

# National Distributed Energy Resources Grid Connection Guidelines

Technical Guidelines for Low Voltage EG Connections

ENA DOC 040-2026

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This document refers to various standards, guidelines, calculations, legal requirements, technical details and other information.

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Correspondence should be addressed to the Industry Standards Officer, Energy Networks Australia, at [info@energynetworks.com.au](mailto:info@energynetworks.com.au) or Level 33, 385 Bourke Street Melbourne VIC 3000.

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Energy Networks Association Limited  
Trading as Energy Networks Australia  
ABN 75 106 735 406

Level 33, 385 Bourke Street  
Melbourne VIC 3000

T: +61 3 9103 0400

E: [info@energynetworks.com.au](mailto:info@energynetworks.com.au)

W: [www.energynetworks.com.au](http://www.energynetworks.com.au)

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## Key Information

<b>Document Category</b>	Guideline
<b>Functional Domain</b>	Connections
<b>Designation</b>	ENA DOC 040-2026
<b>Version No</b>	3.0
<b>Title</b>	National Distributed Energy Resources Grid Connection Guidelines – Technical Guidelines for Low Voltage EG Connections
<b>Scope of Revision</b>	Update to align with current versions of relevant Australian standards, include new sections relating to newer DER technology and address common DNSP deviations from previous version
<b>Reason for review</b>	Periodic review and recent updates to AS/NZS 4777 and other standards
<b>Material changes</b>	Added sections for dynamic DER management, ESS, Electric Vehicles, IPSD, phase balancing and backup power. Added standard tables for inverter size. Removed outdated preamble text and dependencies on original Framework and Principles guideline. Re-ordered some sections in line with common practice. Added new section and appendix based on AEMO’s 2025 guidelines for sub-5MW connections.
<b>Review Leader</b>	Energy Horizons
<b>Revision Working Group</b>	Ausgrid, Ausnet Services, ENA, Energy Queensland, Evoenergy, Horizon Power, Power and Water, SA Power Networks, TasNetworks, Western Power
<b>Foundation work</b>	A ‘Framework and Principles Guideline’ was produced, to guide the development of this and other connection guidelines
<b>Supersedes</b>	National Distributed Energy Resources Grid Connection Guidelines – Technical Guidelines for Small IES EG Connections, version 2, ENA DOC 039-2022
<b>Filing Details</b>	Energy Networks Australia Website
<b>Review Period</b>	Three years after publication date

# Documents of Energy Networks Australia

## History of Energy Networks Australia

Energy Networks Australia is the peak national body representing Australia's gas distribution and electricity transmission and distribution companies. Established in its current form in 2004, it has a long history of industry representation, operating under different names over the years to reflect the sector transformation.

With more than 16 million customer connections across the nation, Australia's energy networks provide the final step in the safe, reliable delivery of gas and electricity to virtually every home, business and industry in the country.

## Documents

Part of Energy Networks Australia's role is the development and management of support material such as codes, specifications, guidelines and handbooks to support the energy industry and members of the public in the interpretation and application of legislation and standards. All documents are written in collaboration with the industry through reference groups and general consultation with Energy Networks Australia's members.

It should be noted that legislation and standards may alter between editions of Energy Networks Australia documents, and they will always take precedence. As such, all document users must be aware of the current national and jurisdictional regulations.

This guideline is just one document in a framework of information designed to support the energy sector. Network Operators and Service Providers should refer to all current Energy Networks Australia Guidelines. A full list of documents can be obtained from Energy Networks Australia at <http://www.energynetworks.com.au/industry-guidelines>.

## Definitions

Note: definitions in *italics* are consistent with the definitions under the National Electricity Rules<sup>1</sup>.

<b>Alternative supply</b>	A supply intended to maintain the supply in case of interruption to the normal supply to the premises, as defined in AS/NZS 3000
<b>Connection point</b>	The agreed point of supply between the distribution network and the customer premises
<b>Embedded generating unit</b>	A generating unit connected within a distribution network and not having direct access to the transmission network
<b>Embedded generating system</b>	A system comprising of one or more embedded generating units
<b>Export capacity</b>	Combined power that all embedded generating units installed at the consumer's premises are capable of exporting to the network
<b>Export limit</b>	A limit on the amount of electricity allowed to be exported from an embedded generating system to the distribution network
<b>Distributed Energy Resources (DER)</b>	Embedded generating units that are connected directly to the distribution network. Small DER are also referred to as Customer Energy Resources (CER)
<b>Energy storage system (ESS)</b>	A system (typically comprising one or more batteries) that stores electricity generated by distributed energy resources or directly from the network, and that can discharge the electricity to loads or export to the network
<b>Generating unit</b>	Plant used in the production of electricity (referred to as a ' <i>production unit</i> ' in the NER), including ESS, EVs and EVSE capable of reverse power transfer (referred to in the NER as ' <i>bidirectional units</i> '), and all related equipment essential to its functioning as a single entity.
<b>Generation</b>	The production of electrical power
<b>Generator</b>	A person who owns, operates or controls a generating unit
<b>Generation limit</b>	Where the active power generated by an IES is controlled so as to not exceed a specified limit that is lower than the inverter nameplate rating

<sup>1</sup> National Electricity Rules v243 at time of writing.

<b>Independent supply</b>	A supply to an electrical installation that is not supplementary to a grid supply, as defined in AS/NZS 4777.1
<b><i>Integrated Resource Provider</i></b>	<i>A person who is registered by AEMO as in Integrated Resource Provider</i>
<b>Interface protection</b>	Interface protection is the protection contemplated by AS/NZS 4777 installed to perform the functions of: coordinating multiple generating installations at one site, providing protection for the entire generation installation and islanding protection to the connected grid as well as preserving safety of grid personnel and the general public
<b>Inverter energy system (IES)</b>	An embedded generating system of the kind contemplated by AS/NZS 4777 comprising one or more inverters that convert direct current to alternating current
<b>Inverter Power Sharing Device (IPSD)</b>	A device used to share the supplementary supply from an inverter or multiple inverters to provide supplementary supplies to a number of electrical installations that are part of a multiple electrical installation
<b>Low voltage (LV)</b>	The mains voltages as most commonly used in any given network by domestic and light industrial and commercial consumers (typically 230V)
<b>Medium voltage (MV) / High voltage (HV)</b>	Any voltage greater than 1kVAC
<b><i>Model standing offer</i></b>	<i>A document approved by the Australian Energy Regulator as a model standing offer to provide embedded generation 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</i>
<b>Proponent</b>	A person proposing to become a generator (the relevant owner, operator or controller of the generating unit, or their agent)
<b>Single Wire Earth Return (SWER)</b>	Parts of the electrical high voltage distribution network that use a single live conductor with the earth as the return current path. All premises are supplied at LV either as single-phase or split-phase electric power
<b>Site generation limit</b>	A generation limit that applies at the connection point
<b>Small IES embedded generation connection</b>	A connection for a small EG system of the kind contemplated by AS/NZS 4777 with a total system capacity less than or equal to 30kVA that is intended to be connected to and capable of operating in parallel with any part of the LV distribution network, involving minimal or no augmentation of the distribution network, for which a model standing offer is in place
<b>Substitute supply</b>	A supply provided via a single socket-outlet on or adjacent to an inverter that is not connected to the electrical installation, as defined in AS/NZS 4777.1

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<b>Supplementary supply</b>	A supply intended to operate in conjunction with the normal supply to the premises, as defined in AS/NZS 3000
<b>Technical requirements document</b>	The document produced by each Distribution Network Service Provider setting out their requirements for proponents to enable a grid connection, to which these guidelines apply

