Electricity Engineers' Association

HEALTH & SAFETY
ASSET MANAGEMENT
PROFESSIONAL DEVELOPMENT

EEA – Update

- Practice note
- AS/NZS 4777.2

EEA.CO.NZ

Electricity Engineers' Association (EEA)

- An industry NFP organisation representing members and stakeholders in the electricity supply industry (ESI).
- Supporting safe, sustainable and reliable delivery of electricity to New Zealanders.
- An advocate, knowledge hub, and 'go to' body on ESI *safety, engineering/technical, asset management, professional development, and emerging technologies*.
- Helping industry recognise, understand and manage risks and opportunities.
- Providing common industry guides.

Electricity Authority- Practice Note

Part 1A recommendation for integration of hosting capacity in connection and operation standards – Practice note

Scope

- Practice note applies to connection applications made **under the Part 1A process only.**

Purpose

a) Provide guidance and consistency, and ensure inverters are setup and installed in a safe manner for the network, owners and public.

b) Distributors and suppliers / installers when connecting inverter equipment to the LV network to ensure:
   I. consistent equipment achieves the correct standards,
   II. equipment settings are consistent for LV networks,
   III. all information is provided to distributors.

c) Distributors include all information when developing their connection and operation standards, to ensure:
   I. efficient processing of small-scale distributed generation connection applications,
   II. maintenance of a safe and reliable supply of electricity to all consumers connected to low voltage distribution networks,
   III. a consistent approach across distributors' connection and operations standards

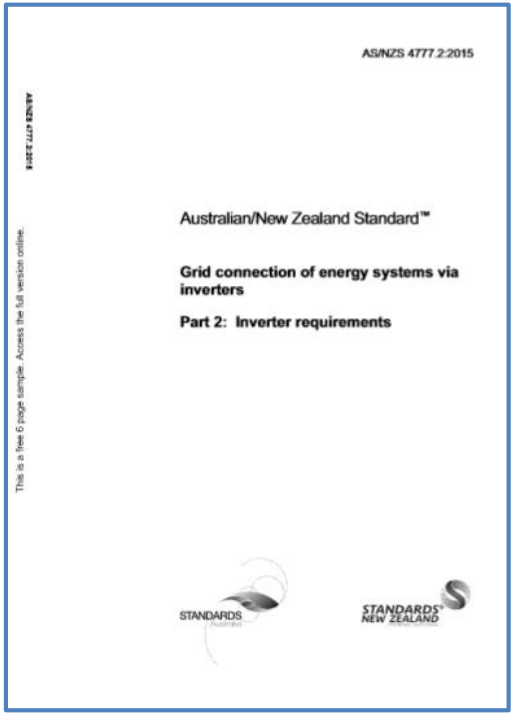
Electricity Authority- Practice Note

Part 1A recommendation for integration of hosting capacity in connection and operation standards – Practice note

Contents

- Information for applicants
    - Standard information required
    - Inverter setting
    - Commissioning information
- Connection & Operations standard settings
    - Volt- Var
    - Volt-watt
    - Protection functions
    - Passive anti-islanding
    - Frequency
- Congestion management
- Maximum export threshold

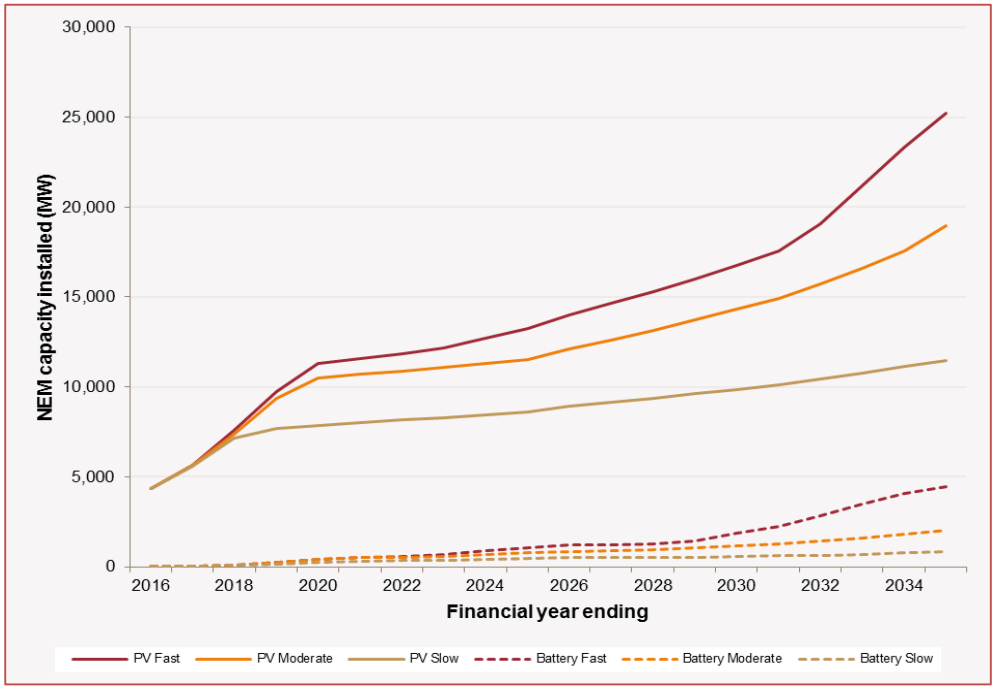
AS/NZS 4777.2 Grid Connection or Energy Systems Via Inverters – Proposed changes



