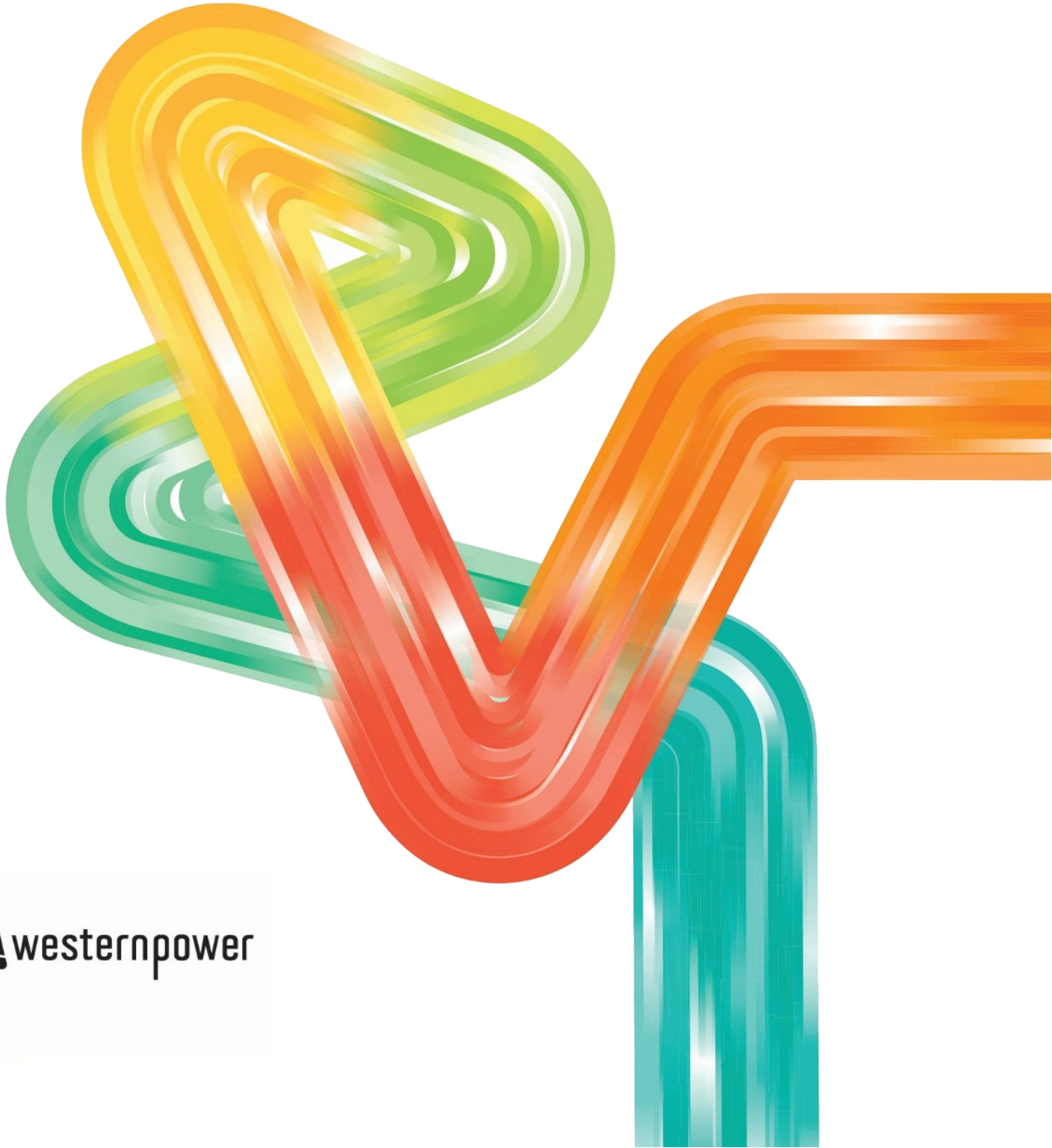
Basic Embedded Generator (EG) Connection Technical Requirements

Public

23 January 2026



westernpower

Western Power

363 Wellington Street
Perth WA 6000
GPO Box L921 Perth WA 6842

Document Information

Title	Basic Embedded Generator (EG) Connection Technical Requirements

Document History

Rev No	Date	Details of amendment
A	14/10/2021	Initial version
1	30/3/2023	Minor revisions, updated definitions, align with WASIR April 2023
2	11/7/2023	Requirements for shared connection services, small network-sole transformers and Appendix A updated.
3	1/5/2025	Alignment AS/NZS 4777.1:2024, 10 kVA single-phase inverters, preparation for VPP
4	12/6/2025	Changes to clause 4.2.1 tables, generation limits and updated balancing requirements in line with public consultation comments, other minor clarifications and edits
5	23/1/2026	Changes to align with "WEM Procedure: Technical Requirements for Standard Small User Facilities", other minor clarifications and edits

Review Details

Review Period:	Revision Date/Last Review Date + 2 years
NEXT Review Due:	1/2/2028

Responsibilities

Western Power's Grid Transformation is responsible for this document and have authorised it use.

Western Power authorisation and approval reference refer to Volt ID39-1194169446-328078

CONTACT
Western Power welcomes your comments, questions, and feedback on this document, which can be emailed to standards.excellence@westernpower.com.au

Contents

List of tables

List of figures

Glossary

Term	Definition
AC Coupled	The terminology used by industry in relation to battery storage systems includes terms AC coupled. Sometimes AC coupled systems are referred to as AC batteries. The term coupled refers to where the battery is connected into an IES. AC coupled refers to connection of energy sources on the AC electrical installation using inverters to control operation of the storage and interaction with other energy sources
Approval to Operate	Confirmation by Western Power that a user may operate the Basic EG system
alternative Supply	As defined in AS/NZS 3000 and AS/NZS 4777.1
Basic EG system	An embedded generator suitable for connection to Western Power standard connection services that meet requirements of the Basic EG Technical Requirements. Includes an aggregation of multiple IES connected to a standard connection service.
battery energy storage system	As defined in AS/NZS 5139 2019
connection agreement	An agreement or other arrangement between the Network Service Provider and a User, which may form part of or include an access contract that specifies the technical requirements that apply in relation to the connection of a User's equipment to the transmission or distribution system (refer Western Power Technical Rules)
connection point	As defined in Electricity Network Access Code 2004. This is the same point as AS/NZS 3000 point of supply.
connection services	As defined Electricity Network Access Code 2004.
DC coupled	DC coupled refers to energy sources that are connected onto a DC bus (or terminations) of an inverter.
Distributed Energy Resources	Distributed Energy Resources are smaller–scale devices that can either use, generate or store electricity, and form a part of the local distribution system, serving homes and businesses. DER can include renewable embedded generation such as rooftop solar photovoltaic (PV) systems, energy storage, electric vehicles (EVs), and technology to manage demand at a premise
disconnect/reconnect	The operation of disconnecting or reconnecting an inverter in an EG System from the grid for the purposes of DER management
Dynamic Connection Agreement	A connection agreement between Western Power and an Electricity Retailer or User
dynamic operating envelope	an operating limit principally allocated at a user connection point by Western Power based on available network capacity that may vary over an effective period
effective period	the date and time range of limits that the dynamic operating envelope applies
EG system	An embedded generator system is a form of DER connected within a User facility
Electricity retailer	The Market Participant for a Standard Small User Facility connected to the Western Power Distribution network
export limit	Permitted level of power (kW) allowed to be transferred from User generation to the grid through the User connection point. Same meaning as injection limit in the WEM Procedure.

failsafe limit	Same as static limit
generation limit	Permitted maximum generation apparent power (kVA) within a User installation where aggregate capacity of all inverters exceeds permitted maximum generation
independent supply	As defined in AS/NZS 4777.1 2024
informative	Parts of this technical requirement that are information only
injection	As defined in the ESM Rules
inverter energy system	As defined in AS/NZS 4777.1 2024
large networks	Most common type of network arrangement and includes all the three-phase 415V low voltage distribution networks. Typically, this includes the metropolitan area and country city centres. The standard network nominal voltage is 415V three-phase (line to line) and 240 V single-phase (line to neutral).
Market Participant	As defined in the ESM Rules
maximum limit	A limit that cannot be exceeded
may	The word 'may' indicates an action or practice that is permitted without affecting other requirements
Modbus TCP	MODBUS TCP/IP is a variant of the MODBUS family of simple, vendor-neutral communication protocols intended for supervision and control of automation equipment.[1]
multi-phase	Used where either a split-phase or three-phase connection may be available
normative	Parts of this technical requirement that form part of the mandatory technical requirements of this document
off-take agreement	This is a commercial agreement between the User and their connection point energy retailer to purchase exported energy into the grid from their EG system
shall	The word 'shall' indicates a mandatory requirement Notes to tables and figures with 'shall' requirements are mandatory part of this document
should	The word 'should' indicates a recommendation requirement that will not be mandatorily imposed on the User.
single-Phase	Connection with an active of an individual phase and the neutral
small networks	Typically, small semi-rural lots, rural lots and larger properties outside of the metropolitan area and outside of country city centres. The small network nominal voltage is 240 V single-phase (line to neutral) and 480 V split phase (line to line). Include any of the following: i. LV distribution transformers less than 60 kVA; ii. Single-phase 240 V LV networks; and iii. Split phase 240/480V LV networks.

