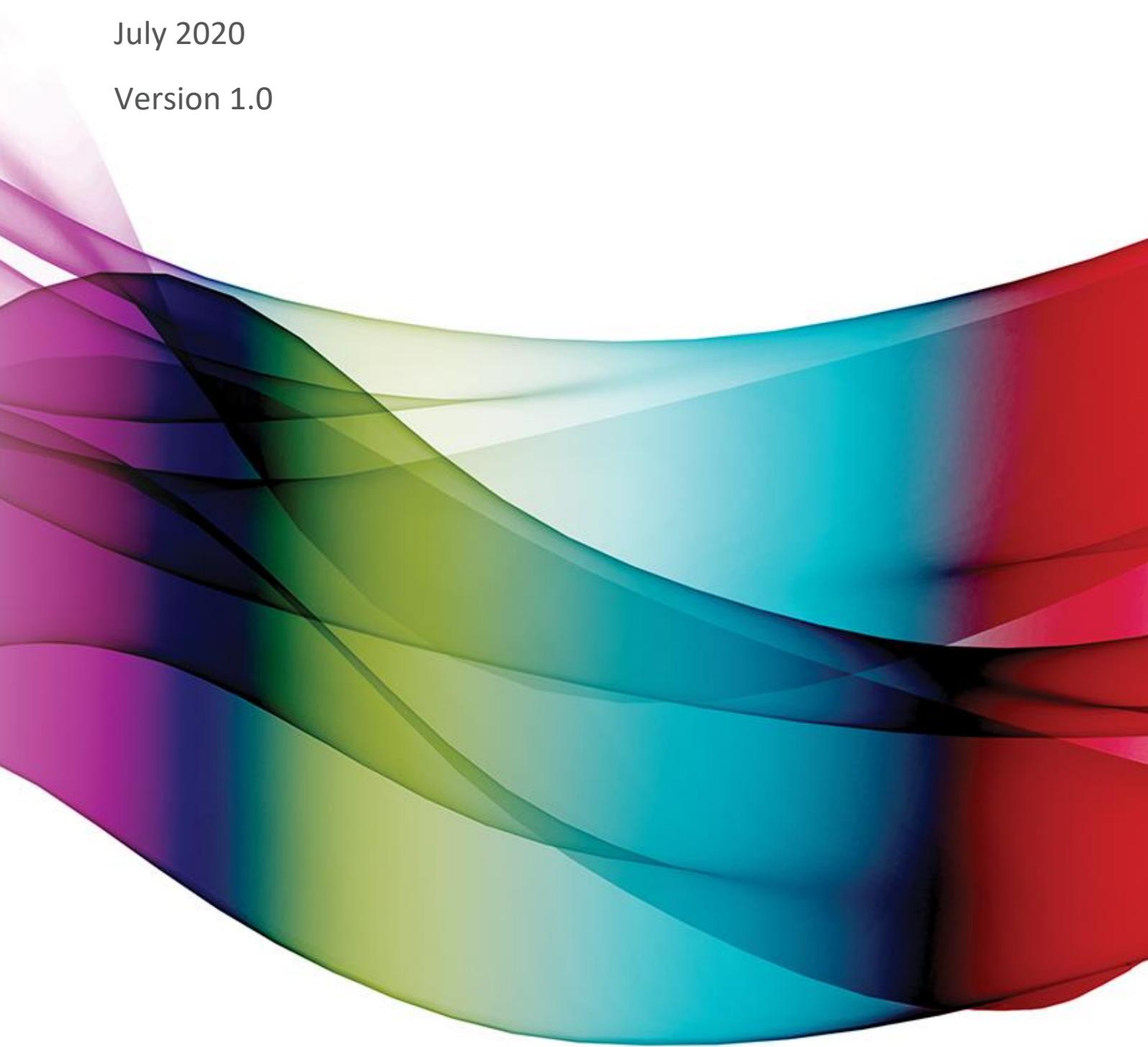


# Basic Micro EG Connection Technical Requirements

July 2020

Version 1.0



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

Please note that approval from us to connect a micro generating system to our distribution network is only an acknowledgement that the embedded generating system is suitable to be connected to our distribution network at the location requested at the time of your application. Our approval does not in any way indicate, guarantee, or approve that customers are or will be eligible to receive payments, credits or other forms of entitlements from any government or retailer sponsored energy feed-in rebate schemes. Customer eligibility should be determined with the relevant agencies responsible for the payment or provision of such entitlements.

## Revisions

We may amend and expand these requirements from time to time where it may be necessary to meet the requirements of the applicable regulations and to suit the needs of our distribution network.

An updated revision of this guideline is expected to be released in 2021.