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## Abbreviations

<b>AEMC</b>	Australian Energy Market Commission
<b>AEMO</b>	Australian Energy Market Operator
<b>AER</b>	Australian Energy Regulator
<b>AS/NZS</b>	A jointly developed Australian and New Zealand Standard
<b>CBD</b>	Central Business District
<b>CEC</b>	Clean Energy Council
<b>DER</b>	Distributed Energy Resources. Small DER are also referred to as Customer Energy Resources (CER)
<b>DNSP</b>	Distribution Network Service Provider
<b>EG</b>	Embedded Generation or Embedded Generating
<b>ESS</b>	Energy Storage System
<b>EV</b>	Electric Vehicle
<b>EVSE</b>	Electric Vehicle Supply Equipment
<b>HV</b>	High Voltage
<b>IEC</b>	International Electrotechnical Commission
<b>IES</b>	Inverter Energy System
<b>IPSD</b>	Inverter Power Sharing Device
<b>LV</b>	Low Voltage
<b>MV</b>	Medium Voltage
<b>NEM</b>	National Electricity Market
<b>NER</b>	National Electricity Rules

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<b>NMI</b>	National Metering Identifier
<b>SWER</b>	Single Wire Earth Return
<b>SWIS</b>	South West Interconnected System
<b>UPS</b>	Uninterruptable Power Supply
<b>WEM</b>	Wholesale Electricity Market servicing the SWIS

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## About the National DER Connection Guidelines

The National DER Connection Guidelines set out the framework, principles, approach and technical settings for Australian DNSPs to adopt in the development and application of their technical requirements for grid connection of DER. The ultimate aim of the guidelines is to facilitate the efficient integration of DER into the grid from the perspective of networks, renewable energy proponents and Australia's electricity system more generally.

In preparing these guidelines, Energy Networks Australia has consulted broadly with industry including: the AEMO, the AEMC, state and federal governments and the Clean Energy Council as well as each of the DNSPs across Australia, who are our member organisations.

### Objectives of the Guidelines

The objectives of the guidelines are to:

1. Give rise to clear, complete and accessible technical requirements for grid connection for each DNSP
2. Provide for a level of consistency between DNSPs' technical requirements for grid connection in terms of both structure of presentation and the requirements themselves
3. Ensure that DNSPs' technical requirements give regard to the long-term interest of consumers by appropriately balancing the economic benefits, costs and risks that the requirements impose upon their network, proponents and Australia's electricity system more generally; consistent with the National Electricity Objective to:  
*"Promote efficient investment in, and efficient operation and use of, electricity services for the long-term interests of consumers of electricity with respect to: (a) price, quality, safety, reliability and security of supply of electricity and; (b) the reliability, safety and security of the national electricity system; and (c) the achievement of targets set by a participating jurisdiction – (i) for reducing Australia's greenhouse gas emissions; or (ii) that are likely to contribute to reducing Australia's greenhouse gas emissions."*
4. Establish a platform for DNSPs to develop common standards and protocols for future management of active DER.

### Structure of Guidelines

The guidelines are separated into four distinct documents:

1. **Framework and Principles guideline** – Specifies the number, scope and structure of the technical requirements documents which all DNSPs shall develop as well as the principles DNSPs shall adopt in setting technical requirements
2. **Technical Guidelines for Small IES EG Connections** – Specifies how DNSPs shall develop and apply technical requirements for the connection of a small IES EG unit with a total system capacity less than or equal to 30 kVA to an LV distribution network
3. **Technical Guidelines for Low Voltage EG Connections** (this document) – Specifies how DNSPs shall develop and apply technical requirements for the connection of an EG unit (which is not a small IES EG unit) to a LV distribution network

4. **Technical Guidelines for Medium Voltage and High Voltage EG Connections** – Specifies how DNSPs shall develop and apply technical requirements for the connection of an EG unit (which is not a small IES EG unit or an LV EG unit) to a MV/HV distribution network, for which the generator is not required to be registered in the NEM ( $\leq 5\text{MVA}$ ) or WEM ( $\leq 10\text{MVA}$ ) or is within other jurisdictions and is  $\leq 5\text{MVA}^2$ .

## How to Comply with the Guidelines

Compliance to the Energy Networks Australia DER Connection Guidelines is not legally required by DNSPs, however, all DNSPs have communicated an intention to adopt the requirements of the guidelines. To be deemed to comply with the guidelines, DNSPs shall:

- » Structure their technical requirements documents consistent with the relevant Guideline (this document)
- » Develop and apply technical requirements set out in the relevant Guidelines.

Where DNSPs choose to adopt an alternative setting, structure or approach, they shall still be deemed to comply so long as the deviation is set out and justified.

Justification shall include:

- » That the alternative setting is required to respond to a jurisdictional legislative or regulatory requirement and/or
- » That the alternative setting promotes improved benefits to Australia's electricity system (in terms of both network and proponent benefits, risks and costs).

Each deviation shall be listed in a table within the appendix of the DNSPs' technical requirements document, consistent with the format provided in Appendix A: Deviations from the National DER Connection Guidelines.

## Terminology

In these guidelines the following terminology is used:

- » The word *shall* indicates that adopting the setting or approach is mandatory in order for DNSPs to be deemed to comply with these guidelines
- » The word *may* indicates an optional setting or approach that DNSPs shall consider. DNSPs will still be deemed to comply with the guidelines if they do not adopt that setting or approach.
- » The word *should* indicates a setting or approach that DNSPs are recommended to adopt. DNSPs will still be deemed to comply with the guidelines if they do not adopt that setting or approach.

## Relationship to Other Documents

The guidelines are intended to be consistent with and to complement existing legislation and regulations.

To the extent that the application of these guidelines results in any inconsistency between existing legislation and regulations and DNSPs' technical requirements, existing legislation and regulations shall prevail. The implications of any inconsistency on DNSP's ability to comply with these guidelines shall be

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<sup>2</sup> Note that the guidelines still apply to generators who elect to register with AEMO as either a generator or an Integrated Resource Provider operating individual generating units of less than 5MW.

set out within a table of deviations as per Appendix A: Deviations from the National DER Connection Guidelines.

These guidelines are also intended to be consistent with relevant Australian/International Standards and Industry Codes. In some cases, these guidelines require DNSPs to apply additional requirements or additional specificity beyond Australian/International Standards and Industry Codes. Any inconsistency shall be interpreted as deliberate and shall not be used as justification for a deviation.

# Preparing LV EG Connection Technical Requirements

DNSPs shall produce a technical requirements document for LV EG connections that shall follow the structure and content detailed in these guidelines. The DNSP shall include the terms “Low Voltage or LV EG Connection Technical Requirements” in their key search terminology for their technical requirements document. The DNSP document title shall include the terms “*Low Voltage EG Connection Technical Requirements*”. The document title may include other terms where required for consistency with the DNSP’s document classification system.

There may be requirements to rearrange sections in DNSPs document in relation to rotating machines requirements.

## 1 Introduction

This section shall include an introduction to the DNSP’s technical requirements document that provides proponents with an overview of the technical requirements for the equipment and installation of LV EG connections to the DNSP’s LV network.