[1] From https://www.rtautomation.com/technologies/modbus-tcpip/ (referenced 21/4/21)

split-phase	Connection using two active conductors and the neutral from a single-phase transformer with a central tapped neutral. The two actives referenced to the neutral have 180° phase angle separation from each other. In some situations, a phase-to-phase connection is used to provide higher voltage capacity supply. Sometimes may be referred to as a 240V/480V supply. Also known as a two-phase connection in some circumstances
standard connection service	As defined in the WA Service and Installation Requirements for Western Power
Standard Small User Facility	As defined in the ESM Rules
static limit	Is an export limit that is applicable when User does not have an off-take agreement or where a DOE has not been received from an electricity retailer during an effective period
substitute supply	As defined in AS/NZS 4777.1
Supplementary supply	As defined in AS/NZS 3000 and AS/NZS 4777.1
system capacity	The rated capacity of the inverters energy system/s that are used in the Basic EG system
three-phase	Connection with three active phases and the neutral
two-phase	See split-phase. This may refer to where an IES with multiple single-phase inverters can be connected to two phases of a three-phase connection service
upgrade/d	Where an EG system that is already installed is being modified such that the rated aggregate IES capacity is increased or system components are being modified, changed or added to
User	For the purpose of this document, a person with an existing or new LV connection point who seeks access to spare capacity or new capacity on the network involving an Embedded Generator (the relevant owner, operator or controller of the Embedded Generator (or their electricity retailer))
voltage stabilisation devices	Any device within an electrical installation that conditions the voltage received at the connection point to the grid and alters the voltage level within the electrical installation
Wi-Fi	A form of wireless communications

Abbreviations

The following table provides a list of abbreviations and acronyms used throughout this document. Defined terms are identified in this document by capitals.

Term	Definition
ATO	Approval to operate
BESS	Battery Energy Storage Systems
DER	Distributed Energy Resources
DOE	Dynamic operating envelope
DSO	Distribution System Operator
EG	Embedded Generation
ESM	Electricity System and Market
HV	High Voltage – Voltages greater than 35kV
IES	Inverter Energy System
LV	Low Voltage – Voltages less than 1 kV
MV	Medium Voltage – voltages greater than 1kV up to 35 KV
PV	Photovoltaic
SGD	Secure Gateway Device
SPS	Stand-alone power system
VDRT	Short Duration Undervoltage Ride-through
VPP	Virtual Power Plant
WASIR	WA Service and Installation Requirements
WEM	Wholesale Electricity Market
xlpe	Type of cable insulation - Cross-linked Polyethylene

1. Introduction

1.1 Purpose and scope

The purpose of this document is to provide Users of basic embedded generator (**EG**) connections, information about their obligations for connection to, and interfacing with Western Power's low voltage (LV) distribution network. Western Power endeavours to provide equitable access to the network for all Users such that Users with equivalent standard connection services have consistent EG system requirements.

This includes all User connected EG, regardless of whether such systems export electricity into the electricity system or not.

This document applies to new connections of **basic EG systems** inclusive of alterations and modifications to existing basic EG systems, where the basic EG system consists of one or more inverter energy system (**IES)**. Basic EG systems are intended for installation on User connections that are categorised as standard connection service (refer to section 2.2). A basic EG system may be installed at a User connection that has a larger capacity than a standard connection service.

A basic EG System consists of an **IES** and compatible energy sources as envisaged by AS/NZS 4777 series of standards, which include renewable energy sources such as solar PV, wind and mini hydro and can include battery energy storage systems (**BESS**). The User's connection application shall identify each type of energy source per connection.

A basic EG system with a system capacity as listed in Table 1.1 is an EG system 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; and

c. meeting all other technical requirements set out in this document

Table 1.1: EG capacity and technical requirement documents

Connection Type	Connection Voltage	Technology Type	Capacity (1)	Relevant document
Basic EG Connection	Up to 1 kV	Inverter energy systems	≤ 30 kVA	This document
LV EG connection	Up to 1 KV	All LV EG not covered by "this document"	≤ 1 MVA	LV EG Connection Technical Requirements(2)
HV EG Connection	> 1 kV	All EG	≤ 10 MVA	HV EG Connection Technical Requirements(2)

Notes:

(1) Maximum permitted aggregate rated IES capacity, this capacity is to be generation limited in accordance with Section 4.2,.
(2) Specific LV and HV EG connections technical requirements are in development.

This Document is applicable to single-phase, three-phase and split-phase connection arrangements. For key criteria of single-phase, three-phase and split-phase connections, refer to the Western Australian Electrical Requirements (WAER) and Western Australian Service and Installation Requirements (WASIR).

This document comes into effect and is mandatory from 1st May 2026 and supersedes previous version from that date at 8:00 AM (Australian Western Standard Time).

1.2 Relationship to the Electricity System and Market Rules

In accordance with amended Electricity System and Market (ESM) Rules on Distributed Energy Resources - Roles and Technical Requirements[2], Western Power has been designated as the Distribution System Operator (DSO) and is required to produce a Wholesale Electricity Market (WEM) Procedure on the Technical Requirements for Standard Small User Facilities[3].

A Standard Small User Facility is defined in the ESM Rules and is similar to the terminology of basic EG System used throughout this document. For convenience the definition of Standard Small User Facility per clause 3.25.1 of the ESM Rules, current at the date of publication of this document, is included below.

"A Standard Small User Facility is a Facility of the type defined in clause 2.29.1B(c) [of the ESM Rules] that:

(a) contains an Energy Producing System installed on or after 1 May 2026 (inclusive of alterations and modifications to an existing Energy Producing System) that comprises one or more Inverter Energy Systems;

(b) is, or is intended to be, connected to a Distribution Network with a connection voltage less than 1000 volts; and

(c) has, or is intended to have, for Inverter Energy System in the Energy Producing System, a maximum aggregate capacity of 30 kVA."

The introduction of the WEM Procedure: Technical Requirements for Standard Small User Facilities is part of wider power system reforms to a central governance framework – the ESM Rules. Where an inconsistency exists between this document and the WEM Procedure: Technical Requirements for Standard Small User Facilities, the latter prevails.

The WEM Procedure comes into effect 1st May 2026 is applicable to this document on that date.

1.3 Obligations of the User

The User shall comply with all the applicable requirements of this document. Users shall:

a. obtain consent from their Electricity Retailer for connection of the basic EG System;

b. obtain consent from Western Power before interconnecting their basic EG System with Western Power's Distribution Network;

c. comply with the technical requirements as well as relevant national standards, industry codes, legislation, and regulations. In the event of inconsistency, the order of the following instruments shall prevail, being legislation and regulations, followed by the technical requirements, followed by national standards and industry codes;

[2] https://www.wa.gov.au/government/document-collections/consultation-electricity-system-and-market-rules-distributed-energy-resources-roles-and-technical-requirements

[3] For Western Power WEM Procedures, refer https://www.westernpower.com.au/about/what-we-do/regulation/the-wholesale-electricity-market/

d. comply with the site specific conditions in addition to the "Conditions of approval to connect an inverter energy system" provided to user at application preliminary approval and published on the Western Power website at date of installation;

e. not connect additional inverters, make modifications, or install additional basic EG Systems, including Battery Energy Storage Systems (BESS), without the prior written agreement of Western Power;

f. Provide relevant and requested system data after installation at completion of system commissioning for registration of embedded generator system; and

g. Comply with site specific conditions provided at approval to operate (ATO) and only operate the basic EG system after receipt of an ATO from Western Power.

Western Power may, at its absolute discretion and without limiting any of its other rights, reject an application and/or direct an Electricity Retailer to disconnect the EG system from the grid if the User's EG system does not comply, or no longer complies with all the requirements for basic EG systems through modification being made to the User's EG system.

2. Network and user connection categories

2.1 Network Categories

Western Power has categorised the topologies of all the low voltage (**LV**) networks as follows:

a) Large LV networks – includes all the three-phase 415 V LV distribution networks.

Note: Typically, this includes the metropolitan area and country city centres. The standard network nominal voltage is 415 V three-phase (line to line) and 240 V single-phase (line to neutral).

b) Small LV networks – include any of the following:

(i) LV distribution transformers less than 60 kVA;

(ii) Single-phase 240 V LV networks; and

(iii) Split phase 240/480 V LV networks.

Note: Typically, small semi-rural lots, rural lots and larger properties outside of the metropolitan area and outside of country city centres. The small network nominal voltage is 240 V single-phase (line to neutral), 415 V three-phase (line to line) and 480 V split-phase (line to line). Areas supplied by Western Power micro-grids are also considered small networks.