# 1 Introduction

Tasmanian Networks Pty Ltd ABN 24 167 357 299 (**TasNetworks**) is a state government owned network service provider.

The installation of a basic micro Embedded Generating (**EG**) system at a premises provides the opportunity for customers to reduce their electricity charges through reduced consumption of electricity from the network. The basic micro EG system may also enable customers to export electricity to the network if the output of their generating system exceeds their consumption.

The purpose of this technical requirements document is to provide TasNetworks' customers and the designers, consultants and installers of basic micro EG systems information about their obligations for connection to and interfacing with the Low Voltage (**LV**) distribution network.

A basic micro EG connection is a micro EG system with a total system capacity less than or equal to 10 kVA per phase excluding any Energy Storage System (**ESS**) capacity<sup>1</sup> that:

- intend to be connected to and capable of operating in parallel with any part of the LV distribution network,
- involve minimal or no augmentation of the distribution network, and
- meet all other technical requirements set out in this document.

The technical requirements contained in this document come into effect on 1 January 2021.

## 1.1 Scope

This technical requirements document applies to:

- new connections of basic micro EG systems, or
- modifications made to existing basic micro EG systems, where the basic micro EG system consists of IES, ESS or a combination of both.

This technical requirements document does NOT apply to:

- EG units covered by TasNetworks' LV EG Connection Technical Requirements,
- EG units covered by TasNetworks' MV/HV EG Connection Technical Requirements, nor
- Electric vehicles, unless the on-board battery storage system is capable of exporting to the LV network (in which case the requirements shall apply).

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<sup>1</sup> Note that ESS are permitted within Basic Micro EG connections. However the ESS capacity is not included in the total system capacity definition of the Basic Micro EG connection



## 1.2 Proponent Responsibilities

Proponents of basic micro EG systems are obliged to:

- a. Comply with these technical requirements as well as relevant national standards, industry codes, legislation and regulations. In the event of inconsistency, legislation and regulations shall prevail, followed by the technical requirements, followed by national standards and industry codes.
- b. Not to connect additional inverters, make modifications or install additional micro EG units, including ESS, without prior written agreement from TasNetworks.
- c. Comply with the TasNetworks' model standing offer<sup>2</sup>.
- d. To meet the above requirements in the design, installation and operation of the basic micro EG system.

## 1.3 TasNetworks Responsibilities

TasNetworks acknowledges its obligation to ensure the safe and reliable operation of the distribution system for operating personnel, customers and the general public.

These technical requirements comply with the National DER Connection Guidelines for Basic Micro EG Connections<sup>3</sup>, with the exception of the deviations presented in Appendix A: Deviations from the National DER Connection Guidelines.

## 1.4 Responsibilities of Designers, Consultants and Installers

As stated in Section 1 above, the content of this document is also relevant to the designers, consultants and installers of Basic Micro EG systems. It is expected that many Proponents will engage designers, consultants and installers to assist them to install Basic Micro EG systems, which includes meeting the technical requirements set out in this document.

TasNetworks also notes that designers, consultants and installers of Basic Micro EG systems, as people who work on electrical installations, may have other obligations and licensing requirements that they must meet under law in relation to electrical works. This document only sets out TasNetworks' technical requirements for the Basic Micro EG system – it is not a comprehensive guide to all legal and technical requirements for electrical work in respect of the system.

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<sup>2</sup> TasNetworks' Model Standing Offer can be found on the [Contracts and policies](#) page of TasNetworks' website.

<sup>3</sup> The National DER Connection Guidelines for Basic Micro EG Connections can be viewed on the [Energy Networks Australia website](#).



## 2 Definitions and Abbreviations

### 2.1 Definitions

Basic micro embedded generation connection	A connection between a distribution network and a retail customer's premises for a micro embedded generating unit, for which a model standing offer is in place or an equivalent model offer is in place in jurisdictions not subject to Chapter 5A of the National Electricity Rules.
Central protection	Central protection is the protection contemplated by AS/NZS 4777 (grid connection of energy systems via inverters) installed to perform the functions of: coordinating multiple inverter energy system installations at one site, providing protection for the entire inverter energy system installation and islanding protection to the connected grid as well as preserving safety of grid personnel and the general public.
Connection point (this may also sometimes be referred to as the "Point of Supply")	Connection point is the agreed point of supply between TasNetworks' distribution network and an electrical installation.
Distributed Energy Resources (DER)	Power generation or storage units that are connected directly to the distribution network.
Embedded generating unit	A generating unit connected within a distribution network and not having direct access to the transmission network.
Embedded generating system	A system comprising of multiple embedded generating units.
Energy storage system (ESS)	A system comprising one or more batteries that store electricity generated by distributed energy resources or directly from the network, and that can discharge the electricity to loads.