The introduction shall include:

1. The definition of an LV EG connection, being:

*“an LV EG system with a total system capacity less than or equal to {insert maximum indicative LV network capacity in kVA} for a single-phase or three-phase IES 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. *meeting all other technical requirements set out in this document”*

OR

*“an LV EG system with a total system capacity less than or equal to {insert maximum indicative LV network capacity in kVA} for a single-phase or three-phase rotating machine (synchronous or asynchronous) 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. *meeting all other technical requirements set out in this document”*

2. The purpose of the DNSP’s technical requirements document being:

*“to provide proponents of LV EG connections information about their obligations for connection to and interfacing with the LV distribution network”*

3. An outline of the scope of connections to which the technical requirements document applies, being new connections of LV EG systems or modifications to existing LV EG systems, where the LV EG system consists of IES, ESS or a combination of both, including EVs and EVSE capable of reverse power transfer.

4. An outline of the scope of systems to which the technical requirements document does NOT apply, being:

- a. EG units covered by the DNSP’s Small IES EG Connection Technical Requirements
- b. EG units covered by the DNSP’s MV/HV EG Connection Technical Requirements

- c. Electric vehicles, unless the EV and EVSE are capable of reverse power transfer (in which case the requirements shall apply)
  - d. DER systems that do not generate electricity, including demand response/demand management systems, unless they impact on the ability of the LV EG system to meet the technical requirements
- 5. The general obligations of proponents, including:
  - a. The obligation to comply with the technical requirements as well as relevant national standards, industry codes, legislation and regulations. The instrument that shall prevail in the event of any inconsistency shall be the legislation and regulations, followed by the technical requirements, followed by national standards and industry codes
  - b. The obligation to not connect additional inverters, make modifications or install additional LV EG units, including ESS, without prior written agreement from the DNSP
  - c. The obligation to comply with the DNSP's model connection agreement
  - d. The obligation to meet the requirements in the design, installation and operation of the LV EG system
  - e. The obligation to meet the connection and commissioning requirements to the LV distribution network
- 6. A statement of acknowledgement from the DNSP of their obligations to ensure the safe and reliable operation of the distribution system for operating personnel, customers and the general public
- 7. A statement that the technical requirements conform with the National DER Connection Guidelines for LV EG Connections version 3, ENA DOC 040-2026, with the exception of the deviations presented in Appendix A: Deviations from the National DER Connection Guidelines.

## 2 Definitions and Abbreviations

### 2.1 Definitions

This section shall provide a tabulated list of definitions for any technical or industry terms used throughout the technical requirements document. The definitions should be consistent with the definitions provided within this document, as relevant.

### 2.2 Abbreviations

This section shall provide a tabulated list of all abbreviations used throughout the technical requirements document. The abbreviations shall be consistent with the abbreviations provided within this document, as relevant.

### 2.3 Terminology

DNSPs shall outline how instructional terms are to be interpreted, being:

- 1. The word 'shall' indicates a mandatory requirement
- 2. The word 'may' indicates a requirement that may be mandatory in some circumstances, or a permitted option

3. The word 'should' indicates a recommendation that will not be mandatorily imposed on the proponent.

## 3 Relevant Rules, Regulations, Standards and Codes

### 3.1 Standards and Codes

This section shall provide a list of all relevant Australian and international standards and industry codes which shall apply to the design, manufacture, installation, testing and commissioning, and operation and maintenance of all plant and equipment for LV EG connections to the distribution network in the DNSP's jurisdiction.

This section shall also state that in the event of any inconsistency between Australian and international standards and industry codes and the DNSP technical requirements, the DNSP technical requirements shall prevail.

### 3.2 Legislation and Regulation

This section shall provide a list of all the relevant legislation and regulations which shall apply to the design, manufacture, installation, testing and commissioning, and operations and maintenance of all plant and equipment for LV EG connections to the distribution network in the DNSP's jurisdiction.

This section shall also state that in the event of any inconsistency between legislation and regulations and the DNSP technical requirements, the legislation and regulation shall prevail.

## 4 Technical Requirements

### 4.1 General

This section specifies the detailed technical requirements for LV EG connections. The technical requirements set out in this document shall apply to all subcategories of LV EG system connections. All equipment shall be designed, manufactured, installed and tested in accordance with the requirements of all relevant Statutory Authorities and Acts and the latest relevant Standards and Codes of Practices.

#### 4.1.1 Network Categories

This section shall state the network categories for which different technical settings may apply, being:

1. LV EG IES connection  $\leq 200$  kVA – Any LV EG system, that is not a small IES EG system, with a total system capacity less than or equal to 200 kVA for a single-phase or three-phase IES network connection, meeting all relevant technical requirements for LV EG connections set out in this document. Further subcategorised by:
  - a. Exporting
  - b. Non-exporting

2. LV EG IES connection >200 kVA – Any LV EG system, with a total system capacity greater than 200 kVA for a three-phase IES network connection, meeting all relevant technical requirements for LV EG connections set out in this document. Further subcategorised by:
  - a. Exporting
  - b. Non-exporting
3. LV EG rotating machine connection – Any LV EG rotating machine, that is synchronous or asynchronous, meeting all relevant technical requirements for LV EG connections set out in this document. Further subcategorised by:
  - a. Exporting
  - b. Non-exporting.
4. Non-standard LV EG connection – any LV EG connection that doesn't fall into the above categories or where non-standard requirements may apply, e.g. systems connecting to a non-standard part of the network.

Where:

1. The maximum LV system capacity allowed for connection to the LV network may be specified as an indicative level or range above which the proponent would likely require a connection to the MV/HV networks. Where this is the case, this section shall state that proponents wishing to connect a system at or near this size contact the DNSP to determine whether an LV EG connection is appropriate
2. Exporting systems shall be considered to be LV EG systems operating in parallel with the LV distribution network and exporting electricity either via partial-export or full-export into the LV distribution network, where:
  - a. Partial-export LV EG systems limit the amount of export into the LV distribution network to an agreed export threshold defined in the connection agreement
  - b. Full-export LV EG systems can export into the LV distribution network to the full LV EG nameplate capacity (full AC rating).
3. Non-exporting systems shall be considered to be LV EG systems operating in parallel with the LV distribution network that are not approved to and limited to ensure they cannot export electricity into the LV distribution network.

This section shall also provide contact details in case there is any doubt as to which subcategory applies.

The technical requirements set out in these guidelines should be interpreted as applying to all subcategories of LV EG connections unless otherwise specified.

## 4.2 Labelling and Signage

This section shall specify that the labels and signs on the installation, including cables, shall comply with the relevant rules, regulations, standards and codes listed in Section 3.

In addition, this section may provide further specificity, including but not limited to:

1. Additional descriptors of the generating unit
2. Details as to where within the installation and/or the DNSP's equipment the labelling and signage should be placed.

Any requirements that are additional to those included in the the relevant rules, regulations, standards and codes listed in Section 3 shall be clearly stated as such.

### 4.3 Maximum System Capacity

This section shall specify the maximum system capacity of LV EG connections at the same connection point for each subcategory using a table consistent with the below:

	LV EG IES ≤200 kVA	LV EG IES >200 kVA	LV EG rotating machine
Maximum system capacity	Up to 200 kVA	Determined at time of application by typically no greater than <i>{insert maximum indicative LV network capacity in kVA}</i>	Determined at time of application by typically no greater than <i>{insert maximum indicative LV network capacity in kVA}</i>

Note:

- » For non-standard connection types that have different capacity limits, DNSPs may add additional columns to the table or may specify these using notes below the table

This section shall state that the aggregate of any combination of single-phase inverters shall not exceed the lesser of the main switchboard rating, main switchboard overcurrent protection rating, or 30kVA.

This section shall specify how system capacity is assessed when there are multiple LV generating units at the same connection point.

This section may state other criteria that will be used in assessing the maximum capacity for LV EG IES >200kVA and LV EG rotating machines at a connection point.

This section should include a statement that describes how the capacity in kVA will be assessed for LV EG rotating machines (e.g. in cases where that the maximum output may be less than the rated kVA of the alternator).