Basic EG System connections are permitted on small networks, however they will be subject to technical reviews and potential for augmentation of the User connection or potential reduction of system size and/or export limit.

Users that may have a Western Power stand-alone power system (**SPS**) connection service have specific technical requirements to integrate an EG System with the Western Power stand-alone power system, these are available in Appendix B.

2.2 Standard connection services

The Table 2.1 provides characteristics of the Western Power Standard connection service that shall be used by User to determine the requirements for a basic EG System connection.

Table 2.1: Standard connection services (as defined in WASIR)

Connection service	Capacity (per Phase)	Nominal voltage
Single-phase	63 A	240 V
Three-phase	32 A	415 V
Split-phase(1)	32 A	480 V (Phase to Phase)

Notes:

(1) Split-phase (or two-phase) are connection types located on small networks only.

3. Relevant Rules, Regulations, Standards and Codes

3.1 Standards and Codes

This section lists the Australian and International standards (Table 3.1) and industry codes (Table 3.2) that shall apply to the design, manufacture, installation, testing and commissioning, and operation and maintenance of all plant and equipment for basic EG system connections to the distribution network.

In the event of any inconsistency between Australian and International standards, industry codes and Western Power's technical requirements, the Western Power technical requirements shall prevail.

Table 3.1: Reference Australian and International Standards

Reference	Title
AS/NZS 3000	Electrical Installations (Wiring Rules)
AS/NZS 4777.1	Grid Connection of Energy Systems via Inverters
AS/NZS 4777.2	Grid Connection of Energy Systems via Inverters
AS/NZS 5033	Installation and Safety Requirements for Photovoltaic Arrays
AS/NZS 5139	Electrical Installations – Safety of Battery Systems for use with Power Conversion Equipment

Notes:

(1) Additional Australian or International standards apply as listed or referenced by the standards listed in this table.

Table 3.2: Western Power documents and relevant Codes

Reference	Title
WASIR	WA Service and Installation Requirements
TR	Western Power's Technical Rules 2016
DCCR	Distribution Customer Connection Requirements
WEM Procedure	WEM Procedure: Technical Requirements for Standard Small User Facilities

Notes:

(1) Additional Western Power documents/requirements, Australian or International standards apply as listed or referenced by the documents and codes listed in this table

3.2 Legislation and Regulation

This section provides a list of all the relevant legislation and regulations that shall apply to the design, manufacture, installation, testing and commissioning, and operations and maintenance of all plant and equipment for basic EG system connections (refer Table 3.3).

In the event of any inconsistency between legislation and regulations and the Western Power technical requirements, the legislation and regulations shall prevail.

Table 3.3: Legislation and Regulations relevant to basic EG Systems

Legislation and regulatory instruments
WA Electricity Act 1945
WA Electricity Licensing Regulation 1991
WA Electrical Requirements (WAER)
Electricity Industry Act 2004
Electricity Network Access Code 2004
WA Electricity Industry (Code of Conduct) Regulations 2005
WA Electricity Industry (Metering) Code 2012
Energy Operators (Power) Act 1979
Electricity Industry (Electricity System and Market) Regulations 2004
Electricity System and Market Rules

4. Technical Requirements

4.1 General

All Basic EG systems that are operating in parallel with the LV distribution network whether they are exporting, partial-exporting or non-export systems, shall comply to all technical requirements of this Document. The technical requirements set out in this document shall apply to all subcategories of Basic EG system connections to the Western Power grid.

These technical requirements are in accordance with the WEM Procedure: Technical Requirements for Standard Small User Facilities and apply to Standard Small User Facilities with maximum aggregated rated IES capacity not exceeding 30 kVA connected to a standard connection service.

Where there are multiple EG systems at a premise or sites connected to a single connection service, the system capacity will consider the aggregate of the existing and proposed EG systems at the connection point. This applies to sites such as but not limited to strata lots, retirement villages and commercial units.

For connection services with capacity larger than the standard connection service and EG Systems larger than maximum capacities of section 4.2, the User shall use the LV EG connection technical requirements to determine requirements.

Where Users intend to modify or upgrade their existing system, their complete basic EG system will be required to comply with the Basic EG Connection Technical Requirements (this document) and meet their obligations outlined in Section 1. Users are required to submit an application that includes systems that are being retained and new/additional systems to Western Power prior to the modification or upgrade being commenced.

Any inverter energy system that is installed as an independent supply (i.e., formerly referred to as off-grid or stand-alone power system) or alternative supply to an electrical installation that has a normal supply from Western Power grid shall conform to requirements of section 4.5.

All Basic EG systems shall be installed as per the arrangement drawings in the Distribution Customer Connection Requirements (DCCR).

4.2 Maximum Basic EG System Capacity for Connection Services

4.2.1 General

The maximum aggregated rated IES capacities of Table 4.1, Table 4.2 and Table 4.3 shall be used by Users to determine the maximum basic EG system capacity for the network category, connection service type and basic EG system type being proposed for the connection service.

The maximum aggregate rated IES capacity of Table 4.1, Table 4.2 and Table 4.3 for multi-phase basic EG Systems shall be the total IES capacity balanced across all phases. Where single-phase IES are used by themselves or with any combination of single-phase IES and/or three-phase IES on a multiple-phase Standard Connection Service, the maximum generation imbalance between any phases shall be in accordance with 4.2.2 Phase balance.

The maximum generation limit for the basic EG system must not exceed the capacity of the Standard Connection Service that the basic EG system is connected to.

Table 4.1: Maximum capacity limits, Generation limits and Export limits for Large LV Networks

Connection service (Large LV Networks)	Maximum aggregate rated IES capacity[2]	Generation limit [6]	Export limit [3],[5]	
			Static Base limit [4]	Maximum limit[1]
Single-phase	30 kVA	15 kVA	1.5 kW	5 kW
Three-phase [7]	30 kVA	8 kVA/phase	1.5 kW	5 kW

Notes:

(1) A higher maximum limit where agreed with an Electricity Retailer may be permitted in accordance with WEMP 3.4.2.
(2) The maximum aggregate rated IES capacity is inclusive of all inverters and inverter energy systems, single-phase or three-phase, single energy source inverters (e.g. PV) or battery systems inverters (e.g. BESS) and is regardless of whether the energy sources are d.c. coupled or a.c. coupled.
(3) Export limit control is required, see section 4.3.1.
(4) A User that does not have an off-take agreement with their Electricity Retailer (i.e., energy retailer) for their basic EG system shall have an export limit setting of no more than the static base limit (1.5 kW). Where the user does have an off-take agreement with their Electricity Retailer (i.e., energy retailer) their basic EG system shall be subject to 4.3.3 DER management requirements.
(5) See clause 4.3.1.5 for export limit requirements for shared network connection services.
(6) For Site generation limit control requirements see section 4.3.2.
(7) Single-phase inverters on a three-phase connection service have additional phase balancing requirements (see section 4.2.2)

Table 4.2: Maximum capacity limits, Generation limits and Export limits for Small LV Networks - Shared networks

Connection service (Small LV Networks – Shared networks) [9]	Maximum aggregate rated IES capacity [2]	Generation limit [6]	Export limit [3],[5]	
			Static Base limit [4]	Maximum limit[1]
Single-Phase	30 kVA	10 kVA	1.5 kW	3 kW
Split-phase (8)	30 kVA	3 kVA/phase	1.5 kW	1.5 kW
Three-phase (7)	30 kVA	5 kVA/phase	1.5 kW	3 kW

Notes:

(1) A higher maximum limit where agreed with an Electricity Retailer may be permitted in accordance with WEMP 3.4.2.
(2) The maximum aggregate rated IES capacity is inclusive of all inverters and inverter energy systems, single-phase or three-phase, single energy source inverters (e.g. PV) or battery systems inverters (e.g. BESS) and is regardless of whether the energy sources are d.c. coupled or a.c. coupled.
(3) Export limit control is required, see section 4.3.1.
(4) A User that does not have an off-take agreement with their Electricity Retailer (i.e., energy retailer) for their basic EG system shall have an export limit setting of no more than the static limit (1.5 kW). Where the user does have an off-take agreement with their Electricity retailer (i.e., energy retailer) their basic EG system shall be subject to 4.3.3 DER management requirements.
(5) See clause 4.3.1.5 for export limit requirements for shared network connection services
(6) For Site generation limit control requirements see section 4.3.2.
(7) Single-phase inverters on a three-phase connection service have additional phase balancing requirements (see section 4.2.2)
(8) Split-phase systems capacity is to be connected equally across both phases and is balanced generation.
(9) Technical studies are required for all basic EG systems on small network category. Listed Export limits are based on the most common small network connection arrangements, for example single-phase and split-phase typically connected to 10 kVA transformers. For these small networks the export limit may be decreased/increased as a result of the technical studies (refer Section 2.1).