Generating unit	The plant used in the production of electricity and all related equipment essential to its functioning as a single entity.
Generation	The production of electrical power by converting another form of energy in a generating unit.
Generator	A person who owns, operates or controls a generating unit.
Inverter energy system	A system comprising one or more inverters that convert direct current to alternating current.
Low voltage	The mains voltages as most commonly used in any given network by domestic and light industrial and commercial consumers (230V line-neutral or 400 V line-line).
Medium voltage/ High voltage	Any voltage greater than 1 kV.
Micro embedded generation connection	Means a connection between an embedded generating unit and a distribution network of the kind contemplated by Australian Standard AS 4777 (Grid connection of energy systems via inverters) currently up to 200kVA.
Market generating unit	A generating unit whose generation is not purchased in its entirety by a retailer (and receives payment for generation through the National Electricity Market or Wholesale Electricity Market).
Model standing offer	A document approved by the Australian Energy Regulator as a model standing offer to provide basic micro embedded generation connection services or standard connection services which contains (amongst other things) the safety and technical requirements to be complied with by the proponent. This definition also applies to an equivalent model offer for jurisdictions not subject to Chapter 5A of the National Electricity Rules.



Proponent	A person proposing to become a generator (the relevant owner, operator or controller of the generating unit (or their agent)).
Site generation limit	The generation threshold that the embedded generation system cannot exceed, measured downstream of the connection point.
Small generation aggregator	A person who has classified one or more small generating units as a market generating unit.
Small registered generator	A generator who elects to register a generator with the Australian Energy Market Operator as a market generating unit who would otherwise be entitled to an exemption to register based on size.
Standard connection	A connection service (other than a basic micro embedded generation connection service) for a particular class (or sub-class) of connection applicant and for which an Australian Energy Regulator approved model standing offer is in place or for which an equivalent model offer is in place in jurisdictions not subject to Chapter 5A of the National Electricity Rules.
Single Wire Earth Return	Parts of the electrical distribution network that use a single live conductor to supply single-phase or split-phase electric power with higher network impedances, and with distribution supplying low voltages to premises.
TasNetworks	Reference to TasNetworks, us, we or our in these requirements is a reference to TasNetworks in its capacity as the owner and operator of the regulated distribution network in Tasmania, unless an alternative meaning is explicitly given in the text.



## 2.2 Abbreviations

<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
<b>EG</b>	Embedded Generation or Embedded Generating
<b>ESS</b>	Energy Storage System
<b>HV</b>	High Voltage
<b>IEC</b>	International Electrotechnical Commission
<b>IES</b>	Inverter Energy System
<b>LV</b>	Low Voltage
<b>MV</b>	Medium Voltage
<b>NEM</b>	National Electricity Market
<b>NER</b>	National Electricity Rules
<b>NMI</b>	National Metering Identifier
<b>PV</b>	Photovoltaic
<b>SWER</b>	Single Wire Earth Return



## 2.3 Terminology

The following instructional terms are to be interpreted as follows:

1. The word '**shall**' indicates a mandatory requirement
2. The word '**may**' indicates a requirement that may be mandatorily imposed on the proponent
3. The word '**should**' indicates a recommendation that will not be mandatorily imposed on the proponent.

### 2.3.1 Subcategories

The following subcategories apply for basic micro EG connections:

1. **Single-phase basic micro EG connection** – Any basic micro EG system with a system capacity less than or equal to 10 kVA for a single-phase IES (excluding ESS) network connection meeting all technical requirements for basic micro EG connections set out in this document.
2. **Three-phase basic micro EG connection** – Any basic micro EG system with a system capacity less than or equal to 30 kVA for a three-phase IES (excluding ESS) network connection meeting all technical requirements for basic micro EG connections set out in this document.
3. **Non-standard basic micro EG connection** – Any basic micro EG system connecting to a non-standard part of the network including (but not limited to) SWER networks, constrained, isolated or weak network locations.

TasNetworks will determine whether a non-standard basic micro EG connection applies during the connection application process.