Where the DNSP allows it, this section shall state that inverter generation limiting may be used in meeting maximum capacity requirements as specified in section 4.4.1.

#### 4.3.1 Phase Balancing

This section shall include any requirements relating to phase balancing for LV EG, including as a minimum that, in accordance with AS/NZS 4777.1:

1. The output of a multi-phase IES EG system shall be balanced across all phases
2. Where one or more single-phase inverters, or a combination of single-phase and multi-phase inverters, are connected to a multiple-phase connection point, the power imbalance of all IES shall not exceed the limits specified in Appendix C of AS/NZS 4777.1 and (if the DNSP requires it), interlocking may be required as specified in section 4.8.3.

This section shall state that LV EG connections may require phase balance protection as specified in section 4.8.2.2.

## 4.4 DER Control

This section shall specify that LV EG connections require generation control.

### 4.4.1 Site Generation Limit

Where the DNSP adopts a site generation limit and/or allows for the use of inverter generation limiting, this section shall specify that the site generation limits downstream of the connection point of the LV EG connections shall be determined at the time of application.

This section shall also specify those factors that shall be considered in determining the site generation limit, including, but not limited to:

1. Retail and market operations
2. Existing asset ratings
3. Existing power quality at the relevant network location
4. Existing and forecast DER penetration at the relevant network location
5. The extent to which the inverter Generation Limit control function as specified in AS/NZS 4777.2 may be used to meet system capacity and phase balancing requirements for LV IES EG connections, including in the case of hybrid systems comprising both IES and rotating machines
6. Any requirements related to the treatment of aggregated generation capacity
7. Any circumstances where site generation limits may vary, e.g. when systems run in alternative supply mode (in which case this section may reference sections 4.6.2 and 4.6.3 as appropriate).

This section may recommend generation control requirements.

Where the DNSP does not have any site generation limit requirements for LV EG connections, this section shall be retained, but noted as intentionally blank.

### 4.4.2 Export Limits at Connection Point

This section shall specify that the export limits at the connection point of LV EG connections will be assessed as to whether it is required. Where an export limit is required or requested by the proponent, it shall be determined at the time of application.

This section shall also specify those factors that are to be considered in determining the export limit including, but not limited to:

1. Existing asset ratings
2. Existing power quality at the relevant network location
3. Existing and forecast DER penetration at the relevant network location.

This section may also specify that an indicative export limit will be provided at the enquiry stage.

This section shall state that any export limit is to be interpreted as “soft”, consistent with the definition of soft export limits within AS/NZS 4777.1, a limit that will cause the IES or rotating machine to reduce its output, preventing ongoing export greater than the limit.

This section shall state that where multiple inverters are installed behind the connection point, they must be configured so that the connection point export limit requirements are met.

This section shall state that for multi-phase small IES EG connections exports shall be balanced across all phases in accordance with section 4.3.1.

This section shall specify that the export limit is to be interpreted by the proponent as a maximum. The ability of the proponent's LV EG system to export at the export limit is not guaranteed, but rather, it will depend upon network characteristics which change over time. This section shall describe those scenarios where output may need to be constrained, including, but not limited to, power output where power quality response modes are in operation.

This section shall state that the requirements for dynamic / flexible export limits are set out in section 4.4.3 below (if applicable).

This section may recommend generation control requirements.

This section may also state that an estimate of the likelihood of constraints occurring and the impact on the proponent's overall export volumes are to be provided at the time of connection application.

### 4.4.3 DER Management

#### 4.4.3.1 *Advanced DER Management*

Where the DNSP offers dynamic connection or flexible export options for LV EG connections, or has other advanced DER management requirements, these shall be detailed in this section. Any associated requirements for communications, data and/or cyber security shall be included in the relevant sections 4.11, 4.12 and/or 4.13 and those sections referenced here as appropriate.

Where no advanced DER management requirements apply, this section may be omitted.

#### 4.4.3.2 *Emergency DER Management*

Where the DNSP has requirements to support an emergency backstop mechanism they shall be specified in this section. Any associated requirements for communications, data and/or cyber security shall be included in the relevant sections 4.11, 4.12 and/or 4.13 and those sections referenced here as appropriate. Any relevant jurisdictional requirements should also be referenced.

Where no emergency backstop requirements apply, this section may be omitted.

### 4.4.4 Import Limits for ESS

Where the DNSP adopts static or dynamic import limit requirements for ESS, they shall be specified in this section. Any associated requirements for communications, data and/or cyber security shall be included in the relevant sections 4.11, 4.12 and/or 4.13 and those sections referenced here as appropriate.

Where no specific ESS import limit requirements apply, this section may be omitted.

## 4.5 Inverter Energy System

### 4.5.1 General

This section shall state the general requirements that apply to IES, including that:

1. IES shall be tested by an authorised testing laboratory and be certified as being compliant with AS/NZS 4777.2 with an accreditation number

2. IES shall comprise inverters that are registered with the CEC as grid-connect inverters approved for the mode(s) of operation in which they are to be used (alternative supply, supplementary supply, substitute supply or independent supply)
3. IES shall comprise inverters installed in compliance with AS/NZS 4777.1

## 4.5.2 Electric Vehicles

This section shall state that an EVSE and EV shall be considered an IES EG System, where it

- a. is capable of reverse power transfer; and
- b. provides a supplementary or alternative supply to the electrical installation.

This section shall specify that an EVSE and EV that is an IES EG system shall be considered as an ESS for the purpose of these requirements, unless stated otherwise, and shall comply with all applicable requirements.

## 4.5.3 Inverter Power Sharing Device (IPSD)

This section shall specify that an IPSD shall be installed in accordance with AS/NZS 4777.1. Where a DNSP has additional requirements in relation to IPSD that are not included elsewhere they may be included here. IPSD requirements relating to interface protection should be included in section 4.8.2 and a reference included here.

## 4.5.4 Energy Storage Systems (ESS)

This section shall state that an ESS that provides a supplementary or alternative supply to the electrical installation is an IES EG system for the purpose of these requirements.

This section shall include any DNSP-specific requirements relating to ESS that are not included in other sections.

Where no specific ESS requirements apply, this section may be omitted.

## 4.6 Network Connection and Isolation

### 4.6.1 General

This section shall specify that network connection and isolation requirements for IES shall be as per AS/NZS 4777.1 and AS/NZS 3000 for LV EG connections less than or equal to 200 kVA, LV EG IES connections greater than 200 kVA and LV EG rotating machine connections. In addition, this section may provide further specificity, including but not limited to:

1. As a minimum, mechanical isolation shall be as per AS/NZS 3000 in that the isolator must always be readily accessible
2. Any means of isolation (where lockable) shall be able to be locked in the open position only
3. Requirements for multiple mode IES.

Any requirements that are additional to AS/NZS 4777.1 or AS/NSZ 3000 shall be clearly stated as such.

This section shall further specify the network connection and isolation requirements for Rotating machine connections or that they shall be determined by the DNSP in the connection application stage.

## 4.6.2 Backup Power

This section shall specify that an embedded generator that is a multiple mode IES installation in accordance with AS/NZS 4777.1 that provides an alternative supply or independent supply shall be installed in accordance with AS/NZS 4777.1 and shall be certified by the CEC for this mode of operation.

This section shall include any requirements relating to LV EG used for backup power that are not included in the above, including requirements relating to rotating machines.