Table 4.3: Maximum capacity limits, Generation limits and Export limits for Small LV Networks - Sole-use

Connection service (Small LV Networks – Sole-use) [9]	Maximum aggregate rated IES capacity [2]	Generation limit [6]	Export limit [3],[5]	
			Static Base limit [4]	Maximum limit[1]
Single-Phase	30 kVA	10 kVA	1.5 kW	3 kW
Split-phase [8]	30 kVA	5 kVA/phase	1.5 kW	1.5 kW
Three-phase [7]	30 kVA	5 kVA/phase	1.5 kW	3 kW

Notes:

(1) A higher maximum limit where agreed with an Electricity Retailer may be permitted in accordance with WEMP 3.4.2.
(2) The maximum aggregate rated IES capacity is inclusive of all inverters and inverter energy systems, single-phase or three-phase, single energy source inverters (e.g. PV) or battery systems inverters (e.g. BESS) and is regardless of whether the energy sources are d.c. coupled or a.c. coupled.
(3) Export limit control is required, see section 4.3.1.
(4) A User that does not have an off-take agreement with their Electricity Retailer (i.e., energy retailer) for their basic EG system shall have an export limit setting of no more than the static limit (1.5 kW). Where the user does have an off-take agreement with their Electricity retailer (i.e., energy retailer) their basic EG system shall be subject to 4.3.3 DER management requirements.
(5) See clause 4.3.1.5 for export limit requirements for shared network connection services
(6) For Site generation limit control requirements see section 4.3.2.
(7) Single-phase inverters on a three-phase connection service have additional phase balancing requirements (see section 4.2.2)
(8) Split-phase systems capacity is to be connected equally across both phases and is balanced generation.
(9) Technical studies are required for all basic EG systems on small network category. Listed Export limits are based on the most common small network connection arrangements, for example single-phase and split-phase typically connected to 10 kVA transformers. For these small networks the export limit may be decreased/increased as a result of the technical studies (refer Section 2.1).

4.2.2 Phase balance

The nominal inverter output rating of a split-phase or three-phase basic EG system connection shall be balanced across all phases.

The consumer mains active and neutral conductors shall have a current carrying capacity of not less than the maximum current to be carried by each individual conductor. This aligns with AS/NZS 3000 clause 3.4.1 requirements. The imbalance between generation and load on differing phases can cause an increased voltage on the neutral and earth connection and increased current carried in the neutral conductor in an electrical installation. This imbalance current carried by the neutral conductor is equal to the phasor summation of phase conductor currents. For unbalanced generation and load conditions, the out of balance current on the neutral conductor may place a maximum demand that exceeds the current carrying capacity of the neutral conductor.

Note: Three-phase consumer mains of 6 mm^2 are nominally rated at 32 A, older homes may have smaller sized consumer mains.

Where single-phase IES are used by themselves or with any combination of single-phase IES and/or three-phase IES on a three-phase Standard Connection Service, the maximum generation imbalance between any phases must not exceed:

a. 3 kVA for single energy source IES; or

b. 5 kVA for an IES with BESS.

Where single-phase IES are used by themselves or with any combination of single-phase IES and/or two-phase IES on a split-phase Standard Connection Service, the maximum generation imbalance between phases must not exceed:

(i) 1.5 kVA for single energy source IES; or

(ii) 5 kVA for an IES with BESS.

Where the basic EG system uses single-phase inverters in multiple inverter combination then the arrangement of single -phase inverters balanced across the phases shall have current balance protection for the multiple inverter combination in accordance with AS/NZS 4777.1.

For a three-phase connection service, where the basic EG system includes a BESS, the BESS shall be balanced across all phases for BESS inverter capacities greater than 5 kVA.

Where a single-phase inverter is used then one of the following methods shall apply to limit unbalance voltage and current at the point of supply for a three-phase connection service:

a. Generation limiting of the single inverter to the maximum generation imbalance limit on the single-phase when providing a supplementary supply;

b. Generation limiting a combination of single-phase inverters on a single-phase to maximum generation imbalance limit when providing a supplementary supply; or

c. Current balance protection for multiple inverter combinations is implemented in accordance with AS/NZS 4777.1 (i.e., limit of 21.7 A).

Where a single-phase basic EG system with BESS either DC or AC coupled is connected on a three-phase connection service they shall be on same phase as the load it is intended to supply whilst also maintaining site load balance for all modes of operation (i.e., charging and generation). No matter the method used to mitigate the current phase unbalance on a site, the requirements of AS/NZS 3000 clause 3.4.1 shall be met.

Note: These phase balancing requirements align with AS/NZS 4777.1 phase balancing. In some cases, a lower limit is applied than in AS/NZS 4777.1.

4.3 Generation Control Functions

4.3.1 Export Limits at Connection Point

4.3.1.1 General

The export limit control function is used to limit the export through the User connection point to the grid.

The export limit for each category of basic EG system is provided in Table 4.1, Table 4.2 and Table 4.3. The export limit shall be interpreted as soft, consistent with the definition of soft export limits within AS/NZS 4777.1 and AS/NZS 4777.2. For multi-phase connection services with balanced multi-phase basic EG systems the export limit shall be a net export limit across all the phases.

For single-phase inverters on any multi-phase connection service additional balance requirements apply (refer 4.2.2).

This export limit shall be interpreted by the User as a maximum. The ability of the User's basic EG system to export at the export limit is not guaranteed, but rather, it will depend upon network characteristics that change over time. The output of a basic EG system may need to be constrained for various scenarios (and hence reducing export below limit) including, but not limited to scenarios where power quality response modes are in operation.

Where a User does not have an off-take agreement with their Electricity Retailer (their basic EG system shall have an export limit setting of no more than the static base limit (i.e., 1.5 kW) of Table 4.1, 4.2 and 4.3. This limit shall take precedence over any other requirement within this section that would otherwise permit a higher export limit.

Where a User has an off-take agreement with an Electricity Retailer with only an emergency DER management requirement then the Maximum limits of Table 4.1, 4.2 and 4.3 will apply and the static base limits of Table 4.1, 4.2 and 4.3 will apply as a failsafe limit.

Where a User has an off-take agreement with an Electricity Retailer under an Advanced DER Management (4.3.3.2) product (such as a Virtual Power Plant), the User will be subject to a Dynamic Operating Envelope (DOE) under a Dynamic Connection Agreement. The Electricity Retailer will remotely control permitted export at any time within the published limits of the DOE. The static limits of Table 4.1, 4.2 and 4.3 will apply as a failsafe limit. See 4.3.3.

Where a User is connecting their basic EG system to a shared connection point then the export limit requirements of 4.3.1.5 shall apply.

In addition to these requirements a User shall manage the export limit so that under no operating condition the User's electrical installation carries current that exceed the current carrying capacity of a part of that electrical installation. This may be a lower value than that of Table 4.1, 4.2 and 4.3.

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.

4.3.1.2 Large networks

The maximum export limit for basic EG Systems connecting within the Large network is listed in Table 4.1.

The export limit for three-phase basic EG systems shall be set according to Table 4.1.

4.3.1.3 Small networks

The maximum export limits for basic EG systems connecting within a Small network are listed in Table 4.2 and Table 4.3. In the Small network area, the basic EG systems are subjected to a technical assessment and may have a reduced export limit requirement based on that assessment.

The export limit for three-phase basic EG systems shall be set according to Table 4.2 and Table 4.3.

The export limit for split-phase basic EG systems shall be set according to Table 4.2 and Table 4.3.

4.3.1.4 Additional requirements for BESS

In the case of the addition of an AC coupled BESS to an existing basic EG system, the entire EG system shall not exceed the limits of Table 4.1, 4.2 and 4.3.

In the case of the addition of a DC coupled BESS to the inverter DC battery port of an existing basic EG system (i.e., originally installed only a PV and without a battery) then the basic EG system shall be export limited to the limits of Table 4.1, 4.2 and 4.3.

4.3.1.5 Shared connection point

Each connection point to the Western Power network has a fixed electrical capacity for the load it may carry. Where a connection point is shared the connection is often rated at a capacity that is less than the capacity that would be allocated if each unit, resident, or business was independently connected to Western Power. As such Western Power often finds that the addition of EG systems at each User may exceed the capacity of the shared connection point.

Shared connection points shall be managed to ensure that all Users have access to a safe and secure electricity supply.

For shared connection point to the Western Power grid the strata company, management body or site owner is responsible for the management of the shared connection point and the electrical system connecting each user to the shared connection point. Before applying to connect Basic EG systems, tenants or owners with a shared connection point shall first seek permission from their strata company, management body or site owner to use a portion of the total shared connection point network capacity in determining the maximum EG system size permitted on each unit, resident, or business.

The export limit for sites that have a shared connection point, where each unit, resident, or business have a Western Power meter, shall be 3kW for each individual unit, resident, or business. Where a User does not have an off-take agreement their export limit shall be 1.5 kW.

Note: The 3 kW export limit is based on typical design ADMD per units on shared residential sites. Western Power may assign a lower or higher limit where design information and site details are matched and confirmed.

Where the total aggregated rated capacity of all Basic EG systems exceed 30 kVA additional requirements and processes are required to meet the Western Power Technical Rules. (Refer to Western Power website for multi-residential exemption).