For all enquiries relating to network connections please contact:

[newsupply.applications@tasnetworks.com.au](mailto:newsupply.applications@tasnetworks.com.au)

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



## 3 Relevant Rules, Regulations, Standards and Codes

### 3.1 Standards and Codes

The following Australian and international standards and industry codes shall apply to the design, manufacture, installation, testing and commissioning, and operation and maintenance of all plant and equipment for basic micro EG connections to TasNetworks' distribution network:

AS/NZS 4777.1	Grid connection of energy systems via inverters Part 1: Installation requirements
AS/NZS 4777.2	Grid connection of energy systems via inverters Part 2: Inverter requirements
AS/NZS 3000	Electrical Installations (Wiring Rules)
AS/NZS 5139	Electrical Installations – Safety of battery systems for use with power conversion equipment
AS/NZS 5033	Installation and safety requirements for photovoltaic (PV) arrays
AS/NZS 61000	Electromagnetic Compatibility
AS/NZS 2373	Electric Cables
AS/NZS 3010	Electrical Installations – Generating sets
AS/NZS 3008	Electrical installations - Selection of cables - Cables for alternating voltages up to and including 0.6/1 kV
AS 60038	Standard Voltages
AS 2184	Low voltage switchgear and control gear

#### TasNetworks Service and Installation Rules

In the event of any inconsistency between Australian and international standards and industry codes and TasNetworks' technical requirements, TasNetworks' technical requirements shall prevail.



## 3.2 Legislation and Regulation

The following legislation and regulations shall apply to the technical requirements for design, manufacture, installation, testing and commissioning, and operations and maintenance of all plant and equipment for basic micro EG connections to the distribution network:

- National Electricity Rules
- National Electricity (Tasmania) Law
- Electricity Supply Industry Act 1995
- Tasmanian Electricity Code

In the event of any inconsistency between legislation and regulations and TasNetworks' technical requirements, the legislation and regulation shall prevail.

As noted in section 1.4, other legislation also applies in relation to licensing and performance of electrical work, such as the Occupational Licensing Act 2005 (Tas) and regulations. This document deals only with the technical requirements of the basic micro EG system itself.



## 4 Technical Requirements

TasNetworks may request a different performance from a micro embedded generator in some circumstances. This could be as part of a request for network support.

### 4.1 Labelling and Signage

The labels and signs on the installation, including cables, shall be as per AS/NZS 4777.1, AS/NZS 3000, AS/NZS 5033 and AS/NZS5139 (if applicable).

### 4.2 Maximum System Capacity

The maximum system capacity of basic micro EG connections for each subcategory is as follows:

- 1 **Single-phase basic micro EG connection** – For single-phase basic micro EG connections of IES (excluding ESS), the maximum system capacity shall be 10 kVA.
- 2 **Three-phase basic micro EG connection** – For three-phase basic micro EG connections of IES (excluding ESS), the maximum system capacity at the same connection point shall be 10 kVA per phase.
- 3 **Non-standard basic micro EG connection** – For non-standard network basic micro EG connections, the maximum system capacity will be determined during the connection technical study.

TasNetworks accepts that the system capacity is effectively limited by the capacity of the inverter, and that the capacity of the energy source (PV array size for e.g.) is permitted to be larger than the inverter output rating.

The system capacity for basic micro EG connections on different strata titles, but at the same network connection point (e.g. retirement villages), will be defined by the capacity at the connection point.



## 4.3 Generation Control

Basic micro EG connections require generation control.

### 4.3.1 Export Limits at Connection Point

Export limits for basic micro EG connections are as follows:

- 1 **Single-phase basic micro EG connection** – For single-phase basic micro EG connections of IES, the export limit shall be set to equal 10 kW at the connection point (including ESS).
- 2 **Three-phase basic micro EG connection** – For three-phase basic micro EG connections of IES, the export limit shall be set to equal 10 kW per phase (including ESS) with a balanced output with respect to its rating and a tolerance of no more than 5 kVA unbalance between any phases as per AS/NZS 4777.1 at the connection point
- 3 **Non-standard basic micro EG connection** – For non-standard basic micro EG connections, a lower export limit than points 1 and 2 above will be determined by TasNetworks following the outcome of a technical study. Details of this assessment can be found in Section 4.14.

The export limit is to be interpreted as “soft”, consistent with the definition of soft export limits within AS/NZS 4777.1.

TasNetworks will accept that an export limit is effectively established where the system capacity of a basic micro EG including ESS is less than the required export limit.

The export limit is to be interpreted by the proponent as a maximum. The ability of the proponent’s basic micro EG system to export at the export limit is not guaranteed, but rather, it will depend upon network characteristics which change over time. The output may need to be constrained in scenarios including, but not limited to times that power quality response modes are in operation.

### 4.3.2 Site Generation Limit Downstream of Connection Point

This section is intentionally blank – TasNetworks does not consider site generation limits downstream of a connection point.