## 4.6.3 Changeover Switches

This section shall specify any requirements relating to changeover switches for LV IES EG or LV rotating machines, whether manual or automated, and shall include, as a minimum, the following:

1. Any device that transfers supply from the grid supply to an alternative IES EG supply shall comply with the requirements of section 5.3 in AS/NZS 4777.1
2. If an IES meets either of the following criteria it shall be considered to be an IES EG system for the purpose of these requirements:
  - a. An IES 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
  - b. A multiple mode inverter that is grid-connected but also supplies an off-grid circuit.
3. Any LV EG connected behind a break-before-make switch that isolates the changeover circuit when transferring between grid supply to generation supply will be considered as an off-grid system and is not an LV EG for the purpose of these requirements.

If the DNSPs has requirements relating to interlocking, they shall be included in section 4.8.3 and a reference to that section included here.

## 4.7 Earthing

This section shall specify the earthing requirements of the LV EG systems consistent with the below:

1. IES (including EVSE capable of reverse power transfer) less than or equal to 200 kVA have earthing requirements as per AS/NZS 4777.1 and AS/NZS 3000.
2. IES (including EVSE capable of reverse power transfer) greater than 200kVA have earthing requirements as per AS/NZS 4777.1 and AS/NZS 3000.
3. Rotating machine have earthing requirements as per AS/NZS 3000 and AS/NZS 3010 and any requirements which are additional shall be clearly stated as such.
4. Battery ESS (excluding EVSE or EV) have earthing requirements as per AS/NZS 5139 and AS 3011.

## 4.8 Protection

### 4.8.1 Inverter Integrated Protection

This section shall specify that the inverter integrated protection requirements that apply will be as per AS/NZS 4777.1 and AS/NZS 4777.2.

This section shall state the regional settings requirement as per AS/NZS 4777.2 either Australia A, B or C setting.

Where a DNSP has variations to the standard regional setting they shall list the circumstances where changes apply and nominate the parameters and values that apply.

## 4.8.2 Interface Protection

This section shall specify that interface protection requirements that apply will be as per AS/NZS 4777.1 for LV EG IES connections.

This section shall also specify the circumstances in which interface protection is necessary and shall include set points for voltage and frequency parameters in conformance with AS/NZS 4777.1.

This section shall reproduce Table 1 below with further details provided as per sections 4.8.2.1 to 4.8.2.5 of this guideline.

Table 1 Interface protection requirements

Protection Requirements	LV EG IES				LV EG Rotating machine	
	≤200 kVA		>200 kVA		Exporting	Non-Exporting
	Exporting	Non-Exporting	Exporting	Non-Exporting		
Grid reverse power (32R)	x	x	-	-	-	-
Generator circuit Phase balance protection (46/47)	x	x	-	-	✓	✓
Overcurrent facility fault, grid fault and earth fault protection (50/51)	x	x	-	-	✓	✓
Passive anti-islanding protection (27, 59, 81U/O, 81R)	x	x	✓	✓	✓	✓
Inter-tripping	x	x	-	-	-	-

Symbols are used to denote protection requirements, where:

- ✓ Represents that the protection shall be required
- Represents that the protection may be required
- x Represents that the protection shall not be required

This section shall clearly indicate the interface protection requirements that apply for any non-standard connection types (if applicable) and for IPSD connections. This may be by including additional columns in Table 1, the use of notes below the table, or a combination of both.

#### 4.8.2.1 *Grid Reverse Power Protection*

This section shall specify the grid reverse power protection requirements which shall include:

1. That reverse power protection shall be set as low as practicable with consideration of protection relay, CT accuracy and generating system synchronisation characteristics
2. That design of control systems shall minimise reverse power flow immediately following synchronisation.

This section shall specify that the specific settings for grid reverse power protection shall be determined via a connection specific technical study.

#### 4.8.2.2 *Phase Balance Protection*

This section shall state that that phase balance protection may be required as shown in Table 1.

This section shall specify that all rotating machines shall require both current unbalance and voltage unbalance protection.

This section shall state the circumstances in which current unbalance and/or voltage unbalance protection are required for LV IES EG systems and reference sections 4.8.2.2.1 and 4.8.2.2.2 for details as appropriate.

This section shall specify that LV IES EG systems made up of three-phase IES generating units with inverter-integrated phase balance protection are exempt from this requirement.

##### 4.8.2.2.1 *Current Unbalance Protection*

This section shall specify the current unbalance protection requirements at the connection point, where not inverter integrated, for each applicable subcategory. These should include, but not be limited to:

1. Threshold of current unbalance: maximum difference between any of the phase currents and the average value of phase currents (%)
2. Minimum limit of measured current as a percentage of nominal current, from which the current unbalance protection is enabled (%)
3. Delay of current unbalance protection (sec).

Alternatively, this section may specify that the specific settings for current unbalance protection shall be determined via a connection-specific technical study.

Where DNSPs do not adopt this requirement, this section shall state that there are no current unbalance protection requirements.

##### 4.8.2.2.2 *Voltage Unbalance Protection*

This section may specify the voltage unbalance requirements at the connection point, where not inverter integrated, for each applicable subcategory. These should include but not be limited to:

1. Threshold of voltage unbalance, i.e. amplitude asymmetry (%)
2. Undervoltage limit of the positive sequence (%)
3. Overvoltage limit of the negative sequence (%)
4. Delay of the voltage unbalance (amplitude asymmetry) protection (sec)
5. Direction of correct phase rotation (clockwise, counter-clockwise, any).

Alternatively, this section may specify that the specific settings for voltage unbalance protection may be determined via a connection-specific technical study.

Where DNSPs do not adopt this requirement, this section shall state that there are no voltage unbalance protection requirements.

#### **4.8.2.3**     *Overcurrent Facility Fault, Overcurrent Grid Fault and Earth Fault Protection*

This section shall specify that the requirements for overcurrent facility fault, overcurrent grid fault and earth fault protection shall be determined via a connection-specific technical study.

#### **4.8.2.4**     *Passive Anti-islanding Protection*

This section shall state that passive anti-islanding protection is required for LV IES and LV rotating machines.

This section shall state that for LV IES, the settings for under- and over-voltage and under- and over-frequency protection shall be as per the relevant Australia A, B or C region settings defined in AS/NZS 4777.1 and AS/NZS 4777.2.

This section shall include the passive anti-islanding table with set point values as per Table 3.1 in AS/NZS 4777.1. DNSPs may depart from the set point values included in Table 3.1 in AS/NZS 4777.1 but should clearly nominate where this is the case.

This section shall include a separate table with the passive anti-islanding protection settings that apply for LV EG rotating machine connections.

#### **4.8.2.5**     *Inter-Tripping*

This section shall specify the inter-trip protection function(s) and requirements for LV EG connections, if any, as per Table 1.

This section may specify that:

1. For LV EG connections inter-tripping may be required depending on the outcomes of technical studies
2. For LV EG rotating machine non-exporting connections, inter-tripping may not be required provided that minimum import protection is installed
3. Where there is an inter-trip, reverse power protection may not be required.

Where specific requirements are included, these should include:

1. Responsibilities for the set-up and monitoring of the communication link between an EG system (specifically connecting to an interface panel on the customer's site) and the DNSP's data collection system
2. Interface requirements
3. Responsibilities for tripping the circuit breaker upon receiving the inter-trip signal
4. Actions that shall be taken by the DNSP should the communication link fail until such time when the link is restored
5. Responsibilities for including a tripping function of the generating system in the case where the DC supply to the protection scheme is lost.

### 4.8.3 Interlocking

If the DNSP has requirements for interlocking, the requirements, and the circumstances in which they apply, shall be stated here. This may include requirements that apply:

1. when multiple single-phase inverters are connected to more than one phase
2. for interlocking mechanisms associated with changeover switches and installations comprising both IES and rotating machines.