4.3.2 Site Generation Limit Downstream of Connection Point

The site generation limit downstream of the connection point shall be used where the aggregated nameplate capacity of all inverters and inverter energy system exceed the site generation limits of Table 4.1, Table 4.2, or Table 4.3 as applicable. This includes any combination of AC coupled BESS, DC coupled BESS or other IES (PV or other energy source). The site generation limit downstream of the connection point shall be the same as the AS/NZS 4777.2 soft limit for the generation limit control function.

The site generation limit for any combination of IES shall be the allowed maximum concurrent output level to the AC electrical installation from all inverter energy systems on the connection service. The site generation may be less than the limit due to requirements for IES phase balancing clause 4.2.2 and export limits of clause 4.3.1.

The site generation limit applied to the combined output of all IES shall be equal to the limits of Table 4.1, Table 4.2, or Table 4.3 as applicable. This is only permissible with Inverters and IES that conform to the generation limit control function of AS/NZS 4777.2:2020 or AS/NZS 4777.1:2024.

NOTE: This requirement is allowing multiple IES in aggregate rated capacity no more than 30 kVA that may exceed the listed maximum generation limit of Table 4.1, Table 4.2, or Table 4.3 to be used provided they can be managed by a site generation limit control function.

4.3.3 DER management

4.3.3.1 General

In addition to the Basic EG Connection Technical Requirements, a basic EG system shall meet their Electricity Retailers requirement for DER Management.

An Electricity Retailer method shall be approved by Western Power before providing services to Users. As at publication, the only Electricity Retailer with an approved method for DER management is Synergy.

Note 1: Synergy has published their requirements in three documents. These include:- DER functional Requirements, Utility Interconnection Handbook and Installer Handbook. These are available from https://www.synergy.net.au/.
Note 2: Western Power does not specify a mandatory method for remote communication and control to be used by a Market Participant. However, Western Power notes that Energy Policy WA released a Statement of Interoperability of Distributed Energy Resources in May 2025 that indicates that WA is aligning with the national approach and will use Common Smart Inverter Profile – Australia (CSIP-AUS) for non-contestable customer DER in the SWIS.

For all basic EG systems subject to DER management, any loss of communications between the Electricity Retailer and the basic EG system the static base limits of Table 4.1, 4.2 and 4.3 shall apply as a failsafe limit.

Users that do not register their basic EG system(s) under an Electricity Retailer's DER Management Product will need to ensure full compliance to the static base export limits prescribed within 4.3.1, Tables 4.1, 4.2 and 4.3.

4.3.3.2 Advanced DER management

Users that register their basic EG system(s) under an Electricity Retailer's advanced DER Management Product will be subject to a Dynamic Operating Envelope (DOE), which will be prioritised over the static base export limits under Tables 4.1, 4.2 and 4.3. These Users must always comply with the published DOE as well as meeting the Emergency DER Management requirements under section 4.3.3.3.

Basic EG systems greater than 5 kVA with an offtake agreement shall be subject to advanced DER management and DOE.

4.3.3.3 Emergency DER management

Basic EG systems shall be able to be remotely disconnected from, and reconnected to, Western Power's distribution grid as directed by Western Power via an Electricity Retailer in accordance with the WEM procedure.

Note: This Clause was previously 4.3.4 DER Management used for Emergency Solar Management (ESM)

A User shall have and maintain a system that provides the capability to be remotely disconnected from, and reconnected to, Western Power's distribution grid.

The minimum functionality shall include the ability to remotely disconnect from and reconnect to the grid. In addition to this minimum functionality, it is recommended that a User EG system is configured to enable reduction of exported real power to zero power (0 kW). It is recognised that in this case there will possibly be some export at times (short periods < 15 s) depending on variation of load and ability of inverter to respond.

The following descriptions provides minimal functional requirements through an Electricity Retailer for methods that may be allowed:

a. A Western Power meter configured and wired such that on receipt of a signal the electricity meter can disconnect or reconnect the Basic EG system only from the distribution grid.

b. A communication channel to an Inverter system, such that the inverter can receive a signal from an Electricity Retailer that shall initiate a disconnect and initiate a reconnect. In addition, the inverter may receive a signal from an Electricity Retailer that may cause export of energy to the grid to cease or to resume.

c. A communication channel to a device, such that the device can receive a signal from an Electricity Retailer that shall initiate a disconnect and initiate a reconnect of the basic EG system. In addition, the basic EG system may receive a signal from an Electricity Retailer that may cause export of energy to the grid to cease or to resume.

d. A device connected to the DRM port of an inverter, which on receipt of a signal from an Electricity Retailer - asserts a DRM0 signal to the inverter – causing the inverter to operate its disconnection device. When the signal is no longer asserted the inverter reconnects.

e. A device connected to the DRM port of an inverter, which on receipt of a signal from an Electricity Retailer – asserts a DRM5 signal to the inverter – causing the inverter to cease to generate. When the signal is no longer asserted the inverter resumes generation.

The above methods are provided such that if utilised by a User and the Electricity Retailer they are considered to conform to the requirements for this capability. Users and Electricity Retailers that may have a methodology that is not listed above, may propose these to Western Power for consideration and approval prior to the application for a basic EG system connection.

For all acceptable methods, the remote reconnect signal allows the basic EG system to reconnect in conformance to AS/NZS4777.2 reconnection requirements.

Emergency DER management became mandatory for basic EG systems from 14 February 2022.

4.4 Inverter Energy System

4.4.1 General

The design of an IES within a basic EG system must be in accordance with all statutory requirements, the requirements of this document, WASIR, relevant Australian Standards and good electricity industry practice.

The following requirements apply to inverter energy systems:

a. The User shall ensure that the basic EG system is compatible with the characteristics of Western Power's supply as defined in Section 2 of the Western Power Technical Rules.

b. The User must ensure that the basic EG system complies with AS/NZS 4777, IEC 62109 and the relevant electrical safety standard for the IES components.

c. IES shall comprise of inverters installed in compliance with AS/NZS 4777.1

d. The inverter shall be tested by an authorised testing laboratory and be certified as being compliant with AS/NZS 4777.2

e. IES shall comprise of inverters that are registered with CEC as approved grid connect inverters. The CEC inverter listing shall not have expired at the time of connection application and IES installation.

f. IES shall comprise of inverters that are tested by an authorised testing laboratory and certified as being compliant with AS/NZS IEC 62116 for active anti-islanding protection as per AS/NZS4777.2

g. IES shall comprise of inverters that have both volt-var and volt-watt response modes available and enabled.

h. Western Power may require the User to update inverter settings upon request.

Appendix A provides operational and protection settings for existing Basic EG systems and new Basic EG systems in accordance with AS/NZS 4777 standard series applicable at time of applications and installations. Appendix A also provides additional inverter requirements not covered by AS/NZS 4777.2:2015 for VDRT for EG system inverters installed prior to 18th December 2021.

4.4.2 Electric Vehicles

Electric vehicles (EV) and EV supply equipment (EVSE) that are only capable of charging from the grid are not considered a basic EG system but rather a load only and are subject to the requirements of the WASIR.

An EV and/or EVSE shall be considered a Basic EG System, where it is

a) capable of reverse power transfer; and

b) provides a supplementary supply to the electrical installation.

An EV or EVSE that is a basic EG system shall comply with all the Basic EG System connection technical requirements, AS/NZS 4777.1:2024 and AS/NZS 4777.2:2020.

4.5 Network Connection and Isolation

4.5.1 General

Network connection and isolation requirements for IES shall be as per WASIR, AS/NZS 4777.1 and AS/NZS 3000.

The basic EG system shall not have any devices that modify the voltage or frequency between the connection point and the grid-interactive port of the inverter.

The IES shall not have any voltage stabilisation devices between the connection point and the IES connection. These include any transformer based or power electronic based equipment that change the voltage level from the grid side of the device to the load or generation side of the device. These voltage stabilisation devices render important voltage-based safety functions in the inverter ineffective.

In all cases the connection service at the time of the basic EG system installation shall comply with WA Electrical Requirements (WAER), the WA Service and Installation Requirements (WASIR) and the Distribution Customer Connection Requirements (DCCR).

The User shall not cause their electrical installation to be overloaded in any combination of basic EG system operation.

4.5.2 Approval to operate

The approval to operate a basic EG system to the Western Power grid will be deemed as given and recorded within Western Power systems once all requirements for application processes, e-notices, data collection and conformance to the basic EG connection technical requirements are confirmed by Western Power.

4.5.3 Main Switch

For all installations that have a basic EG system, the User installation main switch shall be a circuit breaker rated in accordance with WASIR section 11.

Note: For additional guidance refer to AS/NZS 3000 clause 2.5.1.

Refer to Table 2.1 for the applicable connection service capacity.

For all electrical installations that do not have a circuit breaker as the main switch this shall be upgraded to a circuit breaker before connection of the basic EG system.

