

---

# AE-NR03-S

## Small Scale Distributed Generation Connection Standard

Version 1.0

© 2021 Aurora Energy Limited

The copyright of this document is the property of Aurora Energy Ltd. No part of this publication may be reproduced by photocopying or by any other means without prior written permission of Aurora Energy Ltd.

Printed documents, and those transferred electronically out of Aurora Energy's Controlled Document System are uncontrolled. Use Aurora Energy's Controlled Document System to ensure the latest version is being viewed.

## Contents

I	Document Control .....	3
II	Approval & Revision History .....	3
III	External References .....	3
1	Introduction .....	4
1.1	Purpose .....	4
1.2	Scope .....	4
1.3	Definitions .....	4
1.4	Acronyms .....	4
2	Connections .....	4
3	Network Congestion .....	5
4	General Requirements .....	5
4.1	Inverter based generation .....	5
4.2	Voltage Regulation and Response .....	5
4.3	DC Injection .....	6
4.4	Harmonics .....	6
4.5	Means of Isolation .....	6
4.6	Islanding .....	6
4.7	Protection .....	6
4.8	Earthing .....	7
5	Inspection and testing .....	7
6	Metering .....	7
7	Communications and operation .....	7
8	Records and information .....	7
8.1	GIS Information .....	7
8.2	Schematic Diagrams .....	8
8.3	Manuals .....	8
8.4	Testing and inspection .....	8
9	Timeframes applicable to connection agreements .....	8

## Figures

Figure 1 - Voltage regulation for inverters (taken from AS4777.2:2020; applicable to New Zealand) .. 6

Doc ID	Functional Area	Document Owner	Approver	Issued	Version	Page
AE-NR03-S	Network Design	Distribution Engineering Manager	GM Asset Management & Planning	23/03/2021	1	2 of 8

## I Document Control

---

Responsibility	Name	Position
Document Approver:	Glenn Coates	GM – Asset Mgmt.
Document Owner:	Junaid Qureshi	Dist. Eng. Mgr.
Document Author:	Dougal McQueen	Dist. Eng.
Document Reviewer:	David Mulder	Snr. Planning Eng.

## II Approval & Revision History

---

Version	Date	Revision Notes
1.0	01/04/2021	

For submitting feedback or a change request refer to the Aurora Energy Controlled Document System homepage.

## III External References

---

Reference Code	Title
EIPC	Electricity Industry Participation Code 2010, Part 6, Connection of distributed generation
AS/NZS 3010	Electrical Installations – Generating sets
AS/NZS 61000	Electromagnetic compatibility (EMC)
AS/NZS 4777	Grid connection of energy systems via inverters

Doc ID	Functional Area	Document Owner	Approver	Issued	Version	Page
AE-NR03-S	Network Design	Distribution Engineering Manager	GM Asset Management & Planning	23/03/2021	1	3 of 8

## 1 Introduction

---

### 1.1 Purpose

This document defines Aurora Energy's requirements for the connection of Small-Scale inverter based Distributed Generation (SSGD) (capacity < 10kW), to the Aurora Energy distribution network.

### 1.2 Scope

This standard applies to all devices that connect via inverters including Photo-Voltaic panels, batteries, or Electric Vehicles with Vehicle-2-Grid technologies.

### 1.3 Definitions

Aspect	Definition
Distributed Generation	Electrical generation facility capable of operating in parallel with the Aurora Energy network
Safety Manual Electricity Industry	This document defines the requirements for safety in New Zealand Electricity Generation Transmission and Distribution Industry
Hosting Capacity	Hosting capacity is the amount of Distributed Generation that can be added to the distribution network before control system changes or network upgrades are required to safely and reliably integrate additional Distributed Generation
Distributed Generation	Electrical generation facility capable of operating in parallel with the Aurora Energy network

---

### 1.4 Acronyms

Short Form	Long Form
LV	Low Voltage
DG	Distributed Generation
EGR	Electricity Governance Rules
ICP	Installation Control Point
PCC	Point of Common Coupling
SM-EI	Safety Manual Electricity Industry

---

## 2 Connections

---

The connection of DG will follow the processes, timeframes and regulations as set out in EIPC.