If there are no requirements for interlocking for LV EG connections this section shall be retained, but noted as intentionally blank.

### 4.8.4 Power Factor Control

This section shall specify any circumstances in which power factor control at the connection point is or may be required for LV IES or LV rotating machines.

This section may include requirements for power factor control and/or may state that power factor control requirements will be determined through a technical study.

If there are no requirements for power factor control for LV EG connections this section shall be retained, but noted as intentionally blank.

### 4.8.5 Synchronisation

This section shall specify the automatic synchronising and synchronisation check requirements for LV EG connections where it is intended that parallel operation of a generating unit will occur.

### 4.8.6 Additional Requirements for LV EG Rotating Machines

This section shall specify additional protection functions that may be required for EG rotating machines beyond those specified above to allow for the differences between synchronous and asynchronous generator technology and applications on the LV network.

This section may include a reference to Appendix E: Ride-Through and other Requirements for LV Rotating Machine Protection, containing additional requirements from AEMO's 2025 *DNISP Guideline – Technical Requirements for sub 5 MW DER Connections*.

Where DNSPs do not adopt additional requirements for LV rotating machines, this section shall state that there are no additional protection requirements.

## 4.9 Operating Voltage and Frequency

This section may specify the operating voltage and frequency supply characteristics of the network.

This section shall specify that, for IES, the nominated maximum voltage for sustained operation,  $V_{\text{nom-max}}$ , shall be as per the relevant Australia A, B or C setting specified in AS/NZS 4777.2.

This section shall also specify that, for IES, the maximum allowed voltage rise between the point of supply from the grid and the inverter grid-interactive port shall not exceed 2% of the nominal voltage at the point of supply from the grid and shall be calculated in accordance with AS/NZS 4777.1 and any jurisdictional requirements for voltage rise calculation.

This section may specify any additional operating voltage and frequency requirements, including requirements for rotating machines.

## 4.10 Power Quality

### 4.10.1 Quality of Supply

This section shall specify that the LV EG connections shall comply with the applicable power quality requirements of the AS/NZS 61000 series as well as relevant state-based regulations and licence conditions, including but not limited to:

1. Network voltage control
2. Voltage fluctuations
3. Harmonics
4. Voltage balance.

### 4.10.2 LV EG IES Power Quality Response Modes

This section shall specify either of the following inverter power quality response modes as per AS/NZS 4777.2 as being required:

1. The volt-var and volt-watt response modes specified in clause 3.3.2.2, clause 3.3.2.3 and clause 3.4.3 of AS/NZS 4777.2 shall be enabled. This section shall state the regional setting requirement as per AS/NZS 4777.2 either Australia A, B or C setting and may provide additional specificity for the required response modes consistent with the format in Tables 3.6 and 3.7 of AS/NZS 4777.2.

OR

2. Fixed power factor mode and/or volt-var response modes specified in AS/NZS 4777.2 shall be enabled. Where the DNSP allows use of an alternate reactive power mode of clause 3.3 of AS/NZS 4777.2 then the circumstances and settings that apply shall be stated in this section.

This section shall state that for an ESS inverter the volt-watt and volt-var modes shall be enabled for charging and discharging through the grid-interactive port of the inverter in accordance with AS/NZS 4777.2.

This section may specify that where an additional LV EG unit is being added to a site with an existing LV EG connection that has legacy power quality settings, the DNSP may provide site-specific voltage response mode settings.

This section shall specify whether there are ramping requirements of the IES as per AS/NZS 4777.2, where a site generation limit is applied for generation control.

### 4.10.3 LV EG Rotating Machine Synchronous Power Quality Response

This section shall specify that synchronous LV EG rotating machine connections shall be designed and operated to adequately control real and reactive power output through either of the following power quality response modes:

1. Voltage control mode

OR

2. Fixed power factor mode that shall require achieving a power factor operating window at the connection point of *{insert power factor setting}* lagging and not leading unless otherwise agreed to by the DNSP.

This section shall specify that the power quality response mode and settings shall be determined depending on the outcomes of technical studies.

## 4.11 Communications Systems

This section shall set out the communications systems requirements for LV EG connections as per the subcategories.

### 4.11.1 LV EG IES $\leq 200$ kVA Communications Systems

For LV EG IES systems less than or equal to 200 kVA, where DNSPs have communications systems requirements, this section shall describe the communications systems requirements that proponents should adopt with reference to other requirements.

Where the DNSP does not yet have any communications systems requirements for LV EG connections, this section shall be retained, but noted as intentionally blank.

### 4.11.2 LV EG IES $> 200$ kVA Communications Systems

For LV EG IES systems greater than 200 kVA, this section shall describe the communications systems requirements.

If the communications system requirements for non-exporting systems are different from those for exporting systems, that shall be made clear.

Requirements may include:

1. That continuous monitoring of current per phase, active power flow and reactive power flow shall be required. Monitoring of ESS state of charge may also be required where applicable.
2. The options for communication technology that may be adopted and may include the DNSP's private communications network or third-party networks
3. The responsibilities for the set-up and monitoring of the communication link between the EG system and the DNSP's data collection system
4. The interface signal requirements for digital outputs and analogue outputs from the DNSP to the EG system and digital inputs and analogue inputs required from the EG system to the DNSP
5. The communication signal fail-safe scheme requirements for remote monitoring (telemetry) and control functionality. Details shall include timing and expected outcome (e.g. reduce GDL or cease exporting)
6. The communications equipment DC supply requirements and associated fail-safe schemes
7. Any inter-trip communications requirements (if applicable) and the associated signal fail-safe scheme requirements. These requirements may include details such as availability, integrity monitoring and maximum latency.

### 4.11.3 LV EG Rotating Machine Communications Systems

For LV EG rotating machine systems, this section shall describe any communications systems requirements.

If the communications system requirements for non-exporting systems are different from those for exporting systems, that shall be made clear.

Requirements may include:

1. That continuous monitoring of current per phase, active power flow and reactive power flow shall be required
2. The options for communication technology that may be adopted and may include the DNSP's private communications network or third-party networks
3. The responsibilities for the set-up and monitoring of the communication link between the EG system and the DNSP's data collection system
4. The interface signal requirements for digital outputs and analogue outputs from the DNSP to the EG system and digital inputs and analogue inputs required from the EG system to the DNSP
5. The communication signal fail-safe scheme requirements for remote monitoring (telemetry) and control functionality. Details shall include timing and expected outcome (e.g. reduce GDL or cease exporting)
6. The communications equipment DC supply requirements and associated fail-safe schemes
7. Any inter-trip communications requirements (if applicable) and the associated signal fail-safe scheme requirements. These requirements may include details such as availability, integrity monitoring and maximum latency.

## 4.12 Data and Information

### 4.12.1 Static Data and Information

This section shall specify the static data and information that is required to be provided by the proponent to the DNSP as per Appendix D: Static Data and Information.

This section may specify the format and method for providing static data but shall not impose any additional communications systems requirements.

### 4.12.2 Dynamic Data and Information

This section shall specify the data format and protocol requirements for communicating dynamic data and information between the proponent, the DNSP and any other bodies, which proponents shall adopt where communications systems are in place.

## 4.13 Cybersecurity

This section shall set out the cybersecurity requirements for the subcategories of LV EG connections for which a communication link between the DNSP's data collection system and the LV EG system is required.

Cybersecurity requirements shall include but not be limited to:

1. Ensuring monitoring and communications devices are in lockable enclosures

2. Protection and control from the network systems (firewalls)
3. Privilege settings and password protection
4. Limiting access to only that which is required to monitor the generating unit.