Where a Western Power AMI meter is used for DER management purposes, the main switch shall be installed with an additional pole for connection of the auxiliary function terminal of an AMI meter. The auxiliary function terminal may be used for either direct or indirect control of an EG system. The addition of the extra pole of the main switch does not increase the overall capacity of the connection service. The Distribution Customer Connection Requirements (DCCR) provides additional details on the approved wiring arrangements.

For a single-phase connection service, a 2-pole circuit breaker rated at the capacity of the connection service shall be used. Similarly, for a three-phase connection service a 4-pole circuit breaker rated at the capacity of the connection service shall be used.

4.5.4 Isolation of EG systems providing independent supplies or alternative supplies

Embedded Generators that are not an AS/NZS 4777.2 compliant inverter used for backup power shall:

(i) not be connected on the grid side of a basic EG system as defined by this technical requirement document;

(ii) have interlocks that prevent the non-AS/NZS 4777 EG and rotating generators operating in parallel with the grid;

(iii) disconnect the load from the grid before connection to the EG;

(iv) provide mechanical isolation;

(v) be able to be secured in open position where grid nor EG is connected to the site load; and

(vi) provide isolation from grid to energy sources.

An embedded generator that is a multiple mode IES installation in accordance with AS/NZS 4777.1 that provides a substitute supply, alternative supply or independent supply shall be installed in accordance with AS/NZS 4777.1:2024 section 5 Multiple Mode IES installations.

An embedded generator, which is an IES, that provides an Independent supply shall be approved by Western Power before connection to the grid. These shall prevent export from any energy source through the AC input port of the inverter that connects to the Western Power grid side of the User electrical installation. The AC input port shall be limited in the maximum load that the inverter can draw from the grid for charging batteries and supply down-stream load to less than 7kVA.

Note: AS/NZS 4777.1 and AS/NZS 4777.2 previously referred to independent supply inverters as stand-alone inverters. independent supply inverter will be required to be in accordance with AS/NZS 4777.2:2020 to be connected to Western Power. Listing and certification requirements are still being developed.

Stand-alone inverters with an AC input port for charging from a generator or AC source that are not compliant with AS/NZS 4777.2 shall not be connected within an electrical installation connected to the Western Power grid. This specifically refers to connection of the Western Power grid to the AC input ports of these stand-alone inverters usually provided for small electrical rotating generators. These shall only be connected as an alternative supply using a changeover device in accordance with AS/NZS 4777.1:2024 clause 5.3 (specifically 5.3.1 (i) and (ii)).

A Generating Unit connected behind a make-before-break switch that results in a momentary, or longer, connection between grid supply and Generation supply circuits when performing a changeover shall be considered as EG Systems (these are covered in the LV EG Connection requirements).

4.6 Earthing

The earthing requirements for basic EG connections shall include:

a. For **IES**, earthing requirements shall be as per AS/NZS 4777.1 and AS/NZS 3000
b. For BESS, earthing requirements shall be as per AS/NZS 5139.
c. For **PV** systems, earthing requirements shall be as per AS/NZS 5033.

4.7 Protection

4.7.1 Inverter integrated protection

Inverter integrated protection requirements shall be as per AS/NZS 4777.2 for basic EG system connections. For all Inverters conforming to AS/NZS 4777.2 the default regional setting selection shall be “Australia B”.

Passive anti-islanding and active anti-islanding protection requirements and limit values shall be as per AS/NZS 4777.2. The Active anti-islanding detection method shall be available on request for review by Western Power.

4.7.2 Interface protection

Interface protection according to AS/NZS 4777.1 shall not be required for basic EG systems.

4.7.3 Interlocking

Where multiple single-phase inverters are connected to more than one phase they shall operate as a balanced three-phase or split-phase generator with the allowed imbalance of section 4.2.2.

Where either one or more single-phase inverters are connected in combination with three-phase inverters on a standard connection service then maximum allowed imbalance of generation between any two phases shall be according to the requirements of section 4.2.2.

4.8 Operating Voltage and Frequency

Western Power’s supply characteristics are defined in Section 2 of the Western Power Technical Rules.

The User shall be responsible for ensuring that the maximum voltage rise within the Premises complies with AS/NZS 4777.1 and provide a record of measurements or calculations as evidence in User

documentation and retain evidence for Western Power's use or inspection. This is measured or calculated based on maximum output power with no power quality response modes included into calculations.

4.9 Power Quality

4.9.1 General

Power quality relates to the voltage level, voltage fluctuations and voltage distortion supplied to or experienced at a connection point.

The settings required for this power quality clause are for coordinating the operation of the IES with the expected characteristics of the grid at any connection point on the Western Power grid.

4.9.2 IES Power Quality response modes

4.9.2.1 General

AS/NZS 4777.2 provides requirements for various Power Quality response modes for inverters.

All basic EG Systems connected to Western Power shall have the following modes enabled:

a. Volt-var mode
b. Volt-watt mode
c. Power rate limit

Other power quality response modes are available as per AS/NZS4777.2, however, these will not be required for a basic EG system and shall be disabled.

4.9.2.2 Volt-var mode

All inverters shall have Volt-var mode enabled by default. Volt-var mode shall be as per AS/NZS 4777.2 with "Australia B" default regional setting selection.

4.9.2.3 Volt-watt mode

All inverters shall have Volt-watt mode enabled by default. Volt-watt mode shall be as per AS/NZS 4777.2 with "Australia B" default regional setting selection

4.9.2.4 Power rate limit

All inverters are required to have a Soft Ramp Up after Connect or Reconnect mode as per AS/NZS 4777.2.

Western Power only requires soft ramp up to be applied to connection or reconnection (i.e., ramp up / soft start).

The ramp up power rate limit shall be: W_{Gra+}=16.67% of rated power per minute.

4.9.2.5 BESS power quality modes

A BESS inverter is a multiple mode inverter as per AS/NZS 4777.2.

The required voltage response is dependent on the energy storage level and required mode (e.g., fully charged status battery can discharge and generate but won't be able to charge to act as a load).

For a BESS inverter the Volt-watt mode shall be enabled for charging through the grid-interactive port of a multiple mode Inverter in conformance to AS/NZS 4777.2.

For a BESS inverter the Volt-watt mode shall be enabled for generation through the grid-interactive port of the multiple mode Inverter in conformance to AS/NZS 4777.2.

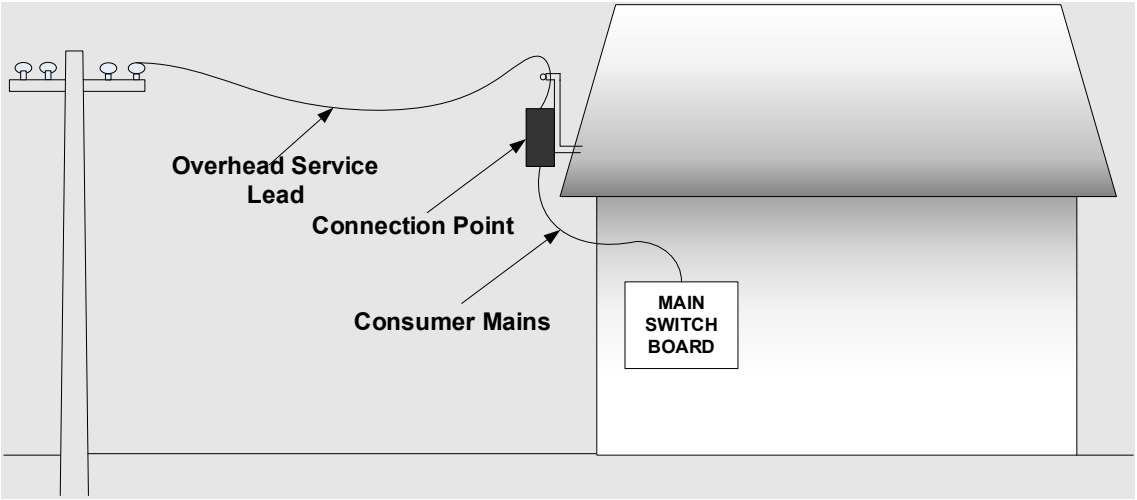
Requirements of section 4.9.2.2 volt-var mode shall apply to the charging mode of inverters with BESS.

4.9.3 Voltage rise

The User shall be responsible for ensuring that the maximum voltage rise within the Premises complies with AS/NZS 4777.1 and provide a record of measurements or calculations as evidence in User documentation and "retain" evidence for Western Power's use.

The maximum voltage rise from the connection point (i.e. on the service cable, Figure 4.1) to the LV street mains shall not exceed 1% of nominal voltage. This should be determined by User for overhead LV network connections. Western Power standard overhead service leads are 6mm^2 copper **XLPE** cable.

Figure 4.1: Example Service lead and Connection point on typical overhead connection service



4.10 Communication Systems

Inverter EG System shall comprise of inverters that have internet capability and an on-board communication port that can be used for a physical connection to another device (e.g., via RJ45, USB and RS-232) or a Wi-Fi connection. Internet capability and an on-board communication port are minimum infrastructure requirements to enable communication between inverter energy systems and Electricity Retailers enabling EG systems to potentially participate in DER management.