The scope of the Standard:
This Standard specifies requirements and tests for low voltage inverters for the injection of electric power through an electrical installation into the grid at low voltage. This Standard applies to inverters that have power flow in either direction between the energy source and the grid.

Proposing a revision to the scope to provide clarity:
This standard specifies device specifications, functionality, compliance and performance testing for inverters designed to facilitate connectivity between energy sources and/or energy storage systems and the grid, connected at low voltage. This includes electric vehicles operating in a vehicle to grid mode.

Australian DER penetrations



Stage 1
(Review AS4777.2:2015)

- Disturbance withstand capability
- Power Quality modes
- Protection and Control Functionality (incl Frequency response)
- Compliance

Stage 2

- Orchestration and Interoperability
- Cyber Security

Stage 3

- Coverage and Applicability

Power Quality Modes: Volt-Var & Volt-Watt

Volt-Var and Volt-Watt

- Default enablement
- Consider smaller deadbands and settings aligned with international standards and system need
- Increase bands to share work more evenly

Proposed changes are intended to:

- Provide an autonomous response to local voltage management issues and maintain the grid within required limits,
- Increase inverter hosting capacity of distribution network feeders.

Table 3.6 *(continued)*

Region	Default value	V_{W1}	V_{W2}
Australia B	Voltage	250 V	260 V
	Inverter maximum active power output level (P) % of S_{rated}	100 %	20 %
Australia C	Voltage	253 V	260 V
	Inverter maximum active power output level (P) % of S_{rated}	100 %	20 %
New Zealand	Voltage	241 V	246 V
	Inverter maximum active power output level (P) % of S_{rated}	100 %	20 %
Allowed range	Voltage	235 to 255 V	240 to 265 V
	Inverter maximum active power output level (P) % of S_{rated}	100 %	0 % to 20 %

NOTE Australia A parameter set is intended for application in large interconnected power systems. Australia B parameter set is intended for application in small interconnected power systems. Australia C parameter set is intended for application in isolated or remote power systems.

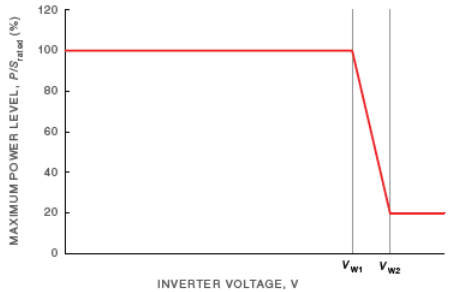


Figure 3.1 — Example curve for the volt–watt response mode

Power Quality Modes: Volt-Var & Volt-Watt

Table 3.7 — Volt–var response set-point values

Region	Default value	V_{V1}	V_{V2}	V_{V3}	V_{V4}
Australia A	Voltage	207 V	220 V	240 V	258 V
	Inverter reactive power level (Q) % of S_{rated}	44 % supplying	0 %	0 %	60 % absorbing
Australia B	Voltage	205 V	220 V	235 V	255 V
	Inverter reactive power level (Q) % of S_{rated}	30 % supplying	0 %	0 %	40 % absorbing
Australia C	Voltage	215 V	230 V	240 V	255 V
	Inverter reactive power level (Q) % of S_{rated}	44 % supplying	0 %	0 %	60 % absorbing
New Zealand	Voltage	207 V	220 V	235 V	244 V
	Inverter reactive power level (Q) % of S_{rated}	60 % supplying	0 %	0 %	60 % absorbing
Allowed Range	Voltage	180 to 230 V	180 to 230 V	230 to 265 V	230 to 265 V
	Inverter reactive power level (Q) % of S_{rated}	30 to 60 % supplying	0 %	0 %	30 to 60 % absorbing

NOTE 1 Inverters may operate at a reactive power level with a range up to 100 % supplying or absorbing.