This section may specify the relevant standards and documents relating to cybersecurity (e.g. compliance to Australian Signals Directorate Essential 8 and Federal Government’s Critical Infrastructure Centre for Operational Cyber Security).

Where the DNSP does not yet have any communications systems requirements for any LV EG connections, this section shall be retained, but noted as intentionally blank.

#### 4.14 Technical Studies

This section shall state the technical studies required to be completed as part of the connection application as per Table 2 and as per jurisdictional requirements.

Table 2 Technical studies required for LV EG connections

Technical Studies	LV EG IES				LV EG rotating machine	
	≤200 kVA		>200 kVA		Exporting	Non-Exporting
	Exporting	Non-Exporting	Exporting	Non-Exporting		
Voltage level (incl. power factor)	-	-	✓	-	✓	✓
Power flow	-	-	✓	-	✓	✓
Fault level	-	-	✓	-	✓	✓
Protection grading	-	-	✓	-	✓	✓

Symbols are used to denote technical studies’ requirements, where:

- ✓ Represents that technical studies shall be required
- Represents that technical studies may be required
- ✗ Represents that technical studies shall not be required

This section shall also state which technical studies shall be completed by the DNSP, which technical studies shall be completed by the proponent and which technical studies may be completed by either the proponent or the DNSP.

For each technical study that shall or may be undertaken by the proponent, this section shall state the following and may be presented in a separate schedule or reference document that is to be appropriately linked in this section:

1. The relevant inputs to be provided by the DNSP
2. The outputs required from the proponent
3. The criteria against which the study shall be assessed by the DNSP.

For each technical study that shall or may be undertaken by the DNSP, the DNSP shall outline the following and may present this in a separate schedule or reference document that is to be appropriately linked in this section:

1. The relevant inputs to be provided by the proponent
2. The estimated time and cost to complete the study
3. The outputs provided
4. The criteria against which the study shall be assessed by the DNSP.

This section shall also state that where one or more of the technical studies does not meet the assessment criteria, the DNSP shall provide the proponent with an alternative option which may include:

1. Alternative configurations of the generating systems (e.g. lower generation control limits)
2. Network augmentation (and associated cost of network augmentation).

#### 4.15 Metering

For DNSPs in jurisdictions subject to Chapter 7 of the NER, this section shall either:

1. state that metering requirements are as per Chapter 7 of the NER and not include any other requirements

OR

2. be omitted.

This section may include requirements for jurisdictional metering for DNSPs in jurisdictions which are not subject to Chapter 7 of the NER.

## 5 Fees and Charges

This section shall specify fees and charges applicable to proponents and any jurisdictional requirements including, but not limited to:

1. The types of connection fees that shall be applied
2. Any ongoing charges applicable regarding the installation and operation of the generating unit while maintaining the connection to the distribution network and how these are determined
3. The fees payable and/or how the fees are determined
4. How the fees are to be paid by the proponent.

This section may provide hyperlinked website addresses with short descriptions where information is published separately on the DNSP's website

## 6 Testing and Commissioning

This section shall state the testing and commissioning requirements for LV EG connections as per Table 3 including the requirements that:

1. Testing and commissioning plans shall be produced by the proponent and may be required to be signed off by the DNSP prior to finalising the connection agreement
2. Testing and commissioning acceptance shall be signed off either by a CPEng, RPEQ (in Queensland), a Registered Professional Engineer (in Victoria or the ACT) or by a DNSP-approved suitably qualified person
3. Testing and commissioning acceptance may require the DNSP to carry out witnessing at the DNSP's expense
4. For IES, this section shall specify that testing and commissioning requirements shall be in accordance with AS/NZS 4777.1, AS/NZS 3000 and AS/NZS 5033 (where applicable), the equipment manufacturer's specifications and the DNSP's technical requirements to demonstrate that the LV EG IES system meets the requirements of the connection agreement. This section may further specify that compliance to AS/NZS 3000 and AS/NZS 5033 (where applicable) may be tested by suitably qualified local electrical authorities
5. For rotating machines, this section shall specify that testing and commissioning requirements shall be in accordance with the equipment manufacturer's specifications and the DNSP's technical requirements to demonstrate that the LV EG rotating machine system meets the requirements of the connection agreement. This section shall also specify the technical settings that will be required to be tested, including: protection settings, power quality settings, export limits, communications settings and shutdown procedures.
6. The requirements of static data may need to be updated as part of the testing and commissioning.

Table 3 Testing and commissioning requirements for LV EG connections

Testing and commissioning requirements	LV EG IES				LV EG rotating machine	
	≤200 kVA		>200 kVA		Exporting	Non-Exporting
	Exporting	Non-Exporting	Exporting	Non-Exporting		
Protection settings and performance	✓	✓	✓	✓	✓	✓
Power quality settings and performance	✓	✓	✓	✓	✓	✓
Export limits settings and performance	✓	✓	✓	✓	✓	✓
Communications settings and performance	–	–	✓	–	✓	✓
Shutdown Procedures	✓	✓	✓	✓	✓	✓
Confirm system is as per specifications	✓	✓	✓	✓	✓	✓
Confirm SLD is located on site	✓	✓	✓	✓	✓	✓

Symbols are used to denote testing and commissioning requirements, where:

- ✓ Represents that testing and commissioning shall be required
- Represents that testing and commissioning may be required
- ✗ Represents that testing and commissioning shall not be required

This section shall specify that the tests shall be installation tests not type tests.

## 7 Operations and Maintenance

This section shall state the operations and maintenance requirements for LV EG connections, including that:

1. An operation and maintenance plan shall be produced. DNSP may request copies of the operation and maintenance plan and may negotiate changes. It may be requested no more than annually

2. The LV EG system shall be operated and maintained to ensure compliance with the connection agreement and all legislation, codes, and/or other regulatory instruments at all times
3. The DNSP may inspect the LV EG system at any time at the DNSP's expense.

This section may also describe the general expectations for operating and maintaining the LV EG system, including, but not limited to:

1. Maintaining the electrical installation at the supply address in a safe condition
2. 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
3. Seeking DNSP approval prior to altering the connection in terms of an addition, upgrade, extension, expansion, augmentation or any other kind of alteration, including changing inverter settings
4. How the DNSP proposes to respond to non-complying LV EG systems.

## Appendix A: Deviations from the National DER Connection Guidelines

This appendix shall include a register of all deviations from this technical guideline in the format provided in Table 4 with the title 'Table of deviations from National DER Connection Guidelines for LV EG Connections version 3, ENA DOC 040-2026'.

*Table 4 Table of deviations from National DER Connection Guidelines*

Section	Description of deviation	Type of deviation	Justification
<i>{Section of this technical guideline document to which the deviation applies}</i>	<i>{High level description of the deviation}</i>	<i>{whether the deviation is to meet a jurisdictional requirement or is to promote improved benefits to Australia's electricity system}</i>	<i>Justification {Either N/A where the deviation is to meet a jurisdictional requirement or provides link to justification documentation}</i>

## Appendix B: Connection Arrangement Requirements

This appendix shall include:

1. Single line diagrams of the DNSP's preferred connection arrangements, and a range of other possible connection arrangements for integration of small IES EG connection, showing:
  - a. the connection point
  - b. the point of common coupling
  - c. the EG unit(s)
  - d. load(s)
  - e. meter(s)
  - f. circuit breaker(s)
  - g. isolator(s)
2. A sample schematic diagram of the protection system and control system relevant to the connection of an EG unit to the distribution network, showing the protection system and control system, and including:
  - a. All relevant current circuits
  - b. Relay potential circuits
  - c. Alarm and monitoring circuits
  - d. Back-up systems
  - e. Parameters of protection and control system elements.