The User and the basic EG systems shall meet the communications and cybersecurity requirements under their DER management requirements.

The User shall maintain User owned communications link and functionality that are used to provide DER Management functionality (see 4.3.3) via an Electricity Retailer.

4.11 Technical Studies

No technical studies for connection of basic EG systems pertaining to the Western Power network are required to be carried out by the User to enable connection to the distribution network.

Technical studies may be performed by Western Power. The outcomes of the technical studies shall not result in any change to the published technical requirements for basic EG system connections. Technical studies where required (typically only for small network category refer Table 4.2 and Table 4.3) will be used to determine the capacity of the connection point for the connection of the proposed basic EG system. These studies may include voltage rise calculation across the LV network and evaluation of network capacity.

Where a Technical Study is performed and identifies the requirement for any generation or network augmentation, or augmentation of the User's EG system to facilitate the EG connection then this will be at the User's cost. The export limit for a User's basic EG system will be reduced before a requirement for augmentation of the network is required.

4.12 Metering

This section refers to Western Power's requirements for the supply, installation and maintenance of metering and service equipment. The requirements of the WASIR metering section shall apply and be read in conjunction with the Electricity Industry (Metering) Code and the WAER.

Western Power metering will be used by Western Power to monitor net exports in compliance with this document. Exceeding export levels can result in systems being disconnected until the export limit is implemented in conformance to basic EG system requirements.

4.13 Labelling and Signage

The labels and signs on the installation, including cables, shall be as per Australian Standards of Table 3.1.

5. Fees and Charges

Western Power does not have fees and charges currently for basic EG Systems applications. However, additional costs could be incurred in the event the Technical Assessment identifies the requirement for any generation or network augmentation, communications, or augmentation of the User's EG system required to facilitate the EG connection.

6. Testing and Commissioning

Testing and commissioning shall be undertaken to demonstrate that the basic EG system meets the requirements of this document and the conditions of connection approval for the User EG System Connection.

Commissioning and verification shall be in accordance with AS/NZS 4777.1, AS/NZS 3000, AS/NZS 3017 and AS/NZS 5033 (where applicable), the equipment manufacturer's specifications, good electricity industry practice and requirements as outlined in this document. Commissioning may only occur after installation of Western Power metering equipment configured for bidirectional power flow.

Commissioning and testing shall include (but not limited to):

a. Confirmation that the export limiting device prevents export above set limit for more than 15 s;

b. Confirmation that the generation limiting device prevents BESS and IES from exceeding the set limit;

c. Confirmation that the imbalance between phases is no more than the allowed level for basic EG Systems and where any controls to manage imbalance are in place, these are set to the required level;

d. Confirmation that the EG system is connected via an approved functional method to an Electricity Retailer's DER management system; and

e. Confirmation that any site-specific conditions have been applied and operating correctly.

Prior to completion of the basic EG system commissioning, or whenever the system is modified, a verification test shall be performed as recommended by the equipment manufacturer and required by the relevant standard. Testing of the basic EG system shall include procedures to functionally test all protective elements including verification of inverter trip timing.

Western Power reserves the right to witness commissioning or request evidence of commissioning results.

If requested, the User will provide to Western Power a list of step-by-step energizing and commissioning procedures prior to basic EG system commissioning.

The User shall retain a complete set of manuals, installation drawings; permits, inspection, and verification test reports; full list of applied operational settings and make them available to Western Power if requested.

The tests shall be installation tests and functional tests, not type tests.

A User shall cooperate with an Electricity Retailer and confirm that the conditions of connection approval have been met, including:

(i) System is same as approved;

(ii) Aggregate rated IES capacity information (including maximum permitted export);

(iii) Confirmation of correct configuration, settings, and compliance with Western Power condition of connection approval; and

(iv) DER management correctly installed and commissioned.

A User shall provide relevant and requested system data after installation at completion of the basic EG system commissioning that indicates all conditions of approval have been met, including commissioning of

DER management systems have been completed. Western Power will publish information on how this information will be collected.

7. Operation and maintenance

7.1 User obligations

Basic EG systems shall be operated and maintained to ensure compliance with their connection agreement and all legislation, codes, other regulatory instruments, and these Basic EG Connection Technical Requirements at all times.

Operations and maintenance requirements for basic EG systems shall include, but not be limited to:

a. Maintaining the electrical installation at the connection service address in a safe condition.

b. 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 User holds a Certificate of Compliance issued in respect of any of the changes.

c. The User shall seek Western Power approval prior to altering the EG system connection in terms of an addition, upgrade, extension, expansion, augmentation, or any other kind of alteration, including changing inverter settings.

d. The User shall maintain connectivity to an Electricity Retailer's system used for DER management.

7.2 Compliance audits

The EG system shall comply with these Basic EG Connection Technical Requirements and the conditions of connection approval at all times, until it is permanently disconnected. The User shall notify Western Power when the EG is permanently disconnected.

An Electricity Retailer or Western Power may inspect or audit the User's basic EG system at any time for compliance with the requirements of this Document or an Electricity Retailer's additional connection requirements. An Electricity Retailer or Western Power may perform an audit either by a site visit to a User's premises, via analysis of data or other means.

The Electricity Retailer or Western Power shall contact the User to arrange for an audit of the EG system at their Premises prior to the proposed audit date. The User shall provide full unrestricted access to the EG system to an Electricity Retailer or Western Power personnel undertaking the audit.

Any non-compliance with the Technical Requirements or site-specific conditions identified during an audit shall result in the EG system being disconnected from Western Power's network. The User will be notified and provided reasons for the non-conformance that needs to be remedied. The EG system shall not be reconnected to the grid until the Electricity Retailer and Western Power are satisfied that the non-compliance has been resolved. Rectification of non-compliance issues shall be at the User's cost.

These compliance audits are separate/different to electrical inspections performed by WA Electrical Inspectors under the Energy Coordination Act 1994.

Appendix A

Inverter settings for all installations

Normative

A.1 Inverter Standards applicability to new and existing installations

This appendix includes the inverter settings and requirements for new basic EG systems installed after publication of this Basic EG Connection Technical Requirement document, for purposes of installation and confirming compliance of installation when audits, maintenance or changes are being performed.

This appendix also includes the inverter settings and requirements for existing basic EG systems installed prior to the publication of this Basic EG Connection Technical Requirement document for purposes of confirming compliance of existing installation when audits, maintenance or changes are being performed.

Where an existing installation is being upgraded, the existing parts of the installation that are not to be changed shall be made compliant with the connection requirement at time of the original installation.

Where an existing basic EG system installation's inverter requires replacement (with no other modifications to energy source or other components) then the following applies:

a. Where a like for like replacement is to be installed to replace an inverter compliant to AS/NZS 4777.2:2005 and AS/NZS 4777.3:2005 then the replacement inverter shall be the same brand and model with settings as per original installation date requirements (refer A.4).

b. Where a like for like warranty replacement is to be installed to replace an inverter compliant to AS/NZS 4777.2:2015 then the replacement inverter shall be same size and additionally capable of volt-var, VDRT requirements and be configured with the settings according to requirements current at 1st July 2021 as per A.3. Where the like for like warranty replacement is compliant with AS/NZS 4777.2:2020 then the latest firmware shall be applied to the replacement inverter, and the 'Australia Region B' setting shall be implemented.

c. Where a like for like replacement is not available then a current model inverter (shall be same size ± 0.1 kVA) shall be used as the replacement inverter. The replacement inverter shall be compliant with AS/NZS 4777.2:2020 with the latest firmware applied to the inverter, and the 'Australia Region B' setting shall be implemented.

d. Where a like for like replacement is not available and the inverter size is changed, a new application is required and shall conform to all current requirements, including DER management requirements.

e. As part of the replacement installation the latest firmware shall be applied to the replacement inverter, and the use of setting to the 'Australia Region B' setting shall be implemented.

All IES connected to the network must comply with the AS/NZS 4777 series of standards.

For Basic EG systems connected between 1 July 2021 and 18 December 2021, the inverter, in addition to being compliant with AS/NZS 4777.2:2015, shall be compliant with Short Duration Under Voltage Disturbance ride-through test procedure published by AEMO. Refer to https://aemo.com.au/-/media/files/electricity/der/2021/vdrt-test-procedure.pdf?la=en

Table A.1 lists applicable inverter energy system standards, together with their validity dates.

Table A.1: Standard series AS/NZ4777 Grid connection of energy systems via inverters

Part	Part Name	Version	Comments
AS4777.1	Installation requirements	2005	Superseded by AS/NZS 4777.1:2016
AS4777.2	Inverter requirements	2005	Superseded by AS/NZS 4777.2:2015 9th October 2016
AS 4777.3	Grid protection	2005	Superseded by AS/NZS 4777.2:2015 9th October 2016
AS/NZS 4777.1	Installation requirements	2016	Superseded by AS/NZS 4777.1:2024 23rd February 2025
AS/NZS 4777.2	Inverter requirements	2015	Superseded by 2020 version 18th December 2021
AS/NZS 4777.2	Inverter requirements	2020	Current and includes Amendment 1 and Amendment 2 (AMD 2 from 23rd August 2025)
AS/NZS 4777.1	Installation requirements	2024	Current

A.2 AS/NZS 4777.2 2020

For all Basic EG Inverters conforming to AS/NZS 4777.2:2020 the default regional setting selection shall be “Australia B”.

