STNW3514

Standard for Small IES Connections to Isolated Networks

Effective from 1 October 2025

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Abstract: This Standard has been prepared by Ergon Energy Network to provide Proponents of Fixed or Dynamic Small IES connecting to Isolated Networks with information about their rights and obligations in respect of connecting to, and interfacing with, the Ergon Energy Network Isolated System. Ergon Network as a Queensland DNSP has an inherent obligation to ensure that Small IES do not cause a material degradation in the quality of supply to other network users and do not adversely affect the operation of the Isolated Network.

Keywords: inverter, solar, connection, photovoltaic, wind, energy storage system, export, low voltage, LV, PV, Micro EG, Small ESS, Small IES, IES, Isolated Networks, Isolated Systems

CONTENTS

1 Introduction

1.1 Purpose

The purpose of this Standard is to provide Proponents of Small IES (less than or equal to 30 kVA) connecting to Isolated Networks with information about their obligations in respect of connecting to, and interfacing with Ergon Energy Network's Isolated Network. This Standard has been developed to ensure safe and stable Parallel operation[1] of Small IES Units connected to the DNSP's network at the Premises.

1.2 Scope

This Standard applies to new connections and connection alterations of any Small IES with a total system capacity less than or equal to 30 kVA that is:

- intended to be connected to, and capable of operating in Parallel with, any part of the LV portion of an Isolated Network; and
- if the Proponent is seeking connection of a Dynamic Small IES that it is capable of responding to Dynamic Operating Envelopes set by the DNSP.

This Standard does not apply to:

- electric vehicles, unless the electric vehicle supply equipment (EVSE) is capable of supplying electricity to the LV portion of an Isolated Network or electrical installation (in which case the requirements shall apply);
- DER systems that do not generate electricity, unless they impact on the ability of the Small IES to meet the technical requirements;
- back-up generation that does not operate in Parallel with the Isolated Network; or
- EG Systems covered by the following Ergon Network connection standards:

Standard Number	Title
STNW1170	Standard for Small IES Connections - 2970697
STNW1174	Standard for LV EG Connections - 27939029
STNW1175	Standard for HV EG Connections
STNW3510	Dynamic Standard for Small IES Connections - 3403035
STNW3511	Dynamic Standard for LV EG Connections
STNW3515	Standard for LV EG Connections to Isolated Networks - 27939029

[1] Section 225 of the *Electrical Safety Regulation 2013* requires that any person who has generating plant must comply with the DNSP's conditions for ensuring safe and stable Parallel operation of the private generating plant with the works of the electricity entity.

The technical requirements in this Standard comply with the framework of the National DER Grid Connection Guidelines for Small IES EG Connections as published by the Energy Networks Association (ENA) to the greatest extent possible; the ENA guidelines do not contemplate dynamic connections, Output Smoothing or Isolated Networks.

1.3 Obligation of Proponents

Proponents shall:

a. obtain the consent from the DNSP before interconnecting their Small IES Unit with the Isolated Network.
b. ensure that the proposed Small IES Unit equipment and installation complies with the relevant Energy Laws, including any applicable standards, codes and guidelines.
c. comply with this Standard and the terms and conditions of the negotiated connection contract.

Proponents shall not connect additional inverters, make modifications, or install additional Small IES Units, including Energy Storage Systems, without the prior written agreement of the DNSP.

2 Definitions and abbreviations

2.1 Definitions

Term	Definition
Accredited Person	A person that is properly licensed under the relevant laws and holds accreditation from a peak industry body as competent to design and/or install renewable Generating Units and/or ESS. Accredited Persons may include accredited installers, designers and supervisors operating in accordance with the terms of their accreditation. To be eligible to produce Renewable Energy Certificates a SAA accredited person must be engaged.
Affected Isolated Network	Any Isolated Network which has reached its Unmanaged Hosting Capacity which is listed on the Isolated Networks Solar Capacity Page.
Anti-islanding Protection	A protection system to detect islanded conditions and disconnect the inverter(s) from the Isolated System.
Break-before-make	Break-before-make operation is used in a switch that is configured to break (open) the first set of contacts before engaging (closing) the new contacts.
Connection	Means a physical link between an Isolated System and a Retail Customer's Premises to allow the flow of electricity.
Connection Assets	Those components of an Isolated System which are used to provide Connection Services.
Connection Contract	A contract formed by the making and acceptance of a connection offer between the Retail Customer and Ergon Network for the connection of an Embedded Generating Unit(s) to an Isolated System.
Connection Point	An agreed point of supply established between the DNSP's Isolated System and a Proponent's Premises.
Connection Services	Any entry service, being a service provided to serve Generating Unit(s) at the same Connection Point, and/or an exit service, being a service provided to serve a customer at the same Connection Point.

Term	Definition
Demand Response	The automated alteration of an inverter mode of operation in response to an initiating signal originating from or defined by the DNSP.
DER Technical Standards	Means the requirements for EG Units under AS/NZS 4777.2:2020 as in force from time to time.
Disconnection Device	Device designed to safely prevent the flow of current such as circuit breaker, ACR or contactor.
Distribution Network Service Provider (or DNSP)	Means Ergon Energy Network who owns, controls, and operates the Isolated Systems in Queensland.
Dynamic Small IES	EG Units of the kind contemplated by AS/NZS 4777 (Grid connection of energy systems via inverters) that have a nameplate rating of less than or equal to 30 kVA for which a Small IES Dynamic EG Connection is appropriate. Variation of some settings for the Dynamic Small IES, such as Import and Export, are supported through publishing of DOEs by the DNSP for the Connection Point.
Dynamic Operating Envelopes (or DOE(s))	Dynamic Operating Envelopes are where Dynamic Small IES setting limits, such as Import and Export limits, can vary over time and location
Embedded Generating System(s) (or EG System(s))	One or more EG Units and auxiliary equipment that are interconnected with the Isolated Network.
Embedded Generating Unit(s) (or EG Unit(s))	A Generating Unit connected within an Isolated System and connected to the LV portion of the Isolated System.
Emergency Backstop Mechanism	Involves the use of Generation Signalling Devices to provide Demand Response that causes an IES to temporarily cease or reduce generation in emergency contingency events within the power system. The mechanism may be called upon to respond to a direction by AEMO issued in accordance with the NEL. It is not applicable to Isolated Networks.
Energy Laws	Relevant laws as they apply in Queensland relating to the subject matter of this Standard.
Energy Storage System (or ESS)	A system comprising one or more components (e.g. batteries) that store electricity generated by Distributed Energy Resources or directly from the grid, and that can discharge the electricity to loads.
Export	Net electricity that is fed from the Premises into the Isolated System through the Connection Point.
Fixed Default Dynamic Export Limit	The Fixed Default Dynamic Export Limit, as per Table 6, is the Export limit that shall be met at all times by the Dynamic Small IES when the communication system (described in Section 4.12 of this Standard) is not fully operational (including, but not limited to, a loss of signal or, the Dynamic Small IES is not receiving or not being able to respond to the dynamic Export limit). The Fixed Default Dynamic Export Limit applies at the Connection Point to the combined EG within the Premises (including any EG Units that may have been previously connected under different connection arrangements).
Fixed Default Dynamic Import Limit	The Fixed Default Dynamic Import Limit, as per Table 9, is the Import limit that shall be met at all times by the Dynamic Small IES when the communication system (described in Section 4.12 of this Standard) is not fully operational (including, but not limited to, a loss of signal or, the Dynamic Small IES is not receiving or not being able to respond to the dynamic Import limit). The Fixed Default Dynamic Import Limit applies at the Connection Point to the combined EG within the Premises (including any EG Units that may have been previously connected under different connection arrangements).

Term	Definition
Fixed Default Dynamic Site Load Limit	The Fixed Default Dynamic Site Load Limit, as per Table 10, is the Site Load Limit that shall be met at all times by the Dynamic Small IES when the communication system (described in Section 4.12 of this Standard) is not fully operational (including, but not limited to, a loss of signal or, the Dynamic Small IES is not receiving or not being able to respond to the dynamic Site Load Limit). The Fixed Default Dynamic Site Load Limit applies to the combined actively managed loads (including the combined EG) within the Premises (including any EG Units that may have been previously connected under different connection arrangements).
Fixed Default Dynamic Site Generation Limit	The Fixed Default Dynamic Site Generation Limit, as per Table 7, is the Site Generation Limit that shall be met at all times by the Dynamic Small IES when the communication system (described in Section 4.12 of this Standard) is not fully operational (including, but not limited to, a loss of signal or, the Dynamic Small IES is not receiving or not being able to respond to the dynamic Site Generation Limit). The Fixed Default Dynamic Site Generation Limit applies at the Connection Point to the combined EG within the Premises (including any EG Units that may have been previously connected under different connection arrangements).
Fixed Small IES	Generating Units of the kind contemplated by AS/NZS 4777 (Grid connection of energy systems via inverters) that have a nameplate rating of less than or equal to 30 kVA for which a Small IES Fixed EG Connection is appropriate. Predetermined settings are applied to the EG Units during installation and are not able to be changed.
Generating Unit	The plant used in the production of electricity and all related equipment essential to its functioning as a single entity. For the avoidance of doubt, the term Generating Unit encompasses both distribution connected generating units and distribution connected bidirectional units (as defined in the NER).
Generation	The production of electrical power by converting another form of energy in a Generating Unit.
Generation Limit	The maximum active power that may flow from an inverter or multiple inverters towards the rest of the electrical installation as a result of Generation Limit Control.
Generation Limit Control	Function to limit the active power that can flow from an inverter or multiple inverters towards the rest of an electrical installation while meeting the requirements of AS/NZS 4777.2.
Generation Management	A method via which the output of the renewable source of electricity is controlled. Includes utilisation of technologies such as the use of Dynamic Operating Envelopes or, the use of energy storage to control the output profile of the Small IES Unit installation.
Generation Signalling Device (GSD)	A DRED providing functionalities and capabilities to achieve Demand Response, which satisfies the requirements of AS/NZS 4755.1.
Grid Connected	See definition for Parallel.
High Voltage (or HV)	Any voltage greater than 1,000 V a.c. or 1,500 V d.c.
Inverter Energy System Unit (or IES Unit)	A sub-type of EG Unit in which the technology comprises IES only.
Import	Net electricity that is supplied via the Isolated System through the Connection Point.

Term	Definition
Interface Protection	Interface 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 within the Premises, providing protection for the collective Inverter Energy System installation and islanding protection to the connected Isolated System as well as preserving safety of personnel and the general public.
Inverter Energy System (or IES)	A system comprising one or more inverters together with one or more energy sources (which may include an ESS) and controls, where the inverter(s) satisfies the requirements of AS/NZS 4777.2.
Inverter Power Sharing Device (IPSD)	A device of the kind contemplated by, and meeting the requirements of, AS/NZS 4777.1 which is used to share the generation from an inverter or multiple inverters to supply loads on a number of electrical installations that are part of a multiple electrical installation.
Isolated Network	The relevant Network which: a. is controlled and operated by the DNSP; and b. supplies electricity to a community listed on the Isolated Networks Solar Capacity Page that can be found on the DNSP website (www.ergon.com.au). For the avoidance of doubt a reference to an Isolated Network in this Standard is the relevant Isolated Network that the Small IES Unit(s) is, or will be, connected.
Isolated Networks Solar Capacity Page[2]	Means the Isolated Networks Solar Capacity Page available on the DNSP website (www.ergon.com.au). This page lists the Isolated Networks which are operated by the DNSP and their associated availability of Unmanaged Hosting Capacity, Managed Hosting Capacity and Small IES Dynamic EG Connections.
Isolated System	An Isolated Network, together with the Connection Assets associated with that Isolated Network, which is supplied by centralised electricity generating asset(s) owned and operated by the DNSP. For the avoidance of doubt a reference to an Isolated System in this Standard is the relevant Isolated System that the EG Unit(s) is, or will be, connected.
Limits	The collective set of limits comprising the Export limit, Import limit, Site Generation Limit and Site Load Limit.
Low Voltage (or LV)	A voltage of no more than 1,000 V a.c. or 1,500 V d.c.
Managed Hosting Capacity	The hosting capacity that can be made available for systems equipped with Generation Management.
Minimal-export	A Small IES Unit that is capable of operating in Parallel with the Isolated Network and which is designed and configured to limit any Export as prescribed in Section 4.4.1 of this Standard.
Negotiated Small IES Dynamic EG Connection	A Connection between an Isolated System and a Retail Customer's Premises for a Small IES, for which a negotiated connection contract is in place.
Negotiated Small IES Fixed EG Connection	A Connection between an Isolated System and a Retail Customer's Premises for a Small IES, for which a negotiated connection contract is in place.
Network	The apparatus, equipment, plant and buildings used to convey, and control the conveyance of, electricity excluding any Connection Assets.

[2] The information on this web page is indicative only and may change from time to time. Ergon Network makes no representations or warranties regarding the terms and conditions on which a Connection Applicant will be able to connect to the Isolated Network as this will be contained in the relevant connection offer.