## 4.4 Inverter Energy System

All basic micro EG systems must be connected with an Inverter Energy System (IES). The IES must meet the following requirements:

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 of inverters that are registered with CEC as approved grid connect inverters.
3. IES shall comprise of inverters that are tested by an authorised testing laboratory and certified as being compliant with IEC 62116 for active anti-islanding protection as per AS/NZS4777.2.
4. IES shall comprise of inverters installed in compliance with AS/NZS 4777.1.
5. IES shall comprise of inverters that have both volt-var and volt-watt response modes available.

## 4.5 Network Connection and Isolation

Network connection and Isolation shall be in accordance with the requirements contained within the relevant Standards. These standards include, but are not limited to:

- 1 Network connection and isolation requirements as per AS/NZS 4777.1.
- 2 Mechanical isolation as per AS/NZS 3000 noting that that the isolator must always be readily accessible by TasNetworks.

## 4.6 Earthing

The earthing requirements shall be in accordance with the requirements contained within the relevant Standards. These standards include, but are not limited to: :

1. For IES, AS/NZS 4777.1 and AS/NZS 3000.
2. For ESS, AS 3011.
3. For PV systems, AS/NZS 5033.



## 4.7 Protection

Protection requirements for basic micro EG shall be as per AS/NZS 4777.2.

### 4.7.1 Inverter Integrated Protection

Inverter integrated protection requirements shall be as per AS/NZS 4777.1 and AS/NZS 4777.2 for basic micro EG connections.

Passive anti-islanding functions shall be set according to the settings in Table 1 below. Items marked (\*) have departed from the default values in AS/NZS 4777.2.

Active anti-islanding protection is required as per AS/NZS 4777.2.

Protective function	Protective function limit	Time delay	Maximum disconnection time
Under-voltage (V<)	180 V <sub>rms</sub>	1 s	2 s
Over-voltage 1 (V>)	260 V <sub>rms</sub>	1 s	2 s
Over-voltage 2 (V>>)	265 V <sub>rms</sub>	-	0.2 s
Under-frequency(f<)	47.0 Hz	1 s	2 s
Over-frequency (f>)	53.0 Hz *	-	0.2 s

Table 1: Mandatory passive anti-islanding settings.

### 4.7.2 Central Protection

Additional central protection is required as per the conditions in Table 2.

Maximum System Capacity	IES ≤ 10 kVA	IES ≤ 5 kVA per phase	IES ≥ 5 kVA per phase
Connection Type	Single-phase	Two-phase or three-phase	Two-phase or three-phase
Protection requirement for all systems	Inverter integrated protection according to AS/NZS 4777.2		
Additional central protection	None	None	Phase balance protection (refer to AS/NZS 4777.1) where not inverter integrated according to AS/NZS 4777.2 (for e.g. if single phase inverters are used.)

Table 2: Requirements for central protection in basic micro EG installations



### 4.7.3 Interlocking

Where multiple single-phase inverters are connected to more than one phase, single-phase inverters are to be interlocked and configured to operate as an integrated multi-phase inverter providing a balanced output that is no more than 5 kW between any phases as per AS/NZS 4777.1.

## 4.8 Operating Voltage and Frequency

The operating voltage and frequency requirements can be found within section 4.7.1 Inverter Integrated Protection.

The long-term over voltage trip setting  $V_{nom\_max}$  shall be set as per AS/NZS 4777.2 to the value in Table 3.

Reference	Voltage
Long-term over voltage trip ( $V_{nom\_max}$ )	255 V

Table 3: Steady state voltage variation setting

The voltage rise between the connection point and the IES terminals must be considered and limited as per Section 3.3.3 of AS/NZS 4777.1.

Further to the Passive Anti-Islanding Setting specified in Section 4.7.1, embedded generating units must not disconnect from the distribution network, due to frequency disturbances, while the power system frequency remains above 47.0 Hz and below 53.0 Hz.

All basic micro EG systems must provide a response to a decrease in grid frequency (as per section 7.5.3.2 AS/NZS 4777.2) and ESS must provide a response to an increase in frequency (as per section 7.5.3.1 of AS/NZS 4777.2). The settings for these responses are listed in Table 4.

Reference	Setting
Over frequency setting for cease of generation ( $f_{stop}$ )	52 Hz
Under frequency setting for cease of charging ( $f_{stop-CH}$ )	48 Hz

Table 4: Over frequency and under frequency settings for response to disturbances

## 4.9 Metering

Import / export metering is required for basic micro EG connections, as per Chapter 7 of the NER.

Additional requirements apply to all revenue metering work within Tasmania, as described in the document 'Electricity Consumption Metering Safety Requirements', published by the Tasmanian Government Department of Justice<sup>4</sup>.