For all other modes and operation that are not covered by a regional setting then requirements of the relevant section of this document apply. Typically, they are the default settings of AS/NZS 4777.2 2020.

For DER Management, an inverter may require connection to activate Inverter demand response modes as per AS/NZS 4777.2:2020 clause 3.2. This may use DRM 0 or DRM 5.

A.3 AS/NZS 4777.2 2015

Table A.2 lists Western Power's requirements for the use of additional inverter functionality and values for set-points required for inverters, in accordance with AS/NZS 4777.2:2015 installed up to 18 December 2021.

The functions have configurable set-points that must be aligned to Western Power's required setting. Any requirement appearing in the standard that is not listed below must be applied as specified by the standard.

Requirement listed in Table A.2 apply to all inverters installed after 9th October 2016 (except where noted in table).

Table A.2: Required settings - inverters compliant with AS/NZS 4777.2:2015

Clause	Comment	Default setting	Western Power requirement
6.2	Inverter demand response modes	DRM 0 Disconnect - required.	*DRM 0 implemented as required by Western Power*
		DRM 1 to DRM 8 - optional.	DRM 1 to DRM 8 - not required.

Clause	Comment	Default setting	Western Power requirement
6.3	**Power quality response modes**		
6.3.2.2	Volt-watt response mode	Default - enabled. Tables 9 & 10 - default values.	Required and Enabled Tables 9 & 10 - default values.
6.3.2.3	Volt-var response mode	Default - enabled.	Required and Enabled Set points V1 =205 V, 30% (vars source) V2 = 220 V, 0% V3 = 235V, 0% V4 = 250, 30% (vars sink) **Note: applicable from 9th August 2019**
6.3.2.4	Voltage balance mode	Default - disabled.	Disabled. Optional for users with supplies > 100 A.
6.3.3	Fixed power factor mode and reactive power mode	Default - disabled.	Disabled.
6.3.4	Power factor curve -Cos Φ (P)	Default - disabled.	Disabled.
6.3.5 (6.3.5.3.2 & 6.3.5.3.3)	Power rate limit Note: This will be applied to reconnection (i.e. ramp up/soft start).	Required. Default ramp time W_{Gra}=16.67% T_n=6 minutes	Required. W_{Gra} or W_{Gra}+ = 16.67% Tn+=6 minutes W_{Gra}-=50% T_n-=2 minutes
Protective functions for connection to electrical installations and the grid			
7.3	Active anti-islanding protection	Either test methods of Appendix F or IEC 62116.	Test method to IEC 62116 is required.
7.5.2	Sustained operation for voltage variations	Required. Default setting $V_{nom-max}$ = 255 V	Required. Default setting $V_{nom-max}$ = 258 V
7.5.3	Sustained operation for frequency variations (generation operation).	Required. Default setting F_{stop}=52 Hz	Required. Default setting F_{stop}=51.5 Hz
7.6	Disconnection by external signal.	Required.	Required. Note: while this capability is a requirement for inverters, this function is generally only implemented for larger systems (> 200 kVA) where an inter-trip is required.
Additional requirements for multiple mode inverters			

Clause	Comment	Default setting	Western Power requirement
6.3.5.3.4	Changes in energy source operation. Note: For multiple mode inverters (i.e. with energy storage) will also apply for changes in energy source operation.	Default - disabled.	Required and Enabled. For changes in energy generation and consumption through grid-interactive port.
6.4.3	Volt-watt response mode for charging of energy storage	Required.	Required and Enabled Set points V1 =205 V, 0% (charging load) V2 = 220 V, 100% (charging load) V3 = 235V, 100% V4 = 250, 100% Note: Table 9 and Table 12 values have been modified.
7.5.3	Sustained operation for frequency variations (charging operations)	Required. Default setting F_{stop}-CH=49 Hz	Required. Default setting F_{stop}-CH=49 Hz

A.4 AS 4777.2:2005 and AS4777.3:2005

This section summarises the requirements that must be used for existing IEG connected to the Western Power network prior to 9th October 2016.

Inverters compliant with the superseded 2005 version have adjustable set-points. For existing installations where an addition or alteration is made and the original inverter is retained, Western Power requires these inverter set-points to be changed to align to its requirements and those of AS/NZS 4777.2:2015. The required settings are listed in Table A.3.

Table A.3: Required settings - inverters compliant with AS/NZS 4777.3:2005

AS 4777.3:2005 clause 5.3	Range	Required setting
Under-voltage, V_{min}	200 - 230 V	200 V
Over-voltage, V_{max}	230 - 270 V	265 V
Under-frequency, F_{min}	45 - 50 Hz	47 Hz
Over-frequency, F_{max}	50 - 55 Hz	51.5 Hz

Appendix B

Stand-alone power system connection services

Connection of Basic EG systems
Normative

B.1 Additional requirements for SPS connection services

Western Power customers with a stand-alone power system (SPS) connection service may connect a basic EG system to their electrical installation (i.e., their premises/homes/property). The requirement of this document with the modified requirements of this appendix (Appendix B) applies to SPS connection services.

Only the modified requirements are included in this appendix. The bracketed reference in the appendix B headings refer to the clause that is being modified. For simplicity only the requirement being modified has been included here, any other requirements are still to be met.

B.2 Maximum basic EG system capacity (4.2)

B.2.1 General (4.2.1)

Table B.1: Maximum System Capacities for SPS connection services

Connection service (Small networks)	Basic EG System Phase[5]	Maximum Inverter Capacity [2]		Site Generation Limit [6]	Export limit [3][5][9]	
		Single energy source (i.e. no BESS)	BESS AC Coupled, or DC coupled[1]		Static Limit	Maximum limit
Single-Phase	Single-phase	10 kVA	10 kVA	15 kVA	0 kW	0 kW
Split-phase [8]	Split-phase [7] (Two single-phase inverters)	10 kVA (5 kVA per phase)	10 kVA (5 kVA per phase)	5 kVA per phase	0 kW	0 kW

Notes:

(1) DC coupled refers to multiple energy sources (including Energy Storage systems) into the DC side of a single inverter. AC coupled refers to systems with multiple inverters for various energy sources (commonly PV) and energy storage systems connecting on the AC electrical installation.
(2) This is the maximum allowed capacity for each inverter. Inverter generation limiting is permitted. Any combination of inverters is permitted e.g. Single-phase IES with a three-phase IES on a three-phase connection service. Also, an AC coupled battery system inverter can be used with a DC coupled battery system inverter.
(3) Export limit control is required, see section B.3.1. No export is permitted
(5) Shared connection services requirements not applicable to SPS connection services
(6) For Site generation limit control requirements see section B.3.2.
(7) Single-phase inverters on a split-phase connection service have additional phase balancing requirements (see section B.2.2)
(8) Split-phase systems capacity is to be connected equally across both phases and is balanced generation
(9) Technical studies are required for all basic EG systems on SPS connection services.

B.2.2 Phase balance (4.2.2)

The nominal inverter output rating of a split-phase basic EG system connection shall be balanced across both phases.

The consumer mains active and neutral conductors shall have a current carrying capacity of not less than the maximum current to be carried by each individual conductor. This aligns with AS/NZS 3000 clause 3.4.1 requirements. The imbalance between generation and load on both phases can cause an increased voltage on the neutral and earth connection and increased current carried in the neutral conductor in an electrical installation. This imbalance current carried by the neutral conductor is equal to the summation of phase conductor currents. For unbalanced generation and load conditions, the out of balance current on the neutral conductor may place a maximum demand that exceeds the current carrying capacity of the neutral conductor.

For any basic EG system inverter on a split-phase connection service the export limit is 0 kW on each phase for all connected inverters. This limits the unbalance between the two phases for all combinations of inverter energy systems used on a split-phase SPS connection service.

B.3 Generation control functions (4.3)

B.3.1 Export Limits at the Connection Point (4.3.1)

For SPS connection services the export limit is 0 kW (Table B.1). For Split phase connection services, the export limit is a per phase export limit (see B.2.2).

This requirement minimises the interaction of the customers basic EG systems with Western Power SPS units, allowing the customer to fully self-consume generated energy from their basic EG system.

B.3.2 Site generation limit Downstream of Connection Point (4.3.2)

The Site Generation limit for SPS connection services is 10 kVA.

For split-phase SPS connection services this is 5 kVA per phase.

B.3.3 DER management (4.3.3)

DER management is not required.

B.4 Network connection and Isolation (4.5)

B.4.1 Main Switch (4.5.3)

For all installations that have a basic EG system, the User installation main switch shall be a circuit breaker with a Type B trip and rated in accordance with the SPS connection service provided.