Term	Definition
Non-export	A Small IES Unit that is capable of operating in Parallel with the Isolated Network and which is designed and configured to prevent any Export of electricity to the Isolated System across the Connection Point
Non-Isolated Networks	Ergon Network distribution networks which are not Isolated Networks. Non-Isolated Networks are defined as distribution networks in STNW1170, STNW1174, STNW1175, STNW3510 and STNW3511.
Off-grid	A Small IES Unit which can supply a customer load as back-up, also known as “non-parallel”. In this circumstance, the Small IES Unit(s) is not connected in Parallel and does not synchronise with the Isolated System. Loads shall be isolated from the Isolated Network when being supplied from the non-parallel Small IES Unit.
Output Smoothing	A form of Generation Management, defined by the additional requirements in Appendix H of this Standard, in which an energy storage system (ESS) is used to limit the rate-of-change of the generation output.
Parallel (or Grid Connected)	This is where the Small IES Unit is configured such that the Small IES Unit and the Isolated Network supply the installation simultaneously from time to time (even if this is a very short period of time). This includes circumstances where energy storage systems can be tied directly or indirectly back to the Isolated System through an AS/NZS 4777.2 grid connect inverter. It is irrelevant whether the Small IES Unit (including any ESS) Exports.
Partial-export	A Small IES that is capable of operating in Parallel with the Isolated Network and which is designed and configured to only Export as prescribed to operate in Section 4.4.1 of this Standard.
Power Limiting	The ability to reduce or stop power output from inverters when Export exceeds a defined value.
Premises	Means any land (whether a single block or multiple contiguous blocks), building(s) (whether whole or part), and structure(s) (or adjuncts thereto) that are owned, occupied or controlled by the Proponent in the vicinity of the proposed connection and which can reasonably be considered to be part of a single overarching operation.
Proponent	The Retail Customer that is the relevant owner, operator, or controller of the Small IES (or their agent).
Reactive Power	The rate at which reactive energy is transferred, which is a necessary part of an alternating current system containing inductive and capacitive components, as it regulates the voltage within the system. Reactive Power is measured in vars within the scope of this Standard.
Retail Customer	Means the electricity retail account holder for the Premises or the person intending to be the electricity retail account holder for the Premises where it is a new connection.
Single Wire Earth Return (or SWER)	Parts of the electrical high voltage Isolated 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.
SEP2 Utility Server	The server hosted by the DNSP and defined in IEEE 2030.5:2018 Standard for Smart Energy Profile Application Protocol.
Site Load	The net active power flowing towards the loads from the rest of the electrical installation where that power is considered as the aggregate across all loads downstream (on the customer side) of the Connection Point.

Term	Definition
Site Load Limit	The maximum net active power which may flow towards the loads from the rest of the electrical installation where that power is considered as the aggregate across all loads downstream (on the customer side) of the Connection Point. The Site Load Limit only applies to actively managed loads (such as ESS) covered under the dynamic connection agreement; the Site Load Limit does not apply to loads which are not part of the dynamic connection agreement.
Site Generation	The net active power flowing from the Embedded Generating Systems towards the rest of the electrical installation where that power from the EG Systems is considered as the aggregate across all Embedded Generating Units downstream (on the customer side) of the Connection Point.
Site Generation Limit	The maximum net active power which may flow from the Embedded Generating Systems towards the rest of the electrical installation where that power from the EG Systems is considered as the aggregate across all Embedded Generating Units downstream (on the customer side) of the Connection Point. Note: The function to achieve the Site Generation Limit is referred to as “generation limit control” in AS/NZS 4777.
Small IES	Either refers to Fixed Small IES or Dynamic Small IES, depending on the context.
Small IES Embedded Generation Connection (or Small IES EG Connection)	Either refers to Small IES Fixed EG Connection or Small IES Dynamic EG Connection, depending on the context.
Small IES Dynamic Embedded Generation Connection (or Small IES Dynamic EG Connection)	A Connection between Dynamic Small IES and an Isolated Network.
Small IES Fixed Embedded Generation Connection (or Small IES Fixed EG Connection)	A Connection between Fixed Small IES and an Isolated Network.
Small IES Unit	A Generating Unit forming part of a Fixed Small IES or Dynamic Small IES, depending on the context.
Spinning Reserve	The amount of unused and immediately dispatchable generating capacity synchronised with, and helping to maintain stability of, the Isolated Network.
Split-phase SWER	A split-phase connection is a two-phase supply provided off a single SWER transformer.
Standard	This document that is titled “Standard for Small IES Connections to Isolated Networks”.
Technical Study	A study to evaluate the effects that the proposed connection of the EG System will have on the Isolated System under different loading conditions or in the event of particular faults. A document will be produced for the Proponent that has requirements as part of the Connection Contract.
Three-Phase Balanced Inverters	Means a three-phase inverter configured for three-phase connection to the LV network. The inverter output shall be balanced across all three-phases at all times whilst connected to the Network and all three-phases simultaneously disconnect from, or connect to, the Isolated System in response to protection or automatic controls (e.g. Anti-islanding and subsequent reconnection).

Term	Definition
Total Hosting Capacity	The limited capacity of the Isolated Network to accept or manage the output of electricity generated by customers' Small IES Units due to insufficient generation Spinning Reserve, minimum loading requirements or other technical limitations. This is defined as the sum of Unmanaged Hosting Capacity and Managed Hosting Capacity.
Unmanaged Hosting Capacity	The limit for hosting of Small IES Units without Generation Management capabilities.
Vehicle-to-Building (V2B)	Plug-in electric vehicle interaction with the Premises, including charging as well as discharging and bi-directional communication interface.
Vehicle-to-Grid (V2G)	Plug-in electric vehicle interaction with the electric grid, including charging as well as discharging and bi-directional communication interface.

2.2 Abbreviations

Term, abbreviation or acronym	Definition
AC or a.c.	Alternating current
ACR	Automatic Circuit Recloser
AEMO	Australian Energy Market Operator
API	Application Programming Interface
AS/NZS	A jointly developed Australian and New Zealand Standard
AS	Australian Standard
CEC	Clean Energy Council
CSIP	Common Smart Inverter Profile
CSIP-AUS	Australian Implementation of CSIP
DC or d.c.	Direct current
DER	Distributed Energy Resources
DOE	Dynamic Operating Envelope
DRED	Demand Response Enabling Device
EG	Embedded Generation or Embedded Generating
EMC	Electromagnetic Compatibility
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
GSD	Generation Signalling Device
HV	High Voltage
IEC	International Electrotechnical Commission
IES	Inverter Energy System
IPSD	Inverter Power Sharing Device
LV	Low Voltage
NEL	National Electricity Law

Term, abbreviation or acronym	Definition
NER	National Electricity Rules
NERL	National Energy Retail Law
PV	Photovoltaic
QECM	Queensland Electricity Connection Manual
RPEQ	Registered Professional Engineer of Queensland
SAA	Solar Accreditation Australia
SEP2	IEEE 2030.5:2018 *Standard for Smart Energy Profile Application Protocol*
SLD	Single Line Diagram
UPS	Uninterruptible Power Supply
V2B	Vehicle-to-Building
V2G	Vehicle-to-Grid
VPP	Virtual Power Plant

2.3 Terminology

In this Standard:

- the word “shall” indicates a mandatory requirement that the Proponent must comply with;
- the word “should” indicates a recommended requirement that will not be mandatorily imposed on the Proponent; and
- the word “may” indicates a requirement that the DNSP may determine the Proponent must comply with.

2.3.1 Subcategories

The technical requirements set out in this Standard shall apply to the following subcategories of Small IES Fixed EG Connections described in Table 1 and Small IES Dynamic EG Connections described in Table 2.

Table 1 Subcategories for Fixed EG Connections

Single-phase Small IES Fixed EG Connection	Two-phase Small IES Fixed EG Connection	Three-phase Small IES Fixed EG Connection	Non-standard Small IES Fixed EG Connection
System capacity ≤ 10 kVA[1]	System capacity ≤ 5 kVA PV & ≤ 5 kVA ESS per phase, with total ≤ 10 kVA PV & 10 kVA ESS[1]	System capacity ≤ 10 kVA per phase, with total ≤ 30 kVA[1]	Connecting to a SWER network[1], Premises with more than one LV Connection Point or connections utilising IPSD.

Note 1: Export limits apply for each subcategory and are as set out in Table 4 and Table 5 of this Standard.

Table 2 Subcategories for Dynamic EG Connections

Single-phase Small IES Dynamic EG Connection	Two-phase Small IES Dynamic EG Connection	Three-phase Small IES Dynamic EG Connection	Non-standard Small IES Dynamic EG Connection
System capacity ≤ 20 kVA[1]	System capacity ≤ 5 kVA PV & ≤ 5 kVA ESS per phase, with total ≤ 10 kVA PV & 10 kVA ESS[1]	System capacity ≤ 10 kVA per phase, with total ≤ 30 kVA[1]	Aggregate system capacity ≤ 30 kVA[1]: • SWER network; or • Premises with more than one LV Connection Point; or • Connections utilising IPSD

Note 1: Export limits apply for each subcategory and are as set out in Table 6 of this Standard.

The following connections are considered to be non-standard for this Standard:

- Premises connected (or connecting) to a SWER network, located within the Ergon Network Isolated Systems that have technical constraints which limits the capacity of Small IES Units to be connected to LV networks with upstream SWER networks in comparison to the standard urban and rural networks.
- Premises connected (or connecting) to the Isolated System at more than one LV Connection Point.
- Premises connected (or connecting) to the Isolated System utilising IPSD.

EG connected to Non-Isolated Networks and HV Isolated Networks are outside the scope of this Standard and are covered by other connection standards as follows:

- Premises connected (or connecting) to a Non-Isolated Network at LV with a Fixed EG connection are covered under
  - STNW1170 “Standard for Small IES Connections” or
  - STNW1174 “Standard for Low Voltage EG Connections”
- Premises connected (or connecting) to a Non-Isolated Network at LV with a Dynamic EG connection are covered under
  - STNW3510 “Dynamic Standard for Small IES Connections” or
  - STNW3511 “Dynamic Standard for Low Voltage EG Connections”.
- Premises connected (or connecting) to a HV network are covered under STNW1175 “Standard for High Voltage EG Connections”.

Premises connected (or connecting to) an Isolated Network at LV where the IES capacity exceeds 30 kVA and is less than 1500 kVA or, involve EG with rotating machine(s) less than 1500 kVA, are covered by STNW3515 “Standard for LV EG Connections to Isolated Networks”.

Further details regarding the categories of Small IES that are capable of being connected under the DNSP Standards are set out in Appendix G: Small IES EG Connection types (informative).

If further clarification is required to determine which subcategory applies to a Proponent, please contact ergongeneration@energyq.com.au.

3 Relevant rules, regulations, standards and codes

3.1 Standards and codes

There are a range of applicable standards and industry codes which define connection types and applicable requirements, as set out below.

In the event of any inconsistency between:

- an applicable Australian and international standards and industry codes (except for legislated industry codes where compliance is mandated by law); and
- this Standard,

this Standard will prevail.

3.1.1 Ergon Network controlled documents

A copy of the latest version of this Standard may be obtained by searching for STNW3514 from the following website: https://www.ergon.com.au/

Other controlled documents include:

Document number	Document name	Document type
01811	Queensland Electricity Connection Manual - 2912908	Reference
STNW1170	Standard for Small IES Connections - 2970697	Standard
STNW1174	Standard for LV EG Connections - 27939029	Standard
STNW1175	Standard for HV EG Connections	Standard
STNW3510	Dynamic Standard for Small IES Connections - 3403035	Standard
STNW3511	Dynamic Standard for LV EG Connections	Standard
STNW3515	Standard for LV EG Connections to Isolated Networks - 27939029	Standard

3.1.2 Australian and New Zealand Standards

Document number	Document name	Document type
AS/NZS 3000	Electrical Installations – Wiring Rules	AU/NZ Joint Standard
AS/NZS 4755.1	Demand response capabilities and supporting technologies for electrical products – Part 1: Demand response framework and requirements for demand response enabling devices (DREDs)	AU/NZ Joint Standard
AS/NZS 4777	Grid connection of energy systems via inverters, (multiple parts)	AU/NZ Joint Standard
AS/NZS 5033	Installation and Safety Requirements for Photovoltaic (PV) Arrays	AU/NZ Joint Standard
AS/NZS 5139	Electrical Installations - Safety of battery systems for use with power conversion equipment	AU/NZ Joint Standard
AS 5385	Smart Energy Profile Application Protocol	Australian Standard
AS/NZS 61000.4.30	Electromagnetic compatibility (EMC) – Part 4.30: Testing and measurement techniques - Power quality measurement methods	AU/NZ Joint Standard
SA/SNZ TR IEC 61000.3.14	Electromagnetic compatibility (EMC) – Part 3.14: Limits - Assessment of emission limits for harmonics, interharmonics, voltage fluctuations and unbalance for the connection of disturbing installations to LV power systems	AU/NZ Joint Standard
AS 62040.1	Uninterruptible power systems (UPS)	Australian Standard
AS/NZS IEC 62116	Utility-interconnected photovoltaic inverters – Test procedure of islanding prevention measures	AU/NZ Joint Standard
SA HB 218:2023 (or CSIP-AUS)	Common Smart Inverter Profile —Australia with Test Procedures	Australian Standard Handbook

3.1.3 International Standards

Document number	Document name	Document type
CSIP	IEEE 2030.5 Common California IOU Rule 21 Implementation Guide for Smart Inverters	International Standard
IEEE 2030.5 (or SEP2)	2030.5-2018 - IEEE Standard for Smart Energy Profile Application Protocol	International Standard

3.2 Legislation and regulation

Set out below is a list of the applicable legislation and regulations (which may be amended, replaced, repealed or have further instruments enacted from time to time).

In the event of any inconsistency between:

- any applicable legislation and regulation; and
- this Standard,

the legislation and regulations will prevail.