Connections smaller than 5kW of export may be single phase.

Connections greater than 5 kW of export must be three-phase.

Connections less than 10 kW will be approved by Aurora Energy within 10 days if they comply with connection standards and are not in areas identified by Aurora Energy as having congestion and/or export limitations.

Doc ID	Functional Area	Document Owner	Approver	Issued	Version	Page
AE-NR03-S	Network Design	Distribution Engineering Manager	GM Asset Management & Planning	23/03/2021	1	4 of 8

Connections proposed in areas identified by Aurora Energy as having network congestion and/or export limitations will be subject to an assessment and approval with potential for additional conditions being required by Aurora Energy.

### 3 Network Congestion

---

Aurora Energy will provide a hosting capacity limit for each ICP.

Approval for connections with export capacity less than 10 kW at ICPs identified as having export limitations may include conditions such as export restriction under certain load conditions or enabling Volt-VAR regulation.

Connections that will lead to a network upgrade may incur a congestion connection charge or an export charge, and these will be assessed and allocated at the time of connection.

### 4 General Requirements

---

#### 4.1 Inverter based generation

Inverter based generators must comply with AS/NZS 4777 Grid connection of energy systems via inverters.

#### 4.2 Voltage Regulation and Response

When considering the role of DG in voltage regulation, we are guiding by the following objectives:

- The DG will not actively regulate the voltage at the PCC but the inverter will assist with voltage management through the provision of Volt-VAR and Volt-Watt response modes
- The DG will not cause the voltage at other installations on the Aurora Energy's network go outside the range specified in the Electricity Regulations.

Voltage response modes should be enabled according to the following priority:

- If both Volt-VAR and Volt-Watt responses are available, then both should be enabled (if possible),
- If both modes cannot be enabled simultaneously then just the Volt-VAR response should be enabled,
- If only the Volt-Watt response is available, then that should be enabled.

Reference values for voltage response modes are as defined for New Zealand in AS4777.2 2020.

Doc ID	Functional Area	Document Owner	Approver	Issued	Version	Page
AE-NR03-S	Network Design	Distribution Engineering Manager	GM Asset Management & Planning	23/03/2021	1	5 of 8

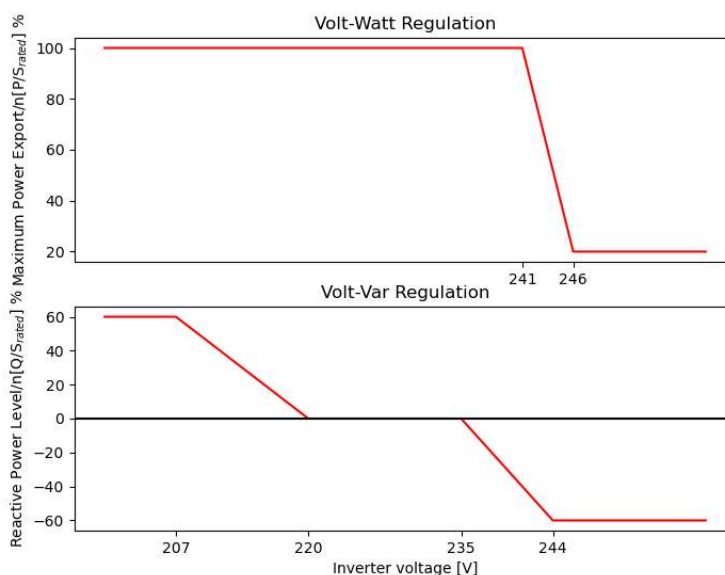


Figure 1 Voltage regulation for inverters (taken from AS4777.2:2020; applicable to New Zealand)

### 4.3 DC Injection

The DG and its interconnection system will not inject a dc current greater than 0.5% of the full rated output current of the generation at the point of DG connection, in line with AS4777.2 (2020) Clause 2.10.

### 4.4 Harmonics

The harmonic current limits of inverter connected generation will comply with the requirements of AS4777.2 (2020) Clause 2.7. The total harmonic current distortion for harmonics up to the 50<sup>th</sup> will not exceed 5%.