## Appendix C: Model Connection Agreement

In jurisdictions subject to Chapter 5 of the National Electricity Rules, this section may include the AER approved model standing offer for any LV EG connections where they exist.

In jurisdictions not subject to Chapter 5 of the National Electricity Rules, and for DNSPs without a model standing offer, this section may include an equivalent document used as the basis to form a connection agreement with proponents of LV EG connections.

The model connection agreement shall be entirely consistent with the technical requirements document.

This section may provide hyperlinked website addresses with short descriptions where information is published separately on the DNSP's website.

## Appendix D: Static Data and Information

This appendix shall include the static data and information that is required to be provided by the proponent to the DNSP, including as a minimum:

1. NMI meter numbers (10 digit)
2. DER Devices
  - a. Fuel source – primary {renewable/biomass/waste; fossil; hydro; geothermal; solar; wave; wind; tidal; storage}
  - b. Fuel source – descriptor {as per appendix 8 of the NEM Generator registration guide}
  - c. Make, model and manufacturer
  - d. Maximum capacity (kW or MW)
  - e. Storage capacity (kWh/MWh of available storage)
  - f. Installer
  - g. Whether the device is registered for ancillary service provision (Y/N)
  - h. Whether the device is part of an aggregated control (Y/N)
  - i. Whether the device is remotely controllable (Y/N)
  - j. Compliance with Australian Standards
3. Inverter
  - a. Make, model and manufacture
  - b. Whether the installer has changed the inverter default manufacturer settings (Y/N)
  - c. Maximum capacity (kW and kVA)
  - d. Date of installation
  - e. Compliance with Australian Standards
4. Inverter enabled modes of operation
  - a. Demand response modes enabled and enablement method
  - b. Power quality modes {power response (frequency control); voltage response (voltage-watt or voltage-var); Q (reactive power), PF (power factor); standalone}
5. Trip settings
  - a. Frequency trip settings {none, over-frequency, under frequency}
  - b. Voltage trip settings {none, over-voltage, under-voltage}

## Appendix E: Ride-Through and other Requirements for LV Rotating Machine Protection [optional]

This appendix is optional. If included, it shall state additional requirements for LV rotating machine protection including, as a minimum, the requirements below based on recommendations in AEMO's 2025 *DNSP Guideline – Technical Requirements for sub 5 MW DER Connections*.

### E.1 Frequency Ride-Through

LV rotating machines shall have frequency ride-through capability, aligned with the requirements of the Frequency Operating Standard worst case as relevant for the region. States not subject to the Frequency Operating Standard should indicate requirements in line with relevant technical rules.

#### Mainland:

- » At frequencies from 49.5 hertz (Hz) to 50.5 Hz, the LV EG shall be capable of remaining in continuous operation.
- » At frequencies from 49.0 Hz to 49.5 Hz and from 50.5 Hz to 51.0 Hz, the LV EG shall be capable of remaining in continuous operation for at least 10 minutes.
- » At frequencies from 47.0 Hz to 49.0 Hz and from 51.0 Hz to 52.0 Hz, the LV EG shall be capable of remaining in continuous operation for at least 2 minutes.

#### Tasmania:

- » At frequencies from 49.0 Hz to 51.0 Hz, the LV EG shall be capable of remaining in continuous operation.
- » At frequencies from 48.0 Hz to 49.0 Hz and from 51.0 Hz to 52.0 Hz, the LV EG shall be capable of remaining in continuous operation for at least 10 minutes.
- » At frequencies from 47.0 Hz to 48.0 Hz and from 52.0 Hz to 55.0 Hz, the LV EG shall be capable of remaining in continuous operation for at least 2 minutes.

### E.2 RoCoF Ride-Through

The LV EG shall be capable of remaining in continuous operation for rate of change of frequency (RoCoF) up to:

#### Mainland:

- »  $\pm 1$  Hz/s over any 500 ms period; and
- »  $\pm 3$  Hz/s over any 300 ms period.

#### Tasmania:

- »  $\pm 3$  Hz/s over any 250 ms.

### E.3 Voltage-Excursion Ride-Through

Performance to be agreed with DNSP based on plant capability with appropriate safety margins.

## E.4 Phase Angle Shift Ride-Through

Performance to be agreed with DNSP based on plant capability with appropriate safety margins.

## E.5 Active Power Curtailment, by Remote Signal

There should be capability at the site to receive a control signal from designated DNSP interface points to (at minimum) disconnect the DER or curtail DER active power to a level specified by the DNSP. Refer to section 4.4.3 for details.

## E.6 Remote Monitoring

See section 4.11.3.

## E.7 Ramp Rate Limit and Permitted Exceptions

The maximum ramp rate for LV rotating machine output should not exceed 20% of maximum generation.

There are situations where a higher ramp rate is supported. The permitted exceptions are as below:

- » When providing contingency or regulation frequency control ancillary services (FCAS)
- » When providing active power response to oppose a significant frequency deviation
- » When net output of a hybrid DER is being controlled at the connection point
- » When operating in an intentional island (and frequency control is required)
- » When operating in accordance with a run-back scheme agreed with the DNSP.

### **Prioritisation of responses**

The prioritisation framework would also apply as adopted from AS/NZS 4777.2:2020. This includes the required responses and the order of activation described below:

- » Level 1: Disturbance withstand
  - The system must be capable of continuous operation during defined voltage and frequency disturbances in accordance with the disturbance withstand capability timeframes specified above – until the duration exceeds time limits of the DNSP's passive anti-islanding settings.
- » Level 2: Automatic disconnection
  - Notwithstanding Level 1, the system may be automatically disconnected from the power system by a local or remote control scheme, initiated by the DNSP under certain abnormal and emergency conditions.
- » Level 3: Generation and/or site-level export limit
  - Limits may be applied by the DNSP on system output or site-level export for local network or power system security.
- » Level 4: Sustained operation for frequency disturbances
  - The system must be capable of sustained operation in accordance with the frequency deviations specified in frequency droop section
- » Level 5: Voltage and reactive power control

- Reactive power support and power factor requirements, in accordance with agreement between the DER operator and the DNSP.
- » Level 6: Power rate limit
  - The maximum ramp rate permitted for this performance requirement, in the transition between different functions and responses, noting the permitted exceptions listed above.

## E.8 Frequency Response (with a Deadband)

An LV rotating machine shall provide a 5% frequency droop response outside a deadband of:

- » 49.5 – 50.5 Hz (Mainland)
- » 49.0 – 51.0 Hz (Tasmania).

A more aggressive frequency response (lower droop and/or narrower deadband) may be agreed with AEMO for the provision of frequency control ancillary services, subject to DNSP endorsement

## E.9 Maximise Ride-Through Capability

Subject to other requirements herein, protection settings must be set to maximise capability to remain in operation beyond ride-through requirements for voltage, frequency and RoCoF, within safe operating limits consistent with good engineering practice.

This has been prepared by Energy Networks Australia for the benefit of its members. A full list of member businesses is available at [www.energynetworks.com.au/ena-members](http://www.energynetworks.com.au/ena-members)

Energy Networks Association Limited  
Trading as Energy Networks Australia  
ABN 75 106 735 406

Level 33, 385 Bourke Street  
Melbourne VIC 3000

T: +61 3 9103 0400  
E: [info@energynetworks.com.au](mailto:info@energynetworks.com.au)  
W: [www.energynetworks.com.au](http://www.energynetworks.com.au)