Document name	Document type
DER Technical Standard	Regulation
Electricity Act 1994 (Qld)	Legislation
Electricity Regulation 2006 (Qld)	Regulation
Electrical Safety Act 2002 (Qld)	Legislation
Electrical Safety Regulation 2013 (Qld)	Regulation
Electricity - National Scheme (Queensland) Act 1997 (Qld)	Legislation
National Electricity (Queensland) Law, as defined in the Electricity - National Scheme (Queensland) Act 1997 (Qld)	Regulation
National Energy Retail Law (Queensland) Act 2014 (Qld)	Legislation
National Energy Retail Law (Queensland), as defined in the National Energy Retail Law (Queensland) Act 2014 (Qld)	Regulation
National Electricity Rules	Regulation
Professional Engineers Act 2002 (Qld)	Legislation

4 Technical requirements

4.1 General

Due to the nature of Ergon Network's Isolated Networks and their inherent differences from the larger, more interconnected networks (in particular, the type and size of relevant baseload generation), there are restrictions on how much customer Small IES Unit capacity can be connected. This is typically the case irrespective of whether those Small IES Units will, or will not, be exporting. As the Small IES Unit capacity increases, the available capability of the Isolated Networks to cope with these Small IES Units and still maintain reliable and economical electricity supply correspondingly reduces. This requires there to be increased control over the output of the Small IES Units and/or augmentation of the relevant power station or network to facilitate the connections.

A concept called "hosting capacity" is used to ensure the reliable and cost-effective supply of electricity to isolated communities. Total Hosting Capacity is divided into Unmanaged Hosting Capacity and Managed Hosting Capacity (refer to Figure 1).

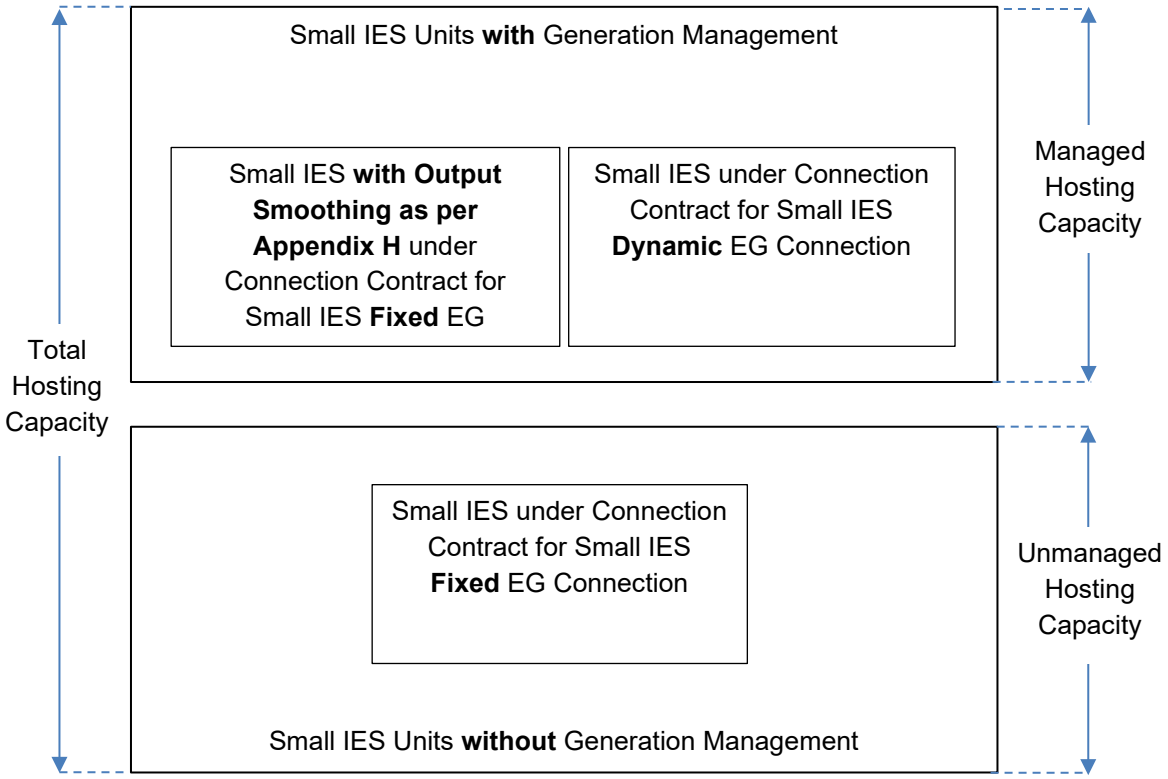

Figure 1: Total Hosting Capacity

Once any Isolated Network reaches its Unmanaged Hosting Capacity limit, that Isolated Network is referred to as an Affected Isolated Network. Any future Small IES Units to be connected to that network must be controlled with Generation Management to ensure that they do not adversely affect the operation of the Isolated Network and the relevant power station. Generation Management is a method of controlling the output of such Small IES Units either through:

- Small IES Dynamic EG Connections; or
- use of energy storage systems (ESS) to limit the rate-of-change of the generation output which is known as Output Smoothing as detailed in Appendix H.

For a list of Isolated Networks operated by Ergon Network and their availability of Unmanaged Hosting Capacity, Managed Hosting Capacity and Small IES Dynamic EG Connections, please visit the Isolated Networks Solar Capacity Page. Note that (due to factors such as changes to infrastructure, advances in technology or withdrawal of customer applications) further Managed Hosting Capacity or Unmanaged Hosting Capacity may be released from time to time.

A process flow chart is presented in Figure 2 to illustrate assessment of proposed IES to Isolated Networks.

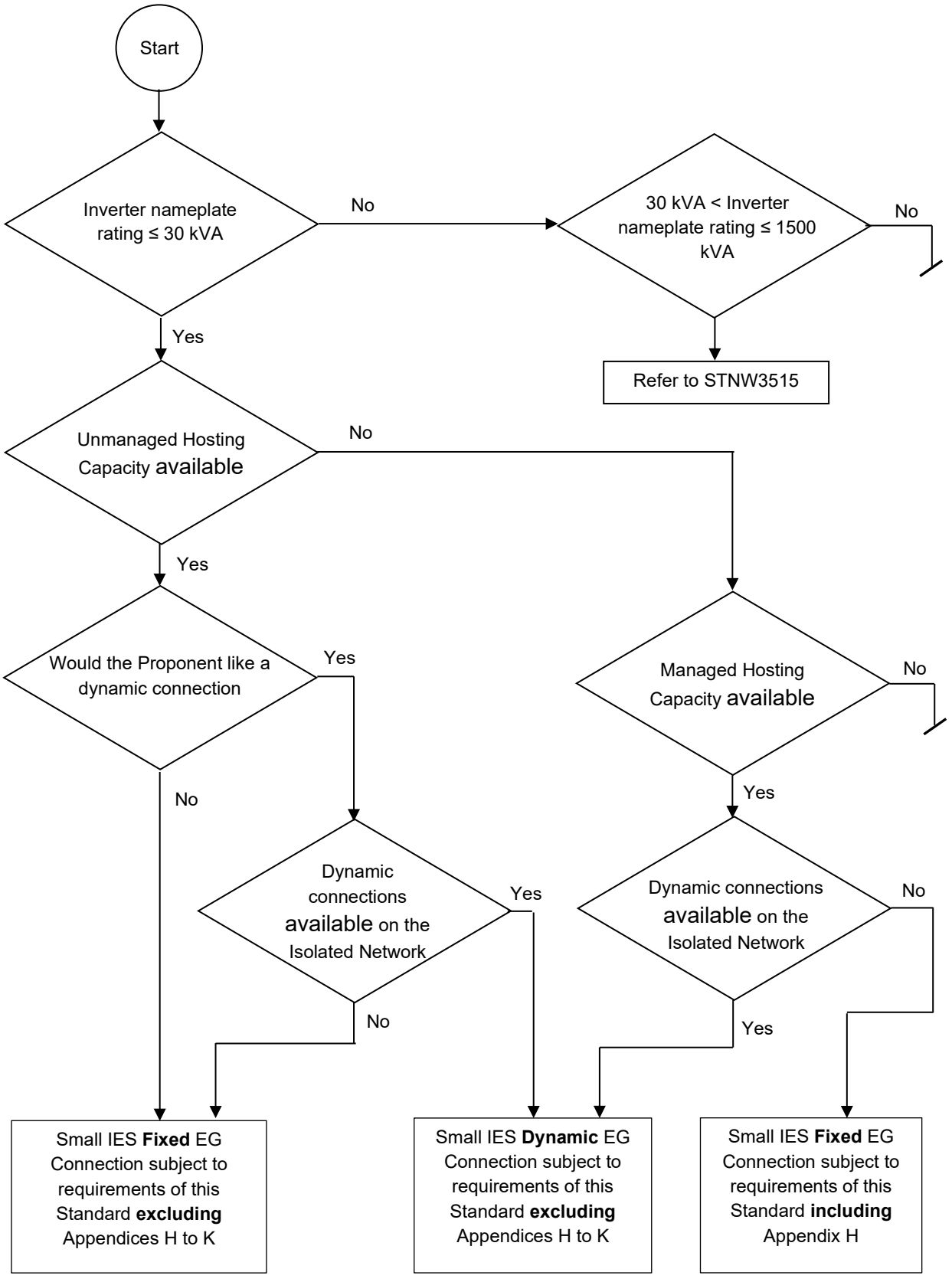

Figure 2: Process flow chart for assessment of proposed connection of IES Unit to Isolated Network

4.1.1 Isolated Networks with Unmanaged Hosting Capacity available

Where a Proponent wishes to connect a Small IES Unit to an Isolated Network which has Unmanaged Hosting Capacity available the Proponent has the option to apply for either:

- a Small IES Fixed EG Connection; or
- a Small IES Dynamic EG Connection (provided that Small IES Dynamic EG Connections are available on that particular Isolated Network).

Please note that Output Smoothing (as per Appendix H) is not offered in these cases and the Small IES will be subject to the requirements of this standard excluding Appendices H to K.

4.1.2 Isolated Networks which only have Managed Hosting Capacity available

Where a Proponent wishes to connect a Small IES Unit to an Isolated Network which does not have Unmanaged Hosting Capacity available but, has Managed Hosting Capacity available, the Proponent may:

- apply for a Small IES Dynamic EG Connection (provided that Small IES Dynamic EG Connections are available on that particular Isolated Network) subject to the requirements of this standard excluding Appendices H to K; or
- if Small IES Dynamic EG Connections are not yet available on that Isolated Network the Proponent may apply for a Small IES Fixed EG Connection provided that the Small IES Unit meets the requirements of this standard including the additional requirements of Appendix H (Output Smoothing).

4.2 Labelling and signage

Labels and signs on the Small IES, including cables, shall meet the requirements of AS/NZS 4777.1, AS/NZS 3000, AS/NZS 5033 and AS/NZS 5139.

4.3 Maximum system capacity

The maximum system capacity permitted varies based on whether the Small IES is connected under a Connection Contract for Small IES Fixed EG Connection (refer to Section 4.3.1) or a Connection Contract for Small IES Dynamic EG Connection (refer to Section 4.3.2).

Where there are multiple EG Systems at a Premises connected via a single Connection Point, the system capacity will consider the aggregate of the existing and proposed EG System.

For Premises with multiple LV Connection Points, Premises with network(s) connected to multiple Connection Points, or EG system(s) being connected to multiple Connection Points, the standard shall be applied to meet the following:

a. The maximum capacity is the aggregate of all EG units connected or proposed for connection to all LV Connection Points, on the Premises and for all connected network(s).
b. All criteria in this Standard and the Technical Study will be applied for the aggregate maximum capacity.

This section shall be applied with consideration to the entire Standard. Proponents with a multi-phase connection shall meet the phase balance requirements of Section 4.4.7 of this Standard.

This Standard can only be applied up to a total aggregate capacity less than or equal to 30 kVA. System capacity for a bulk metered Premises, such as strata title (e.g. retirement villages) are aggregated at the Connection Point. The Proponent is responsible for compliance with the requirements set out in this Standard, including, but not limited to, phase balancing.

4.3.1 Small IES Fixed EG Connection

The maximum aggregate system capacity for Small IES Fixed EG Connections covered under this Standard is 10 kVA per phase.

4.3.2 Small IES Dynamic EG Connection

The maximum aggregate system capacity for Small IES Dynamic EG Connections covered under this Standard shall meet the requirements in Table 3. For single-phase connections with an aggregate capacity > 10 kVA, the maximum capacity allocation is split into allocations for solar PV and ESS.

Table 3 Small IES Dynamic EG Connection maximum system capacity

		Enabled for dynamic operation[1]
Single-phase		≤ 10 kVA PV & ≤ 10 kVA ESS[2]
Two-phase		≤ 5 kVA PV & ≤ 5 kVA ESS per phase[3]
Three-phase		≤ 10 kVA per phase[3]
SWER	Single-phase	≤ 15 kVA PV & ≤ 15 kVA ESS[2]
	Split-phase	≤ 5 kVA PV & ≤ 5 kVA ESS per phase[3]

Note 1: A Dynamic Small IES is enabled for dynamic operation where it meets the requirements of the Dynamic Limits operational function of Table 18 in Section 7.2.1.

Note 2: For maximum capacity with separate allocation limits for PV and ESS:

- the maximum capacity for PV is calculated based on the total IES with connected solar PV; and
- the maximum capacity for Energy Storage Systems (ESS) includes the total IES with connected ESS, including batteries and electric vehicles as per Sections 4.5.1 and 4.5.2.

Note 3: Multiple-phase EG Systems shall meet phase balance requirements from Section 4.4.7 of this Standard.

4.4 Generation Control and Limits for Export, Site Generation, Import and Site Load

4.4.1 Export limits at Connection Point

4.4.1.1 Standard Small IES Fixed EG Connections

The Export limits at the Connection Point of Fixed Small IES for each standard Small IES Fixed EG Connection is set out in Table 4 below:

Table 4 Standard Small IES Fixed EG Connection Export limits

Subcategory	Export limit	Technical Study required
Single-phase	≤ 5 kW	Yes
Two-phase	≤ 5 kW per phase[1]	Yes
Three-phase	≤ 5 kW per phase[1]	Yes

Note 1: Multiphase EG Systems shall meet phase balance requirements from Section 4.4.7 of this Standard.