<sup>4</sup> This document can be found on the [Tasmanian Consumer, Building and Occupational Services' website](#)



## 4.10 Power Quality

### 4.10.1 IES Power Quality Response Modes (Mandatory)

From 1 July 2020 the following power quality response mode settings must be enabled in all new and replacement basic micro EG systems:

1. Volt-watt response (as per AS4777.2)
2. Volt-var response (as per AS4777.2)

The settings for these response modes in Table 5 and Table 6 must be used:

Reference	Reference voltage (V)	Var % of rated VA	Power factor
V1	207	44%	0.9 leading
V2	220	0%	1
V3	240	0%	1
V4	258	60%	0.8 lagging

Table 5: Mandatory volt-var response mode settings

Reference	Voltage (V)	Power (% of rated power)
V1	207	100%
V2	220	100%
V3	253	100%
V4	260	20%

Table 6: Mandatory volt-watt response mode settings

Settings must be programmed into each inverter and protected from unauthorised changes as per section 6.5 of AS/NZS 4777.2.

The following limitations apply where an additional basic micro EG unit is added to a site with an existing basic micro EG connection:

1. Inverters installed prior to 1 January 2021 may be updated to the response mode settings in this document during an upgrade to a basic micro EG system.
2. Inverters that are replaced after 1 January 2021 must be configured with the volt-watt and volt-var response mode settings in this document, unless an inverter is replaced under warranty and the manufacturer recommended replacement is not capable of these modes.
3. TasNetworks may provide site-specific voltage response mode settings for pre-existing inverters that have legacy power quality settings if these are deemed necessary at the time of connection.



## 4.11 Communications Systems

This section is intentionally blank.

## 4.12 Data and Information

### 4.12.1 Static Data and Information

The static data and information listed in Appendix D must be submitted by the proponent in their connection application.

### 4.12.2 Dynamic Data and Information

This section is intentionally blank.

## 4.13 Cybersecurity

This section is intentionally blank.

## 4.14 Technical Studies

TasNetworks will perform some form of technical study for every basic micro EG connection application. The results of the technical study will determine if a new connection will be considered as a 'non-standard basic micro EG connection'. Non-standard basic micro EG connections will be provided with a site-specific export limit.

Specific circumstances to be considered in the Technical studies include:

- 1 The capability of the LV network,
- 2 Voltage regulation,
- 3 Voltage balance,
- 4 Fault level, and
- 5 The capability of the local distribution substation.

No technical studies are required to be carried out by the proponent or at the proponent's expense to enable connection to the distribution network.

## 5 Fees and Charges

Fees and charges for basic micro EG connections are available on the [Fees page of our website](#) or through our [Distribution Connection Pricing Policy](#).



## 6 Testing and Commissioning

Testing and commissioning shall be undertaken in accordance with AS/NZS 4777.1, AS/NZS 3000 and AS/NZS 5033 (where applicable) and the equipment manufacturer's specifications to demonstrate that the basic micro EG system meets the requirements of the connection agreement.

These tests shall be installation tests and not type tests.

## 7 Operations and Maintenance

Basic micro EG systems should be operated and maintained to ensure compliance with the connection agreement and all legislation, codes, and/or other regulatory instruments at all times.

TasNetworks may inspect basic micro EG systems at any time at TasNetworks' expense.

It is generally expected that operation and maintenance of basic micro EG systems will include, but is 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 Proponent holds a Certificate of Compliance issued in respect to any of the changes.
- 3 Seeking TasNetworks' 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.



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

Section	Description of deviation	Type of deviation	Justification
2.3.1 Subcategories	The 'non-standard basic micro EG connection' subcategory is not defined by geographic location, but based on the outcome of a technical study.	Promote improved benefits to Australia's electricity system	In order to safely allow larger export limits in our network, TasNetworks will continue to assess each connection application and determine if there is suitable network capacity to accommodate the proposed connection.  This approach maximises the connection of EG possible to our network.
4.3.1 Export Limits	The export limit has been set to 10 kW instead of the recommended 5 kVA	Promote improved benefits to Australia's electricity system	Following consultation with industry, TasNetworks has elected to retain the export limit of 10 kW for new connections until such time that technical studies can demonstrate an appropriate and fair apportionment of existing capacity. This may be revised in the next revision of this document. The units of kW have been specified for consistency with the requirement for power quality response modes.
4.7.2 Central Protection	Updated Table 1 of AS/NZS 4777.1 to align with 10 kW export limit possible single phase.	Promote improved benefits to Australia's electricity system	See discussion of 4.3.1
4.14 Technical studies	Removed statement that technical studies will not change the technical requirements for a connection	Promote improved benefits to Australia's electricity system	See discussion of 2.3.1.



## 9 Appendix B: Connection Arrangement Requirements

Sample single line diagrams are provided below.