### 4.5 Means of Isolation

Every DG installation must have a means of isolation that can disconnect the DG from the Aurora Energy network.

The isolation switch or circuit breaker must be suitably labelled and preferably be readily accessible. If the isolation switch is not readily accessible Aurora Energy will be provided with contact details and a means of access to enable immediate isolation in case of a fault.

### 4.6 Islanding

DG must not, under any circumstances, re-energise parts of the Aurora Energy network that have been disconnected from the rest of Aurora Energy’s network.

The DG must have at least one method of anti-islanding protection which must always be fully functional.

### 4.7 Protection

Aurora Energy applies principles of Safety in Design and operates the network to achieve a high level of reliability while ensuring all components and connected equipment is protected from damage from faults and equipment malfunction.

All DG installations shall have the following protection:

Doc ID	Functional Area	Document Owner	Approver	Issued	Version	Page
AE-NR03-S	Network Design	Distribution Engineering Manager	GM Asset Management & Planning	23/03/2021	1	6 of 8

- External system over and under voltage,
- External system over and under frequency,
- Overcurrent

For inverter-based systems compliance with AS4777.2 will satisfy protection requirements.

Loss of grid protection must operate within 2 seconds of any limit being exceeded. Reconnection will not occur within 60 seconds of normal grid supply being established.

### 4.8 Earthing

The earthing of all DG installations will be in accordance with the requirements of AS/NZS 3000:2018.

## 5 Inspection and testing

---

DG installations must have been inspected and approved for connection by an inspector authorised by Aurora Energy before power can be exported into the Aurora Energy network. Aurora Energy may charge a fee of \$60 for inspections.

The owner of the DG will keep records of test results and protection settings and a copy of these records will be sent to Aurora Energy.

Periodic tests should be carried out to verify the settings and serviceability of protection.

## 6 Metering

---

Metering of the DG injection must be certified and comply with the requirements of the EIPC and record import and export of electricity separately.

## 7 Communications and operation

---

From time to time there will be a need for Aurora Energy to make contact with DG owners and therefore we will have access to contact phone and email details, typically supplied through the retailer.

During normal operation of the network and during shutdowns for planned works we will not need to manually isolate DG and therefore access to DG or the isolation device is not required on a day to basis but may be required in special circumstances.

## 8 Records and information

---

Aurora Energy is responsible for ensuring that it has sufficient plans and records of DG installations to ensure the safe and reliable operation of the network.

### 8.1 GIS Information

The DG owner will provide all necessary information required to facilitate recording the location and attributes of all DG plant and associated, switchgear, lines and cables on the Aurora Energy geographic information system (GIS).

Doc ID	Functional Area	Document Owner	Approver	Issued	Version	Page
AE-NR03-S	Network Design	Distribution Engineering Manager	GM Asset Management & Planning	23/03/2021	1	7 of 8

## 8.2 Schematic Diagrams

The DG owner will always have available at the DG site an up to date single-line diagram and protection schematic of the DG plant.

## 8.3 Manuals

The owner of the DG will have manuals on the installation, operation and maintenance of the DG equipment and these will be available to Aurora Energy if requested.

## 8.4 Testing and inspection

The owner of the DG will keep records on testing and inspection, these will be provided to Aurora Energy as per schedule B 3.3 of the EIPC.

# 9 Timeframes applicable to connection agreements

---

Applications, installation and operation of Distributed Generation should proceed according to timeframes that meet the needs of our customers and are compatible with Aurora Energy's planning and operational functions.

- Aurora Energy will approve compliant applications in areas not identified as being subject to network congestions within 10 business days,
- Aurora Energy will provide approve with conditions or decline applications in areas identified as having network congestion within 30 days,
- After receiving notice of approval for connection the customer must proceed with installation within 18 months or Aurora Energy will withdraw the application,
- If changes to the network (including loads and generation) require Aurora Energy to impose changes to the operational requirements of DG, then the customer will be given 90 days to implement the changes.

Doc ID	Functional Area	Document Owner	Approver	Issued	Version	Page
AE-NR03-S	Network Design	Distribution Engineering Manager	GM Asset Management & Planning	23/03/2021	1	8 of 8