4.4.1.2 Non-standard Small IES Fixed EG Connections

The following Table 5 has the Export limits and Technical Study requirements for non-standard Small IES Fixed EG Connections.

Table 5 Non-standard Small IES Fixed EG Connection Export limits and Technical Study requirement

Subcategory	Export limit	Technical Study required
SWER	≤ 2 kW	Yes

4.4.1.3 Small IES Dynamic EG Connections

The Export limits for a Dynamic Small IES shall meet the following requirements:

a. The dynamic Export limits are supplied by the DNSP for the Dynamic Small IES; they will be no less than the 'Fixed Default Dynamic Export Limit' and no more than the 'maximum dynamic Export limit' shown in Table 6.
b. Any time that the communication system (described in Section 4.12 of this Standard) is not fully operational (including, but not limited to, a loss of signal or, the Dynamic Small IES not receiving or not being able to respond to the dynamic Export limit), the permitted Export shall be limited to the 'Fixed Default Dynamic Export Limit' as set out in Table 6. This Export limit will apply at the Connection Point to the combined EG within the Premises (including any EG Units that may have been previously connected under different connection arrangements).
c. For Premises with multiple Connection Points, the Export limit is the total for the Premises and the aggregate Export across the Connection Points shall stay below the Export limit. The Export limit will be in the range set out in Table 6.
d. The Export limits shall meet the measurement and control requirements in Section 4.4.6.

Table 6 Dynamic Export limits under a Connection Contract for Dynamic EG Connection

Subcategory	Fixed Default Dynamic Export Limit	Maximum dynamic Export limit	Technical Study required
All	0 kW	10 kW per phase[1,2,3]	Yes

Note 1: Multiple-phase EG Systems shall meet phase balance requirements from Section 4.4.7 of this Standard.

Note 2: Availability of Export limits greater than the 'Fixed Default Dynamic Export Limit' set out in Table 6, are subject to capacity availability of the Isolated System.

Note 3: Aggregate Export limits will not be permitted to exceed Isolated System capacity limits.

The ability of the Dynamic Small IES to Export into the Isolated System will be subject to the limitations of the Isolated System from time to time, and the DNSP is unable to, and does not, represent, warrant or guarantee that the Dynamic Small IES will be able to Export electricity into the Isolated System at any time. Circumstances which may cause the Export to be constrained include, but are not limited to, times of low Isolated Network operational demand, local or widespread communication issues, or when power quality response modes are in operation.

4.4.2 Site Generation Limit downstream of Connection Point

4.4.2.1 Small IES Fixed EG Connections

Site Generation Limits do not apply to Small IES Fixed EG Connections.

4.4.2.2 Small IES Dynamic EG Connections

The Site Generation Limit for a Dynamic Small IES shall meet the following requirements:

a. Meet the requirements of generation limit control specified in AS/NZS 4777.
b. The dynamic Site Generation Limits[3] are supplied by the DNSP for the Dynamic Small IES; they will be no less than the 'Fixed Default Dynamic Site Generation Limit' and no more than the 'maximum dynamic Site Generation Limit' shown in Table 7.
c. Any time that the communication system (described in Section 4.12 of this Standard) is not fully operational (including, but not limited to, a loss of signal or, the Dynamic Small IES not receiving or not being able to respond to the dynamic Site Generation Limit), the permitted Site Generation shall be limited to the 'Fixed Default Dynamic Site Generation Limit' as set out in Table 7. This Site Generation Limit will apply at the Connection Point to the combined EG within the Premises (including any EG Units that may have been previously connected under different connection arrangements).
d. For Premises with multiple Connection Points, the Site Generation Limit is the total for the Premises and the aggregate Site Generation across the Connection Points shall stay below the Site Generation Limit. The Site Generation Limit will be in the range set out in Table 7.
e. The Site Generation Limit shall meet the measurement and control requirements in Section 4.4.6.

Table 7 Dynamic Site Generation Limits for Small IES Dynamic EG Connections

Subcategory	Fixed Default Dynamic Site Generation Limit	Maximum dynamic Site Generation Limit	Technical Study required
All	0 kW	10 kW per phase[1,2,3]	Yes

Note 1: Multiple-phase EG Systems shall meet phase balance requirements from Section 4.4.7 of this Standard.

Note 2: Availability of Site Generation Limits greater than the Fixed Default Dynamic Site Generation Limit set out in Table 7 are subject to capacity availability of the Isolated System.

Note 3: Aggregate Site Generation Limits will not be permitted to exceed Isolated System capacity limits.

[3]The dynamic Site Generation Limit is defined in CSIP-AUS as opModGenLimW.

The ability of the Dynamic Small IES to generate in Parallel with the Isolated System will be subject to the limitations of the Isolated System from time to time and, the DNSP is unable to, and does not, represent, warrant or guarantee that the Dynamic Small IES will be able to generate electricity in Parallel with the Isolated System at any time. Circumstances which may cause the generation to be constrained include, but are not limited to, times of low Isolated Network operational demand, local or widespread communication issues, or when power quality response modes are in operation.

4.4.3 Generation Limit Control as a means of reducing the EG Unit nameplate rating

For Premises with a multiple-phase connection to the network, Generation Limit Control as specified in AS/NZS 4777.2 may be applied to control the active power output levels of EG Unit(s) to enforce a Generation Limit as per Table 8. Where such Generation Limit Control has been applied, the Generation Limit in Table 8 shall be substituted for the EG Unit's nameplate rating[4].

Table 8 Generation Limit Categories

Category	Generation Limit	Single-Phase Inverter Maximum Nameplate Rating
V2G	5 kW per phase[1]	8 kVA per phase
V2B	5 kW per phase[1]	8 kVA per phase

Note 1: Generation Limits may need to be reduced to meet system capacity and phase balance requirements in this Standard.

4.4.4 Import limits at Connection Point

4.4.4.1 Small IES Fixed EG Connections

Import limits do not apply to Small IES Fixed EG Connections.

4.4.4.2 Small IES Dynamic EG Connections

Dynamic Small IES capable of importing electricity from the Isolated Network, such as an ESS, shall be subject to Import limits. The Import limits for a Dynamic Small IES shall meet the following requirements:

a. The dynamic Import limits are supplied by the DNSP for the Dynamic Small IES; they will be no less than the 'Fixed Default Dynamic Import Limit' and no more than the 'maximum dynamic Import limit' shown in Table 9.
b. Any time that the communication system (described in Section 4.12 of this Standard) is not fully operational (including, but not limited to, a loss of signal or, the Dynamic Small IES not receiving or not being able to respond to the dynamic Import limit), the permitted Import limit shall be limited to the 'Fixed Default Dynamic Import Limit' as set out in Table 9.
c. For Premises with multiple Connection Points, the Import limit is the total for the Premises and the aggregate Import across the Connection Points shall stay below the Import limit. The Import limit will be in the range set out in Table 9.
d. The Import limits shall meet the measurement and control requirements in Section 4.4.6.

[4] The Generation Limit and nameplate ratings have different units of kW and kVA respectively. The Generation Limit is in kW so as not to interfere with the volt-watt and volt-var response.

Table 9 Dynamic Import limits for Small IES Dynamic EG Connections

Subcategory		Fixed Default Dynamic Import Limit	Maximum dynamic Import limit	Technical Study required
Single-phase		1.5 kW	18 kW	Yes
Two-phase		1.5 kW	10 kW per phase[1,2,3]	Yes
Three-phase		1.5 kW	10 kW per phase[1,2,3]	Yes
SWER	Single-phase	1.5 kW	10 kW	Yes
	Split-phase	1.5 kW	10 kW per phase[1,2,3]	Yes

Note 1: Multiple-phase EG Systems shall meet phase balance requirements from Section 4.4.7 of this Standard.

Note 2: Availability of Import limits greater than the Fixed Default Dynamic Import Limit set out in Table 9 are subject to capacity availability of the Isolated System.

Note 3: Aggregate Import limits will not be permitted to exceed Isolated System capacity limits.

The Proponent shall not exceed the maximum supply limits in the QECM or the limits within the Connection Contract for supply.

4.4.5 Site Load Limit downstream of Connection Point

4.4.5.1 Small IES Fixed EG Connections

Site Load Limits do not apply to Small IES Fixed EG Connections.

4.4.5.2 Small IES Dynamic EG Connections

Dynamic Small IES capable of consuming electricity, such as an ESS, shall be subject to Site Load Limits. The Site Load limits for a Dynamic Small IES shall meet the following requirements:

a. The dynamic Site Load Limits are supplied by the DNSP for the Dynamic Small IES; they will be no less than the 'Fixed Default Dynamic Site Load Limit' and no more than the 'maximum dynamic Site Load Limit' shown in Table 10.
b. Any time that the communication system (described in Section 4.12 of this Standard) is not fully operational (including, but not limited to, a loss of signal or, the Dynamic Small IES not receiving or not being able to respond to the dynamic Site Load Limit), the permitted Site Load Limit shall be limited to the 'Fixed Default Dynamic Site Load Limit' as set out in Table 10.
c. For Premises with multiple Connection Points, the Site Load Limit is the total for the Premises and the aggregate Site Load across the Connection Points shall stay below the Site Load Limit. The Site Load Limit will be in the range set out in Table 10.
d. The Site Load Limits shall meet the measurement and control requirements in Section 4.4.6.
e. Site Load Limits only apply to actively managed loads covered under a dynamic connection agreement.

Table 10 Dynamic Site Load Limits for Small IES Dynamic EG Connections

Subcategory		Fixed Default Dynamic Site Load Limit	Maximum dynamic Site Load Limit	Technical Study required
Single-phase		1.5 kW	18 kW	Yes
Two-phase		1.5 kW	10 kW per phase[1,2,3]	Yes
Three-phase		1.5 kW	10 kW per phase[1,2,3]	Yes
SWER	Single-phase	1.5 kW	10 kW	Yes
	Split-phase	1.5 kW	10 kW per phase[1,2,3]	Yes

Note 1: Multiple-phase EG Systems shall meet phase balance requirements from Section 4.4.7 of this Standard.

Note 2: Availability of Site Load Limits above the Fixed Default Dynamic Site Load Limit in Table 9 are subject to capacity availability of the Isolated System.

Note 3: Aggregate Site Load Limits will not be permitted to exceed Isolated System capacity limits.

The Proponent shall not exceed the maximum supply limits in the QECM or the limits within the Connection Contract for supply.

4.4.6 Measurement and control of the Limits for Export, Site Generation, Import and Site Load

4.4.6.1 General

Measurement and control of Export limits shall comply with the requirements of Section 4.4.6 for both:

- Small IES Fixed EG Connections and,
- Small IES Dynamic EG Connections.

Measurement and control of Import limits, Site Generation Limits and Site Load Limits:

- Is not required for Small IES Fixed EG Connections.
- Shall comply with the requirements of Section 4.4.6 for Small IES Dynamic EG Connections.

The total aggregate Export or Import of all the inverters at the Connection Point shall not exceed the approved limits (as applicable).

The total aggregate generation (or total aggregate Site Load) of all the inverters downstream of the Connection Point shall not exceed the Site Generation Limit (or Site Load Limit) for Small IES Dynamic EG Connections.

The Limits will be used herein as a term for the collective set of limits comprising the Export limit, Import limit, Site Generation Limit and Site Load Limit (as applicable).

For Premises with multiple LV Connection Points, Premises with network(s) connected to multiple Connection Points, or EG system(s) being connected (directly or indirectly) to multiple Connection Points, the standard shall be applied to meet the following:

a. The minimum and maximum of each of the Limits are applied to the Premises and the Connection Points must collectively achieve these Limits.
b. In addition to the maximum Export and Import limits, a Proponent may be required to design the EG system to meet Export or Import limits applied to an individual Connection Point. No Export or Import limit for an individual Connection Point shall exceed the maximum Export and Import limit for the Premises.
c. All criteria in this Standard and the Technical Study will be applied for the Premises and the Connection Points collectively.
d. Another entity (such as a VPP or mobile application) shall not cause the Small IES to exceed the Limits.

4.4.6.2 Measurement of Export and Import limits

The reference point for the measurement of Export and Import limits shall be:

a. Measured at a point as close to the Connection Point as practicable, referencing a single point beyond the Connection Point within the Premises.
b. Connected at a location that has a lower impedance to the Connection Point than any EG Unit connected within the Premises.

4.4.6.3 Control of Export and Import limit

Export limits for both Fixed Small IES and Dynamic Small IES shall be interpreted as “soft”, respond within 15 s, and meet the requirements of soft Export limits in Clause 3.4.8 of AS/NZS 4777.1.

Export limits shall be set to meet Table 11.

Table 11 Export limit settings

	Non-export	Partial-export
Export limit setting (kW)	0	*k* of total inverter rating[1]

Note 1: Where *k* is equal to the approved Partial-export power value as a per unit value of the inverter capacity. For example, where the approved Partial-export value is 2.5 kW of a 5 kVA inverter, k = 0.5 (or 50%).

The control function for Import limitation shall meet the following requirements:

a. have a limit that will cause the Dynamic Small IES to reduce its consumption, preventing Import at the Connection Point greater than the Import limit[5];
b. where the Import limit is exceeded, the Import control function shall operate to ensure the Dynamic Small IES meets the import conditions within 15 seconds;
c. the Import control device settings shall be secured against inadvertent or unauthorized tampering. Changes to settings shall require the use of a tool and special instructions not provided to unauthorized personnel.

[5] Unmanaged loads, such as cooking equipment, may still cause the Import limit to be exceeded; the dynamic Small IES under a Connection Contract for Dynamic EG Connection agreement may only consume whilst the Import limit is not exceeded.