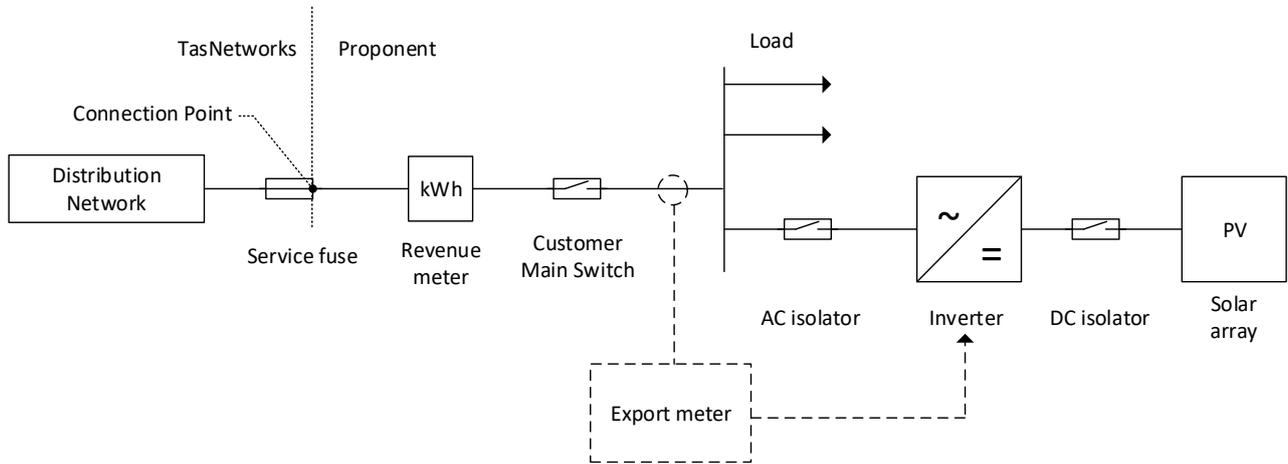


Figure 1: Single line diagram for a solar inverter connection. A meter for export limiting if required is shown dashed.

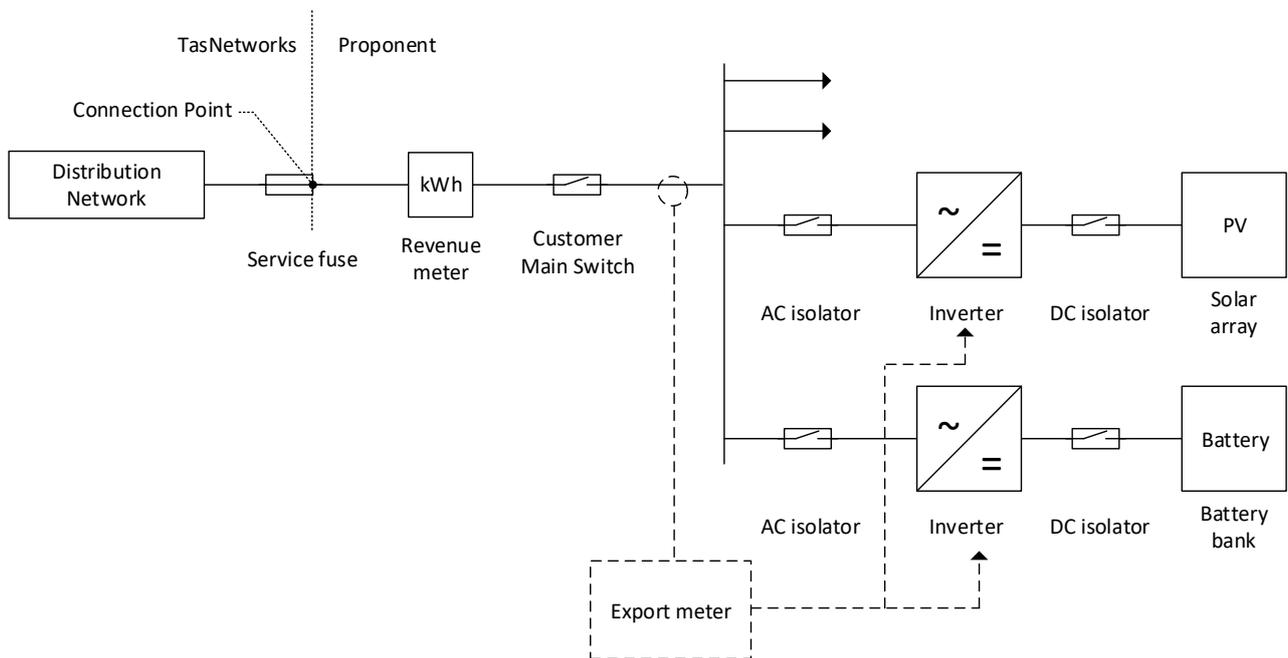


Figure 2: Single line diagram for EG and AC coupled ESS. A meter for export limiting if required is shown dashed.