NOTE 2 Australia A parameter set is intended for application in large interconnected power systems. Australia B parameter set is intended for application in small interconnected power systems. Australia C parameter set is intended for application in isolated or remote power systems.

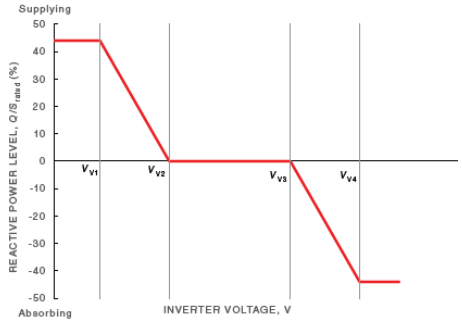


Figure 3.2 — Example curve for the volt–var control mode

Table 3.8 — Volt–watt response set-point values for multiple mode inverters with energy storage when charging

Region	Default value	$V_{W1\text{-}ch}$	$V_{W2\text{-}ch}$
Australia A	Voltage	207 V	215 V
	$P_{charge}/P_{rated\text{-}ch}$	0 %	100 %
Australia B	Voltage	195 V	215 V
	$P_{charge}/P_{rated\text{-}ch}$	0 %	100 %
Australia C	Voltage	207 V	215 V
	$P_{charge}/P_{rated\text{-}ch}$	0 %	100 %
New Zealand	Voltage	216 V	224 V
	$P_{charge}/P_{rated\text{-}ch}$	0 %	100 %
Allowed Range	Voltage	180 to 230 V	180 to 230 V
	$P_{charge}/P_{rated\text{-}ch}$	0 to 20 %	100 %

NOTE 1 P_{charge} refers to power input level through the grid-interactive port.

NOTE 2 $P_{rated\text{-}ch}$ refers to the rated active power input through the grid-interactive port used for charging the energy storage.

Power Quality Modes: Frequency Response

Frequency response

- Specify required response times
- Specify extended response to extreme over and under frequency events from storage systems
- Require under frequency response from curtailed inverters

Proposed changes are intended to:

- Provide an autonomous response to frequency to maintain the grid within required limits,
- Ensure inverters do not exacerbate disturbances and help to manage their response.

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Table 4.5 — Frequency response limits

Inverter response	Decrease in frequency response limits (see Note 1)		Increase in frequency response limits (see Note 2)	
	Frequency where power output level is maximum (f_{Pmax}) Hz	Frequency where charging power level is zero (see Note 3) ($f_{stop-ch}$) Hz	Frequency where discharging power level is zero (see Note 3) ($f_{transition}$) Hz	Frequency where power level is minimum (f_{Pmin}) Hz
Range	47 to 49	48 to 49.5	50.5 to 52	51 to 53
Australia A	48	49	50.75	52
Australia B	48	49	50.75	52

Table 4.5 *(continued)*

Inverter response	Decrease in frequency response limits (see Note 1)		Increase in frequency response limits (see Note 2)	
	Frequency where power output level is maximum (f_{Pmax}) Hz	Frequency where charging power level is zero (see Note 3) ($f_{stop-ch}$) Hz	Frequency where discharging power level is zero (see Note 3) ($f_{transition}$) Hz	Frequency where power level is minimum (f_{Pmin}) Hz
Australia C	47	48.25	51.75	53
New Zealand	48	49	51	52
NOTE 1 For decrease in frequency response refer to Clause 4.5.3.2				
NOTE 2 For increase in frequency response refer to Clause 4.5.3.3				
NOTE 3 This refers to multiple mode inverters with energy storage.				

DRAFT

AS/NZS 4777.2 2020 Grid connection of energy systems via inverters, Part 2 Inverter requirements

- EL-042 *Renewable Energy Power Supply Systems and Equipment-Committee*
  - *Members: Simon Milmine- Orion, Sean McCready-EEA*
- Standard phase: Public Consultation
- Closes: 10th September
- NZ response, through EEA
- Link to draft standard https://sapc.standards.org.au/sapc/public/listOpenCommentingPublication.action