In the case of Fixed Small IES, for configurations where the inverter provides the Power Limiting capability, the aggregate Export of all inverters shall not exceed the approved Export limit.

In the case of Dynamic Small IES, where the Export (or Import) control function loses connection with an external device, or detects any fault or loss of operation of the Export (or Import) control function, it shall reduce Export (or Import) to the Fixed Default Dynamic Export Limit (or Fixed Default Dynamic Import Limit respectively).

The Import limit shall apply to all of the EG Units connected within the Premises. Total Import at the Connection Point to the electrical installation will remain within the limits described in the Connection Contract[7].

The control of the Small IES for Export or Import limitation shall not interfere with Anti-islanding Protection of the inverter(s).

The ability of the Small IES to Export into and Import from the Isolated System at the limits described in Table 4, Table 5, Table 6, Table 9 and Table 11 will be subject to the limitations of the Isolated System from time to time, and the DNSP is unable to, and does not, represent, warrant or guarantee that the Small IES will be able to Export/Import at any time. Circumstances which may affect the Export or Import to be constrained include, but are not limited to, times of low Isolated Network operational demand, local or widespread communication issues, or when power quality response modes are in operation.

4.4.6.4 Measurement of Site Generation (and Site Load)

The measurement of Site Generation (and Site Load), for the purposes of controlling the Dynamic Small IES to meet the Site Generation Limit (and Site Load Limit), shall have the measurement accuracy as described in AS/NZS 4777.2 Clause 2.13. The measurement may be made by an inverter or an external measurement device. The measurement may be made by aggregation of measurements made by inverter(s) and/or external measurements device(s) provided that the measurement accuracy, as described in AS/NZS 4777.2 Clause 2.13, is maintained for measurement of the Site Generation (and Site Load).

4.4.6.5 Control of Site Generation Limit (and Site Load Limit)

The control function for the Site Generation Limit (and Site Load Limit) shall meet the following requirements:

a. have a limit that will cause the Dynamic Small IES to reduce its generation (or load), preventing Site Generation (or Site Load) downstream (i.e. on the customer side) of the Connection Point greater than the Site Generation Limit (or Site Load Limit respectively);
b. where the Site Generation Limit (or Site Load Limit) is exceeded, the Site Generation Limit (or Site Load Limit) control function shall operate to ensure that the Dynamic Small IES meets the Site Generation Limit (or Site Load Limit) conditions within 15 seconds;
c. the Site Generation Limit (and Site Load Limit) control device settings shall be secured against inadvertent or unauthorized tampering. Changes to settings shall require the use of a tool and special instructions not provided to unauthorized personnel.

Where the Site Generation Limit (or Site Load Limit) control function loses connection with an external device, or detects any fault or loss of operation of the Site Generation Limit (or Site Load Limit) control function, it shall reduce the Site Generation (or Site Load) to the Fixed Default Dynamic Site Generation Limit (or Fixed Default Dynamic Site Load Limit respectively).

The Site Generation Limit (and Site Load Limit) shall apply to all of the dynamic EG Units connected within the Premises. Site Generation (and Site Load) downstream (i.e. on the customer side) of the Connection Point to (from) the electrical installation will remain within the limits described in the Connection Contract.

The control of the Small IES for the Site Generation Limit (and Site Load Limit) shall not interfere with Anti-islanding Protection of the inverter(s).

The ability of the Small IES to generate (and consume) at the limits described in Table 7 (and Table 10) will be subject to the limitations of the Isolated System from time to time, and the DNSP is unable to, and does not represent, warrant or guarantee that the Dynamic Small IES will be able to generate (or consume) at any time. Circumstances which may affect the Site Generation Limit (or Site Load Limit) to be constrained include, but are not limited to, times of low Isolated Network operational demand, local or widespread communication issues, or when power quality response modes are in operation.

4.4.7 Phase Balance for Multiple-Phase Connections

For all multiple-phase connections to the network, the phase balance requirements in AS/NZS 4777.1 Appendic C applies including:

a. Customers that may have a combination of single-phase and/or three-phase inverters in compliance with AS/NZS 4777.2.
b. All multiple-phase Small IES Units shall have a balanced a.c. output.
c. Where single-phase inverters are installed for both PV and ESS they shall be installed on the same phase.
d. For IES with an aggregate rating ≤ 30 kVA the additional phase balance requirements in Section 4.4.7.1 of this Standard apply.

4.4.7.1 Phase Balance for Connections with IES less than or equal to 30 kVA

For multiple-phase connections where the aggregate IES nameplate rating for single-phase and balanced three-phase inverters are ≤ 30 kVA, the limits in Table 12 shall be met.

Table 12 Phase Balance Requirements for Multiple-Phase Connections with IES ≤ 30 kVA

Multiple-Phase Connections with IES ≤ 30 kVA	Single-Phase Inverter Aggregate Nameplate Rating Limit	Balanced Three-Phase Inverter Aggregate Nameplate Rating Limit
PV Inverters	5 kVA per phase	30 kVA
ESS Inverters	5 kVA per phase	30 kVA
V2G or V2B Inverters[1]		
Aggregate of Combined IES	10 kVA per phase	30 kVA

Note 1: Generation Limit may be applied to V2G or V2B single-phase inverter as per Section 4.4.3 of this Standard to meet phase balance requirements.

Where there is a combination of single-phase inverters, the maximum nameplate rating imbalance of all IES shall not exceed 5 kVA between phases.

4.4.8 Emergency Backstop Mechanism

Emergency Backstop Mechanism and GSDs are not applicable to Isolated Networks due to these networks lacking AFLC communication infrastructure.

4.5 Inverter Energy Systems

The following requirements apply to all IES regardless of whether they are part of a Fixed Small IES or Dynamic Small IES:

a. inverters shall be tested and certified by an authorised testing laboratory as being compliant with AS/NZS 4777.2 (with an accreditation number issued).
b. the inverters shall be registered with CEC as approved grid connect inverters.
c. the inverters shall be tested and certified by an authorised testing laboratory as being compliant with AS/NZS IEC 62116 for active Anti-islanding Protection.
d. the inverters shall be installed in compliance with AS/NZS 4777.1.
e. the inverters shall have both volt-var and volt-watt response modes available and be capable of operating the modes concurrently, as per Section 4.11.1 of this Standard.
f. the inverters shall be set to the regional setting “Australia A”.

IES, which are part of a Dynamic Small IES, shall be capable of sending and receiving information via SEP2 protocol using CSIP-AUS directly or via a third party.

4.5.1 Energy Storage System (ESS)

The connection of an ESS (such as batteries or EV and EVSE), capable of supplying electricity to an electrical installation such as the Premises or the Isolated System is considered Grid Connected, unless the inverter is connected behind a Break-before-make switch in accordance with Section 4.6.1 of this Standard or is an UPS in accordance with AS 62040.1.

Where the ESS is considered to be Grid Connected:

a. the ESS shall be subject to the requirements of this Standard.
b. the inverter(s) for the ESS shall be installed in accordance with Section 4.5 of this Standard;
c. the installation of battery ESS shall comply with AS/NZS 5139 (except for EVs combined with EVSE).
d. the ESS is either externally DC coupled to an inverter or packaged as a product into an integrated system with an inverter and AC-coupled. The following requirements shall apply to ESS inverters:

1. the inverter capacity for any ESS inverter will be included in the aggregated nameplate rating[6] of inverters at the Connection Point.
2. the Export limit for the ESS inverter will be considered as part of the aggregated Export limit at the Connection Point.

The installation and commissioning of an ESS shall be certified as compliant by an Accredited Person.

4.5.2 Electric vehicles

EVSE that is only capable of charging from the grid is not considered a Small IES Unit but rather a load and is subject to the requirements outlined in Section 8.14.2.2 of the QECM.

EVSE shall be considered an ESS and is subject to the requirements set out in Section 8.16.2 of the QECM and Section 4.5.1 this Standard, where:

a. the EVSE is capable of supplying electricity into the Premises but not the Isolated System, resulting in a Non-export configuration (also referred to as Vehicle-to-Building or V2B); or
b. the EVSE is capable of Export into the Isolated System, resulting in either a full- or Partial-export configuration (also referred to as Vehicle-to-Grid or V2G); or
c. the EVSE being installed has the capability to supply electricity into either the Premises or the Isolated System.

Where an EVSE is capable of either supplying electricity into the Premises or Export to the Isolated System, its nameplate rating shall be counted toward the ESS inverter capacity for the purposes of determining maximum system capacity as per Section 4.3 of this Standard.

Note: An EV coupled with EVSE capable of supplying electricity into the Premises or Isolated System is a type of energy storage system however is excluded from the scope of AS/NZS 5139.

4.5.3 Inverter Power Sharing Device (IPSD)

The following requirements apply for the use of Inverter Power Sharing Device (IPSD) on Premises with multiple electrical installations:

a. The IPSD shall not interfere with the safety, functional and performance requirements for an IES conforming with AS/NZS 4777.2.
b. IPSD shall be installed in compliance with AS/NZS 4777.1.
c. The design and implementation of the IPSD installation shall be completed under the engineering supervision of an RPEQ.

4.6 Network connection and isolation

Requirements for connecting to the Isolated System, including any isolation requirements, shall be in accordance with AS/NZS 4777.1.

In addition, the following conditions shall apply:

[6] Nameplate rating for any inverter shall be based on the maximum continuous rating of the inverter throughout this Standard

a. mechanical isolation shall be in accordance with AS/NZS 3000 including that the isolator must always be readily accessible;
b. any means of isolation (where lockable) shall be able to be locked in the open position only.

4.6.1 Changeover switches

Any Small IES Unit connected behind a Break-before-make switch, that is, it isolates the changeover circuit when transferring between a Grid Connected supply to Generation supply, will be considered as an Off-grid inverter.

The following shall be considered as Grid Connected Small IES Units and will be required to comply with the requirements of this Standard:

a. a Small IES Unit connected behind a Make-before-break switch that results in a momentary, or longer, connection between grid supply and Generation supply circuits when performing a changeover.
b. a multiple mode inverter with uninterruptible power supply (UPS) mode functionality that is Grid Connected but also supplies an Off-grid circuit.

4.7 Earthing

The earthing requirements shall include:

a. for IES and EV and EVSE capable of supplying electricity, earthing requirements shall be as per AS/NZS 4777.1 and AS/NZS 3000;
b. for battery ESS, earthing requirements shall be as per AS/NZS 5139 and AS/NZS 3000.

4.8 Protection

4.8.1 Inverter integrated protection

The inverter integrated protection requirements for inverters connected to the Isolated System shall comply with AS/NZS 4777.1 and AS/NZS 4777.2.

Active Anti-islanding Protection requirements shall apply as per AS/NZS 4777.2.

Inverters shall be set to the values given in Table 13 of this Standard, which is consistent with the passive Anti-islanding Protection requirements in Table 4.1 and Table 4.2 from AS/NZS 4777.2.

Table 13 Prescribed Inverter Settings

Parameter	Settings	Trip delay time	Maximum disconnection time
Undervoltage 2 (V<<)	70 V	1 s	2 s
Undervoltage 1 (V<)	180 V	10 s	11 s
Overvoltage 1 (V>)	265 V	1 s	2 s
Overvoltage 2 (V>>)	275 V	—	0.2 s
Under-frequency (F<)	47 Hz	1 s	2 s
Over-frequency (F>)	52 Hz	—	0.2 s
Reconnect time	60 s	N/A	N/A

4.8.2 Interface Protection

This section has been left intentionally blank.

4.9 Operating voltage and frequency

The proposed installation shall be able to operate within the limits of supply voltage:

$V_{phase\text{-}to\text{-}neutral}$ = 230 V ±10%.

The maximum sustained voltage set point for Small IES, V_{nom_max} as per AS/NZS 4777.2, shall be set at 258 V.

The proposed Small IES Unit installation shall not cause more than 2% voltage rise at the Connection Point as per Clause 3.3.3 of AS/NZS 4777.1. Voltage rise is calculated from the a.c. terminals of the inverter or inverters to the Connection Point using a method contained in Clause 3.3.3 of AS/NZS 4777.1.

4.10 Metering

This section has been left intentionally blank.

4.11 Power quality

4.11.1 IES power quality response modes

The volt–var and volt–watt response modes specified in Clause 3.3.2.2 and Clause 3.3.2.3 of AS/NZS 4777.2 shall both be enabled as per below Table 14 and Table 15 for IES. For IES with energy storage the volt-watt response mode when charging, specified in Clause 3.4.3 of AS/NZS 4777.2, shall be enabled as per Table 16.

Table 14 Volt–var response mode settings

Reference	Voltage	Inverter reactive power level (Q) % of S_{rated}
V_{V1}	207 V	44% supplying[1]
V_{V2}	220 V	0%

V_{V3}	240 V	0%
V_{V4}	258 V	60% absorbing[1]

Note 1: Absorbing is when the Small IES Unit absorbs reactive power from the Isolated System and supplying is when the Small IES Unit acts as a source of reactive power into the Isolated System.