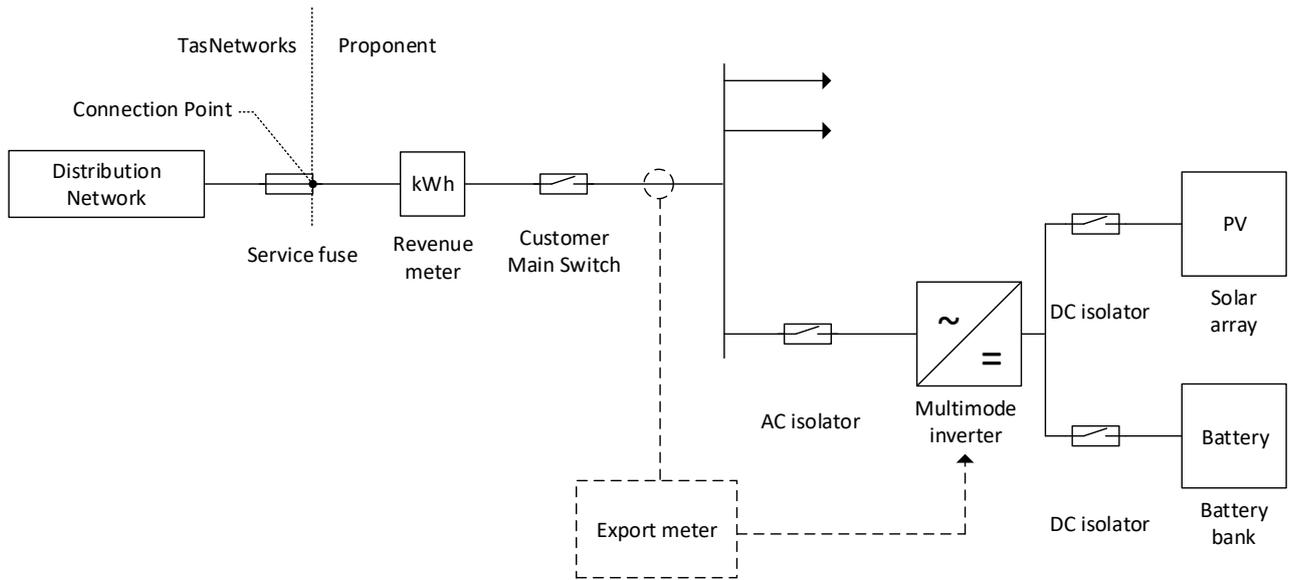


Figure 3 Single line diagram for EG and DC coupled ESS. A meter for export limiting if required is shown dashed.

## 10 Appendix C: Model Standing Offer - Electricity Supply Contract (Deemed)

TasNetworks' Electricity Supply Contract (Deemed) can be found on our website on our [Contracts and policies](#) page.



## 11 Appendix D: Static Data and Information

- 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) Battery maximum rated output (Amps or kW)
  - g) Installer
  - h) Compliance with Australian Standards
- 3) Inverter
  - a) Make, model and manufacture
  - b) Whether the installer has implemented over-frequency protection trip setting of 53 Hz (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}



## 12 Appendix E: Summary of Mandatory Inverter Settings

### Passive anti-islanding

Protective function	Protective function limit	Time delay	Maximum disconnection time
Undervoltage (V<)	180 V <sub>rms</sub>	1 s	2 s
Overvoltage 1 (V>)	260 V <sub>rms</sub>	1 s	2 s
Overvoltage 2 (V>>)	265 V <sub>rms</sub>	-	0.2 s
Under-frequency(f<)	47.0 Hz	1 s	2 s
Over-frequency (f>)	53.0 Hz	-	0.2 s

### Volt-var response mode

Reference	Reference voltage (V)	Var % of rated VA	Power factor
V1	207	44%	0.9 leading
V2	220	0%	1
V3	240	0%	1
V4	258	60%	0.8 lagging

### Volt-watt response mode

Reference	Voltage (V)	Power (% of rated power)
V1	207	100%
V2	220	100%
V3	253	100%
V4	260	20%

### Other settings

Reference	Setting
Long-term over voltage trip (V <sub>nom-max</sub> )	255 V
Over frequency setting for cease of generation (f <sub>stop</sub> )	52 Hz
Under frequency setting for cease of charging (f <sub>stop-CH</sub> )	48 Hz