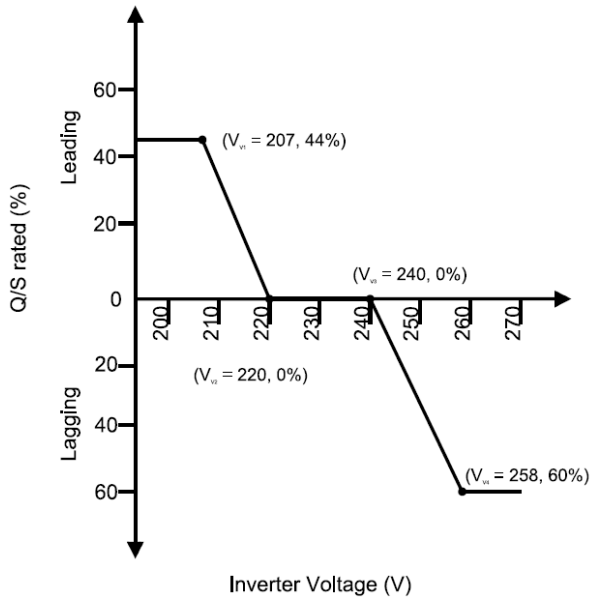

Figure 3 Volt-var response mode

Table 15 Volt-watt response mode settings

Reference	Voltage	Inverter maximum active power output level (P) % of S_{rated}
V_{W1}	253 V	100%
V_{W2}	260 V	20%

Note 1: Where P is the output power of the inverter and P_{rated} is the rated output power of the inverter.

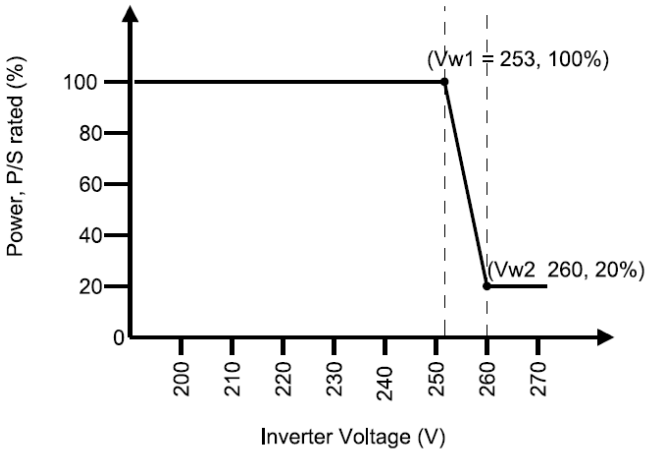

Figure 4: Volt-watt response mode

Table 16 Volt-watt response mode settings for inverters with energy storage when charging

Reference	Voltage	Power Input, $P_{charge}/P_{rated\text{-}ch}$ (%)
$V_{W1\text{-}ch}$	207 V	20%
$V_{W2\text{-}ch}$	215 V	100%

Power quality response modes shall commence and complete in accordance with their defined characteristics in Clause 3.3.2 and 3.4.3 in AS/NZS 4777.2 within the relevant times specified in Table 17 below:

Table 17 Maximum response time for power quality response modes

Response commencement time	Response completion time
1 s	10 s

4.11.2 Disturbance issues

Disturbance to the LV network shall be assessed against SA/SNZ TR IEC 61000.3.14.

Measurement of voltage disturbances shall be as described in AS/NZS 61000.4.30 using Class A instruments.

4.12 Communications systems

4.12.1 General

A Dynamic Small IES shall support the sending and receiving of information to the DNSP with communication systems that meets the following requirements:

a. connection of the Dynamic Small IES to the public internet; and
b. compliance with SEP2 using CSIP-AUS.

4.12.2 Connection of communication system

The communication systems for a Dynamic Small IES shall be met by one of the following methods of connection for information exchange via SEP2 using CSIP-AUS:

a. direct connection of an EG Unit; or
b. third-party device which communicates with the EG Unit(s); or
c. cloud based vendor which communicates with the EG Unit(s).

For installations of Dynamic Small IES Systems with multiple EG Units for which the communication system cannot support communication with all the installed EG Units, the EG Unit(s) installed prior to 23 February 2025 that cannot be communicated with must be set to non-export and non-import. If an inverter installed prior to 23 February 2025 is replaced or altered, the replaced or altered inverter must be capable of information exchange via SEP2 using CSIP-AUS.

4.12.3 Information exchange

The communications system shall be able to support sending and receiving information with the following frequency and capacity:

a. polling frequency of once per minute or better (i.e. polling at intervals of no greater than one minute); and
b. forecast information with thirty-second intervals for the next immediate quarter hour (30 events) for each of the following limits; dynamic Export limit, dynamic Import limit, dynamic Site Generation Limit and dynamic Site Load Limit (i.e. 120 events total).

4.13 Data and information

4.13.1 Static data and information

Static data and information shall be provided by the Proponent to the DNSP as per Appendix D: Static data and information (informative).

4.13.2 Dynamic data and information

Dynamic data and information that is required to be provided by the Proponent to the DNSP as per Appendix E: Dynamic data and information for Dynamic Small IES (informative).

4.14 Cybersecurity

This section has been left intentionally blank.

4.15 Technical Studies

Negotiated Small IES Dynamic EG Connections covered by this Standard may be required to undertake Technical Studies.

5 Fees and charges

Information regarding fees and charges applicable to Proponents is available at the following link:

Ergon Network: https://www.ergon.com.au/network/connections/residential-connections/connection-services-charges

6 Testing and commissioning

6.1 General

On-site testing and commissioning shall be undertaken in accordance with AS/NZS 4777.1, AS/NZS 3000, AS/NZS 5139 and AS/NZS 5033 (where applicable), the equipment manufacturer's specifications, and the DNSP's technical requirements to demonstrate that the Dynamic Small IES meets the requirements of the applicable Connection Contract. The tests shall be installation tests not type tests.

Commissioning tests for the inverter shall be in accordance with AS/NZS 4777, including:

a. operate the main switch (inverter) and verify the connection time is greater than 60 seconds;
b. isolate the main switch (grid) and verify the disconnect time is less than 2 seconds;
c. where Export Limiting Operation is required, disconnect Proponent's load and confirm Export to the grid does not exceed the approved limits.
d. For Dynamic Small IES, disconnect the internet connection to the inverter and verify that the Dynamic Small IES does not exceed the Fixed Default Dynamic Export Limit, Fixed Default Dynamic Import Limit, Fixed Default Dynamic Site Generation Limit and Fixed Default Dynamic Site Load Limit.

6.2 Commissioning of limits

A Dynamic Small IES shall be commissioned with its fixed default limits:

a. Fixed Default Dynamic Export Limit;
b. Fixed Default Dynamic Import Limit;
c. Fixed Default Dynamic Site Generation Limit; and
d. Fixed Default Dynamic Site Load Limit.

Limits for Export, Import, Site Generation and Site Load shall not be set above their respective fixed default limits by an installer or the Proponent.

To support Dynamic Limits being issued to the Dynamic Small IES by the DNSP:

a. the Dynamic Small IES shall be connected to the internet; and
b. Registration for the Premises with the DNSP, via the Registration System shall be completed by the Proponent.

6.3 Electromechanical meters

If the meter at the Premises is an electromechanical meter, the Proponent shall ensure that the Small IES Unit shall be left with DC isolators on and AC isolators off until the Proponent's electricity retailer has confirmed that the metering equipment at the Premises has been modified or reconfigured to comply with the Energy Laws. For all new connections and connection alterations, the Accredited Person shall ensure compliance of the IES and complete the compliance checklist in Appendix F, and a copy of this checklist shall be left on site for the DNSP's connection officers.

7 Operations and maintenance

7.1 Fixed Small IES

Fixed Small IESs shall be operated and maintained by the Proponent, to ensure compliance with their negotiated connection contract and all legislation, codes, and/or other regulatory requirements at all times.

The Proponent shall ensure that the Fixed Small IES and other systems and facilities at the Premises operate satisfactorily:

a. for the full range of variation of system parameters and characteristics; and
b. within the distortions and disturbances specified in these technical requirements.

The DNSP does not guarantee the operation of any customer appliances, including Small IES Units and their associated components. The Proponent shall take necessary steps to ensure their Small IES Unit operates as anticipated and adheres to their negotiated connection contract.

The DNSP may inspect Fixed Small IES at any time at the DNSP's expense.

7.2 Dynamic Small IES

Dynamic Small IESs shall be operated and maintained by the Proponent, to ensure compliance with their Connection Contract and all legislation, codes, and/or other regulatory requirements at all times.

The Proponent shall ensure that the Dynamic Small IES and other systems and facilities at the Premises operate satisfactorily:

a. for the full range of variation of system parameters and characteristics; and
b. within the distortions and disturbances specified in these technical requirements.

The DNSP does not guarantee the operation of any customer appliances, including Small IES Units and their associated components. The Proponent shall take necessary steps to ensure their Small IES Unit operates as anticipated and also adhere to their applicable Connection Contract.

The DNSP may inspect Dynamic Small IES at any time at the DNSP's expense.

7.2.1 Dynamic operation

A Dynamic Small IES shall be operated in fixed default limits or dynamic limits as per Table 18.

Table 18 Dynamic operation criteria

Operational function	Requirements
Fixed default limits	• Connection contract for a Dynamic Small IES. • Installed in compliance with this Standard.

Dynamic limits	• Connection contract for a Dynamic Small IES. • Installed in compliance with this Standard. • Registered to the DNSP IEEE SEP2 Utility Server. • Receive dynamic Export limits, dynamic Site Generation Limits, dynamic Import limits and dynamic Site Load Limits. • Operate Dynamic Small IES to meet dynamic Export limits, dynamic Site Generation Limits, dynamic Import limits and dynamic Site Load Limits.

Appendix A: Deviations from the National DER Connection Guidelines (informative)

There are no current National DER Connection Guidelines for dynamic connections or connections to Isolated Networks. This Standard has been developed in alignment with the framework of the National DER Grid Connection Guidelines for Small IES EG Connections.

Appendix B: Connection arrangement requirements (normative)

Following is a representation for a Small IES Unit installation as considered in this Standard.

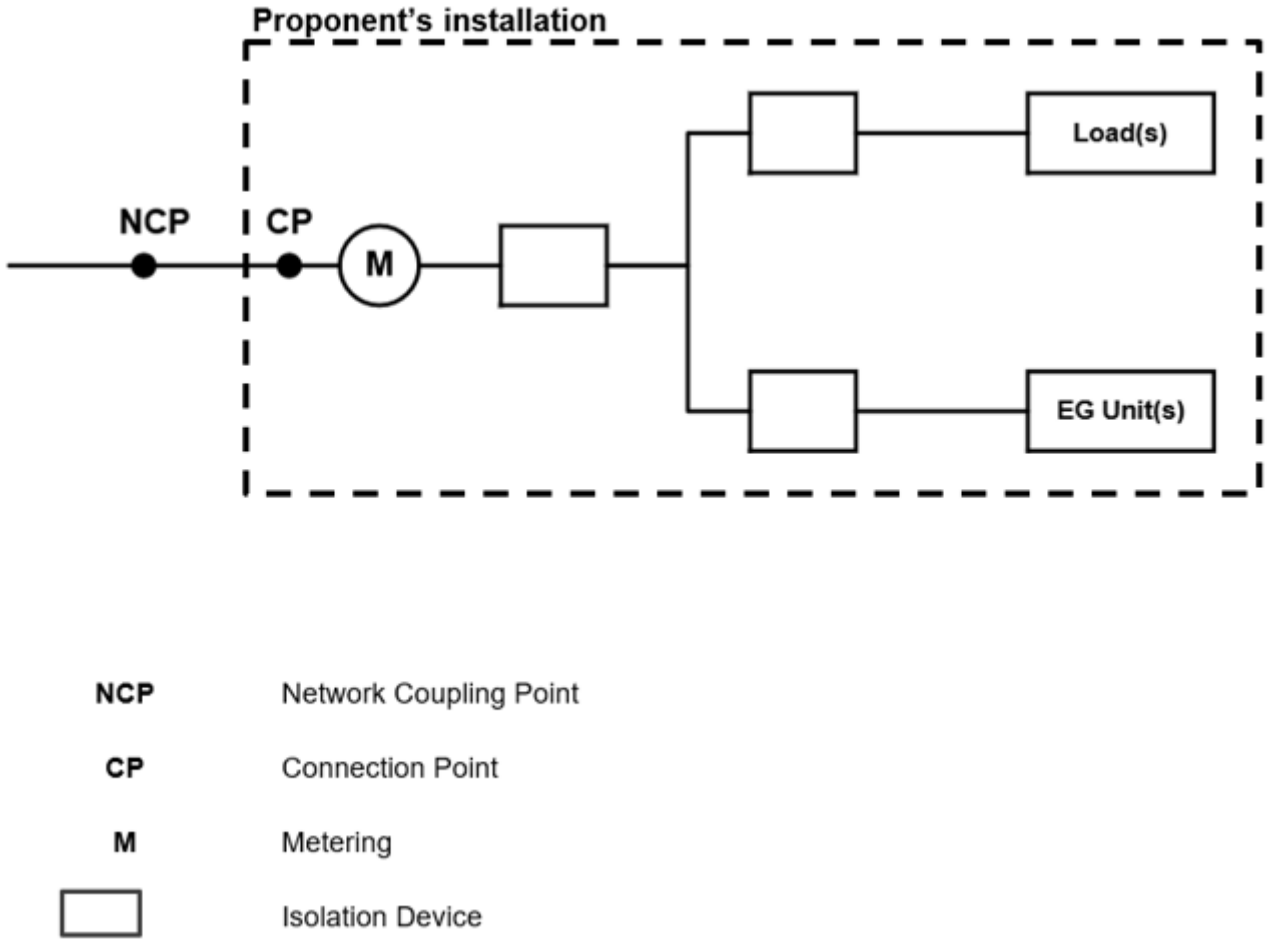

Figure 5: Small IES Dynamic EG Connection installation representation

Appendix C: Model Standing Offer (informative)

Model Standing Offers are not currently offered for Small IES connecting to Isolated Networks.

Appendix D: Static data and information (informative)

Static data and information shall be provided by the Proponent to the DNSP based on your application type and may include some of the following below (but not limited to):

1. NMI and physical meter number(s)
2. System information
    a. Detailed single line diagram demonstrating motors, large loads, EG Units connected, and proposed for connection, at the Premises (including detail of any interlocking).
    b. Number of phases available and number of phases DER installed
    c. Energy source(s).
    d. Maximum demand, capacity and output rating.
    e. Any proposed Export limit (Full / Partial- / Non-) and method of Export control
    f. Metering scheme information (gross or net)
3. Inverter
    a. Make, model and manufacturer
    b. Number installed
    c. Power quality modes
4. Other Device information
    a. Type (e.g. motor, pump, mill, chiller, panel, battery)
    b. Make, model and manufacturer
    c. Number installed
5. Applicant and Customer information
    a. Type.
    b. Full customer name or name of other legal entity capable of contracting with the DNSP.
    c. Retail Customer / Retail Account Holder.
    d. Address and contact information.
6. Electrical Contractor, RPEQ, Consultant and/or Installer information.
7. DER Registration information

Appendix E: Dynamic data and information for Dynamic Small IES (informative)

For Dynamic Small IES, dynamic data and information shall be provided by the Proponent to the DNSP or by the DNSP to the Proponent based on the application type and may include (but is not limited to) the following:

Table 19 Dynamic monitoring information via CSIP-AUS

Measurement	Data Qualifier	Site	DER[1]
Real Power (W/phase)	Average	Mandatory	Mandatory
Reactive Power (Var/phase)	Average	Mandatory	Mandatory
Voltage (V/phase)	Average	Mandatory	Optional

Note 1 – Measurements from Metering Mirror function set.

Note 2 – DER telemetry is total of aggregated actively managed devices.

Note 3 – At least one site or device voltage must be reported. Where site voltage is available, it must be reported.

Table 20 Dynamic control functions via CSIP-AUS

Category	Support Function	DER control requirements
Export limit	DERControlBase within the DERControl.	DERControlBase:csipaus:opModExpLimW (Watts)
Import limit	DERControlBase within the DERControl.	DERControlBase:csipaus:opModImpLimW
Site Load Limit	DERControlBase within the DERControl.	DERControlBase:csipaus:opModLoadLimW
Site Generation Limit	DERControlBase within the DERControl.	DERControlBase:csipaus:opModGenLimW and DERControl:opModEnergize
Forecasting[1]	Forecasting using DERControl	Using DERControl events
Loss of communications revert to fixed default limits	DefaultDERControl.	DefaultDERControl; and setGradW

Note 1 – Capable of supporting a minimum of thirty-second interval envelope events, polled every 60 seconds, for the next quarter hour, updated every minute under normal circumstances. (30 events per Connection Point per DER Control).

Appendix F: Compliance checklist (informative)

The purpose of this compliance checklist is to aid the Proponent with the design and commissioning of the Small IES Unit to ensure it meets the relevant requirements, as set out in this Standard.

Registration to the SEP2 Utility Server is required to support dynamic operation within dynamic Export and Import limits.

Table 21 General Inverter Settings

Parameter	Settings	Australia A Region
V_{nom_max}	258 V	Default 'Australia A' region settings
Volt-var settings (refer to Table 14)	V_{V1} = 207 V; 44% supplying V_{V2} = 220 V; 0% V_{V3} = 240 V; 0% V_{V4} = 258 V; 60% absorbing	
Volt-watt settings (refer to Table 15)	V_{W1} = 253 V; 100% V_{W2} = 260 V; 20%	
Volt-watt settings for energy storage when charging (refer to Table 16)	$V_{W1\text{-}ch}$ = 207 V; 20% $V_{W2\text{-}ch}$ = 215 V; 100%	
Reconnect time	60 seconds	

Table 22 Disconnection Times

Parameter	Settings	Trip Time Delay	Maximum Disconnection Time	Australia A Region
Undervoltage 2 (V<<)	70 V	1 s	2 s	Default 'Australia A' region settings
Undervoltage 1 (V<)	180 V	10 s	11 s	
Overvoltage 1 (V>)	265 V	1 s	2 s	
Overvoltage 2 (V>>)	275 V	-	0.2 s	
Underfrequency (F<)	47 Hz	1 s	2 s	
Overfrequency (F>)	`52 Hz	-	0.2 s	

Table 23 Power Limiting Settings

Parameter	Settings
Export Power Limit	As approved
Maximum response time	15 s

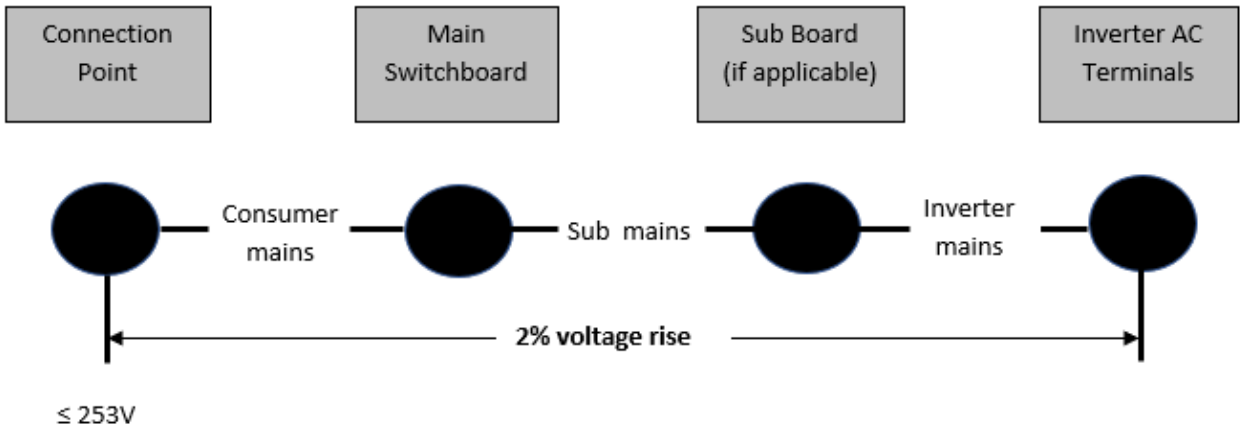

Figure 6 Voltage Rise Calculation Diagram

Table 24 Calculated voltage rise

Voltage rise	Consumer mains	Submains	Inverter mains	Total voltage rise
Calculated (V)				
Percentage (%)				

Appendix G: Small IES EG Connection types (informative)

G.1: Small IES Fixed EG Connection types

Table 25 Connection types - Small IES Fixed EG Connections to Ergon Network Isolated System

Connection types[1]	System capacity	Export limit	Contract type
Single-phase	≤ 10 kVA	≤ 5 kW	Negotiated
Two-phase	≤ 5 kVA PV & ≤ 5 kVA ESS per phase[2]	≤ 5 kW per phase	Negotiated
Three-phase	≤ 10 kVA per phase[2]	≤ 5 kW per phase	Negotiated
SWER Single-phase	≤ 10 kVA	≤ 2 kW	Negotiated
SWER Split-phase	≤ 5 kVA PV & ≤ 5 kVA ESS per phase[2]	≤ 2 kW	Negotiated

Note 1: Excludes Premises with more than one LV Connection Point and where a Proponent is seeking connection to network(s) connected to more than one LV connection Point.

Note 2: Multiple-phase EG Systems have phase balance requirements as per Section 4.4.7.

G.2: Small IES Dynamic EG Connection types

Table 26 Connection types - Small IES Dynamic EG Connections to Ergon Network LV Isolated System

Connection types[1]		Capacity	Export		Import[4]		Site Generation		Site Load		Contract type
		Maximum capacity limit where dynamic operation is enabled	Fixed Default Dynamic Export Limit[3]	Maximum dynamic Export limit	Fixed Default Dynamic Import Limit	Maximum dynamic Import limit	Fixed Default Dynamic Site Generation Limit	Maximum dynamic Site Generation Limit	Fixed Default Dynamic Site Load Limit[5]	Maximum dynamic Site Load Limit[5]	
Single-phase		≤ 10 kVA PV & ≤ 10 kVA ESS	0 kW	10 kW	1.5 kW	18 kW	0 kW	10 kW	1.5 kW	18 kW	Negotiated
Two-phase		≤ 5 kVA PV & ≤ 5 kVA ESS per phase[2]	0 kW	10 kW per phase[2]	1.5 kW	10 kW per phase[2]	0 kW	10 kW per phase	1.5 kW	10 kW per phase	Negotiated
Three-phase		≤ 10 kVA per phase[2]	0 kW	10 kW per phase[2]	1.5 kW	10 kW per phase[2]	0 kW	10 kW per phase	1.5 kW	10 kW per phase	Negotiated
SWER	Single-phase	≤ 15 kVA PV & ≤ 15 kVA ESS	0 kW	≤ 10 kW	1.5 kW	10 kW	0 kW	10 kW	1.5 kW	10 kW	Negotiated
SWER	Split-phase	≤ 5 kVA PV & ≤ 5 kVA ESS per phase[2]	0 kW	≤ 10 kW per phase[2]	1.5 kW	10 kW per phase[2]	0 kW	10 kW per phase	1.5 kW	10 kW per phase	Negotiated

Note 1: These limits shall be considered applicable to the aggregate of all Small IES Dynamic Connections at a Premises, including Premises with more than one LV Connection Point and where a Proponent is seeking connection to the Isolated System at more than one LV Connection Point.

Note 2: Multiphase EG Systems have phase balance requirements as per Section 4.4.7.

Note 3: Fixed Default Dynamic Export Limits are as per Sections 4.4.1.1 and 4.4.1.2.

Note 4: Total Import limit by a Proponent at the Connection Point shall meet the requirements of a Proponent's network Connection Contract for supply. The operation of Import limits shall not enable a Proponent to exceed the maximum supply limits for the Premises under the applicable Connection Contract.

Note 5: Only applies to actively managed loads (such as ESS) covered under the dynamic connection agreement; see definition of Site Load Limit.

Appendix H: Output Smoothing (normative)

H.1 Overview

H.1.1: Purpose

The object of this Appendix is to provide Proponents of Small IES Units with additional information about their obligations (over and above those set out in the main body of this Standard) in respect of connecting to, and interfacing with, certain Isolated Networks in situations when those Isolated Networks have reached their Unmanaged Hosting Capacity and the Isolated Network does not support dynamic (IEEE2030.5 SEP2) solar PV connections. Any new Small IES Units connecting to such networks must be equipped with Output Smoothing which is compliant with this Appendix H (principally, to smooth generation output) so that their operation will not adversely affect the continued security and stability of the relevant Isolated Network.

The communities that are supplied by Isolated Networks and do not support dynamic (IEEE2030.5 SEP2) solar PV connections are listed on Ergon Network's Isolated Networks Solar Capacity Page.

H.1.2: Scope

This Appendix supplements the main body of this Standard, and applies to the connection of Small IES Units in any of the Affected Isolated Networks (being those Isolated Networks that have reached their Unmanaged Hosting Capacity) where Ergon Network is not yet able to make available an offer for Small IES Dynamic EG Connections. This is achieved through effective Output Smoothing to maintain stability of the Isolated Network and the relevant power station. Small IES Units required to comply with this Appendix H are classed as a sub-type of Small IES Fixed EG Connections.

H.1.3: Disclaimers

We are not responsible or liable for any loss, damage, cost or expense users might incur as a result of the use of, or reliance on, any of the material contained in this Appendix.

H.2: Introduction

Please refer to Section 4.1 and H.1 for an introduction and background to Output Smoothing.

H.3: General Requirements

A Proponent required to comply with the additional requirements of this Appendix H (Output Smoothing) must also comply with the requirements of this Standard for Small IES Fixed EG Connections, as well as other applicable Ergon Network and Australian Standards in respect of any Small IES Unit connections to an Affected Isolated Network.

Ergon Network may, in its absolute discretion and without limiting any of its other rights, reject an application or disconnect a Proponent from the Affected Isolated Network if the Proponent's installation does not comply, or, no longer complies with, all the requirements of this Appendix H if the Connection Contract requires compliance with Appendix H.

The cases in which compliance with Appendix H is required by a Proponent is described in Section 4.1.2 and is illustrated as one of the outcomes from the Small IES Unit connection assessment process illustrated in Figure 2.

H.3.1: Documentation

The following additional documentation must be supplied by the Proponent as part of an application to connect:

- Compliance checklist;
- System and circuit diagrams; and
- Registered Professional Engineer of Queensland (RPEQ) sign-off.

The above diagrams must include the following elements:

- A point of connection to Ergon Network's Isolated Network
- Details of the electrical installation, including the Small IES Unit installation, switchboards, Proponent loads and meters.
- Details of the installation, including, but not limited to, the following elements:
    - Generation sources;
    - Inverters;
    - ESS (i.e. batteries and energy management system); and
    - Any associated auxiliary, control or monitoring equipment.

Ergon Network may request additional information needed to perform an impact assessment or to demonstrate that the Proponent's proposed installation meets the requirements of this Appendix.

H.3.2: RPEQ sign-off

For all Small IES Units with Output Smoothing, an RPEQ must validate and certify that the design of the Small IES Units with Output Smoothing is compliant with the requirements of this Appendix H. Refer to Appendix J for an example RPEQ sign-off template. A RPEQ sign-off will be valid for more than one Small IES Fixed Connection (comprising Small IES Unit(s) with Output Smoothing) provided that the IES the subject of the connection application replicate the following details from the RPEQ certified design:

- Make and model of inverters;
- System diagram;
- Circuit diagram (changes to protection and cable sizes permitted);
- Electrical arrangement of the installation;
- Changes to firmware that affect compliance with this Appendix;
- Changes to equipment that affect compliance with this Appendix; and
- Changes to the type of technology or methodology used to achieve compliance with this Appendix.

Where a previous RPEQ sign-off is being submitted as part of an application to connect by a Proponent, the Proponent must include a letter in the form set out in Appendix K that specifies the project and date of the RPEQ reference design and confirms that the IES the subject of the connection application is the same as the IES that was certified by the RPEQ in the above respects.

H.4: Technical requirements

Figure 2 outlines the process flow chart used by Ergon Network when assessing proposed Small IES Unit connections to Isolated Networks. This Appendix sets out additional requirements that apply to Small IES Units to be connected to Isolated Networks that have reached the limits of their Unmanaged Hosting Capacity (that is, Affected Isolated Networks), where there is available Managed Hosting Capacity but not yet availability of Small IES Dynamic EG Connections. Due to minimum loading of baseload diesel generation and other technical requirements, Managed Hosting Capacity is finite and its availability is location-dependent.

Note that Ergon Network reserves the right to require remote control of Small IES Units for installations with Output Smoothing. The specifics of control are to be determined through negotiation.

Note: No direct connection is permitted between a Proponent's Small IES Unit installation and the Proponent's final loads. Connection must be made via the switchboard.

H.4.1: Export capable and non-export installations

The requirements of this Appendix apply to both export- and non-export-capable Small IES Unit installations, unless otherwise specified.

Non-exporting Small IES Unit installations are required to have Output Smoothing (refer to Section H.4.4) to be eligible for the allocation of Managed Hosting Capacity. This is to maintain the stability of Affected Isolated Networks during cloud events, and to ensure reliable electricity supply in these networks. Rapid change in load can lead to instability of isolated power stations, regardless of whether the installation is non-export- or export-capable.

H.4.2: Export only for energy storage systems

The Proponent's Small IES Unit installation must not be capable of importing power from the Ergon Network Isolated Network to charge ESSs. The installation must also be resistant to tampering that would enable energy storage to be charged from the Isolated Network. Ergon Network reserves the right to exclude an inverter make and model from connection if it considers that the method to prevent energy import is not satisfactory.

H.4.3: Permission to export

The inverter must be prevented from supplying the Proponent's loads or exporting power to the Isolated Network at all times unless the ESS has sufficient energy stored to meet the ramp rate requirements described in Section H.4.4.

H.4.4: Output Smoothing requirements

The method of Generation Management covered by this Appendix is Output Smoothing. This requires the Proponent to install an ESS that releases energy back into the Isolated Network to mitigate sharp changes in output of the Small IES Units, as shown in Figure 7. This allows sufficient time for Ergon Network to ramp up generation to cover a loss of output from customer generation.

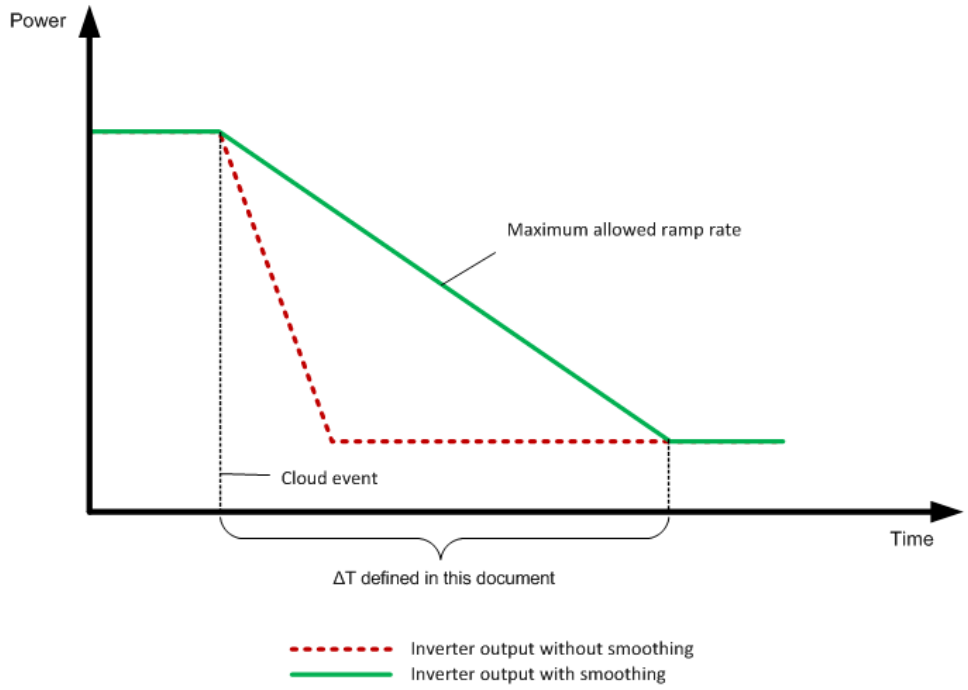

Figure 7: Concept of inverter output smoothing

Note: that this Appendix defines the required output behaviour of the system. The control methodology, system, type and capacity of the ESS are determined by the Proponent.

H.4.4.1: Ramp down time

All installations that require Output Smoothing must have a ramp down time (being the time taken for the inverter to ramp down from its rated output value to 0 kW) of 720 seconds. This is to mitigate a sudden decrease in the output of Small IES Units, and to enable the isolated power system to adjust to a change in load.

It is expected that under this scenario the ESS will be discharging to maintain the defined ramp down rate. Output smoothing is required when the ramp down rate of the Small IES Unit generation source exceeds the rate defined as:

$$R_{down} = \frac{Nominal\ Inverter\ Rating}{Ramp\ Down\ Time}$$

H.4.4.2: Ramp up time

All installations that require Output Smoothing must have a ramp up time (being the time taken for the inverter to ramp up from 0 kW to its rated output value) of at least 360 seconds. This is to mitigate a sudden increase in the output of Small IES Unit installation and enable the isolated power system to adjust to a change in output.

It is expected that this action will be achieved by either charging the ESS, curtailing some of the output of the Small IES Unit installation, or both, to maintain the required ramp up rate. Output Smoothing is required when the ramp up rate of the Small IES Unit generation source exceeds the rate defined as:

$$R_{up} = \frac{Nominal\ Inverter\ Rating}{Ramp\ Up\ Time}$$

H.4.4.3: Selection of Energy Storage System

Note: that the requirements set out in this Appendix describe the behaviour of the output of the inverter only. The rating, type, equipment and control algorithms required for the ESS to achieve these requirements are up to the Proponent to determine.

H.4.4.4: Compliance

Note: that the Proponent's installation is considered to have met the ramp down requirements if it passes the ramp down test described in Section H.4.5. Ergon Network needs to ensure that the installation complies with the ramp rate requirements set out in this Appendix. This is achieved through validation by a RPEQ that the Small IES Unit smoothing system meets the requirements specified in this Appendix.

The inverter must be prevented from exporting power or supplying the Proponent's loads until the ESS has sufficient energy stored to meet the ramp rate requirements described in this Appendix.

ESSs must be resistant to tampering, to prevent any changes that might render the system non-compliant with Ergon Network's ramp rate requirements. Ergon Network reserves the right at its absolute discretion to perform testing, request additional evidence of compliance and disconnect the Small IES Unit installation until sufficient evidence of compliance is provided.

H.4.5: Testing

Both of the following methods of evaluating functionality of the ESS are to be provided:

1) Self-test function.

   Test sequence (described in Sections H.4.5.1 to H.4.6) is initiated by the system. The means of activating the sequence manually is also to be provided via a push button, menu selection or other means, and is to be accessible by Ergon Network.

2) Energy storage health indicator

   An indicator that guarantees the health of the battery system and shows there is sufficient capacity in the battery system to perform the ramp down test. This indicator must be clearly visible in the meter box. Output of the inverter is to be displayed. For non-exporting systems, total Proponent load is also to be indicated.

H.4.5.1: Testing procedure

The following process is to be followed at all times when a ramp down test is performed (including automatic self-tests):

1) Measure and record the inverter output power prior to commencement of the test. The output of the inverter must be at least 60% of the nominal inverter rating at the time of commencement of the test. For non-exporting systems, the Proponent's loads must exceed the output of the inverter throughout the test for the result to be considered valid.
2) Isolate the generation source (e.g. solar PV) from the rest of the Small IES Unit installation.
3) Measure and record power output of the inverter at points in time identified in Table 27.

   P_0 – output of the inverter at the beginning of the testing sequence.

Note: power measurements are to be accurate within 4%. Measurements that lie outside of the pass bounds but within measurement uncertainty bounds will be considered passed.

T_d – ramp down time, as defined in Section H.4.4.1.

Table 27: Output measurements for the testing procedure

Time of measurement (seconds)	Required inverter output	Margin of error
$\frac{1}{5}T_d$	$\frac{4}{5}P_0$	±10%
$\frac{2}{5}T_d$	$\frac{3}{5}P_0$	
$\frac{3}{5}T_d$	$\frac{2}{5}P_0$	
$\frac{4}{5}T_d$	$\frac{1}{5}P_0$	
T_d	0	

4) If the measured values meet the requirements outlined in Table 27, then the Small IES Unit installation passes the test. Otherwise, it fails the test.
5) Indicate the result of the test and perform the relevant control action listed in Table 28:

Table 28: Control Actions

Result of the test	Control actions
Passed	Allow the inverter to connect, or remain connected, to the network.
Failed	Disconnect the inverter from the network.

6) Reconnect the Small IES Unit generation source to the rest of the Proponent's installation.

H.4.5.2: Temporary reconnection for testing

If the Small IES Unit installation fails the ramp down test, the system must wait at least 24 hours before reconnecting the Small IES Unit installation to the network for the purpose of performing the ramp down test. This reconnection is a temporary connection only for testing purposes.

If, after a maximum of 3 attempts, the test is not passed, the inverter is to remain permanently disconnected from the network. Reconnection by the Proponent is to be prevented by software interlock or other method.

H.4.5.3: Recording of Data

Data associated with the previous 12 ramp down tests is to be stored, and prevented from tampering that would allow the test results to be erased. The data is to include:

- date and time of test;
- P_0 output of the inverter prior at the commencement of the test;
- times of measurement (to resolution of seconds);
- inverter output measurement values; and
- results of the test: pass or fail.

H.4.6: Frequency of testing

Ergon Network requires evidence that ramp down self-tests (as described in Section H.4.5.1) will be automatically performed on a regular basis in accordance with the frequency of testing requirements outlined in Table 29.

If the ramp down test is not performed within the prescribed timeframes, the Small IES Unit installation must automatically disconnect from the network until the testing procedure outlined in section H.4.5.1 has been performed and the ramp down requirements are met.

Table 29: Frequency of testing

Type	Inverter rating	Minimum self-test frequency requirements
Automatic self-test	Less than or equal to 10 kW	Every 12 months
	Greater than 10 kW	Every 6 months
Manually activated self-test	All sizes	Upon request from Ergon Network

H.4.7: Commissioning

Commissioning and verification must be in accordance with all applicable standards. A ramp down test is to be performed after the installation is commissioned and prior to its use. Ergon Network reserves the right to witness commissioning, or request evidence of commissioning results, prior to granting final approval.

Appendix I: Compliance checklist for Output Smoothing (informative)

Description	Applicable sections	Complies	Comments
General requirements - system and circuit diagrams	Appendix H.3.1: Documentation	☐	
General requirements - RPEQ sign-off	Appendix H.3.2: RPEQ sign-off	☐	
General technical requirements - export only for ESSs	Appendix H.4.2: Export only for energy storage systems	☐	
General technical requirements - permission to export	Appendix H.4.3: Permission to export	☐	
Smoothing requirements – ramp down time	Appendix H.4.4.1: Ramp down time	☐	
Smoothing requirements – ramp up time	Appendix H.4.4.2: Ramp up time	☐	
Testing – testing procedure	Appendix H.4.5.1: Testing procedure	☐	
Testing – recording of data	Appendix H.4.5.3: Recording of Data	☐	
Testing – frequency of testing	Appendix H.4.6: Frequency of testing	☐	
Commissioning	Appendix H.4.7: Commissioning	☐	

Appendix J: RPEQ sign-off templates for Output Smoothing (informative)

New reference design

Ergon Energy Network

420 Flinders Street

Townsville QLD 4810

National Metering Identifier for the installation: <NMI>

<Date>

Subject: Connection of Small IES Unit with Output Smoothing – NMI: < National Metering Identifier>, <Installation Site Address>

Please find attached our submission for the above installation.

This letter is to certify that as a Registered Professional Engineer of Queensland the submission documentation provided together with this letter complies with the requirements of Appendix H of STNW3514 “Standard for Small IES Connections to Isolated Networks” <state latest revision>.

The following documentation has also been submitted as part of the application:

- Compliance checklist
- System diagram
- Circuit diagrams

Regards,

<Full name of the RPEQ>

<Registration number>

<Professional title>

<Company name>

<Company address>

<Contact details (including phone, email and postal addresses)>

Appendix K: Reused reference design for Output Smoothing (informative)

Ergon Energy Network

420 Flinders Street

Townsville QLD 4810

National Metering Identifier for the installation: <NMI>

<Date>

Subject: Connection of Small IES Unit with Output Smoothing – NMI: < National Metering Identifier>, <Installation Site Address>

Please find attached our submission for the above installation.

As part of this submission we make reference to the RPEQ sign-off dated <date> for an IES reference design that is attached to this connection application (RPEQ Certified Design). We confirm that the design of the IES installation the subject of this connection application located at <Installation Site Address>, NMI <NMI> dated <Date> replicates the key elements of the RPEQ Certified Design without alteration (in accordance with Item H.3.2 of Appendix H of STNW3514 “Standard for Small IES Connections to Isolated Networks” <state latest revision>).

The following documentation is also attached in support of the connection application as required by the Standard:

- Compliance checklist
- System diagram
- Circuit diagrams

Regards,

<Full name>

<Professional title>

<Company name>

<Company address>

<Contact details (including phone, email and postal addresses)>

Part of Energy Queensland

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