



**DEIP**

DISTRIBUTED ENERGY  
INTEGRATION PROGRAM

DEIP Interoperability  
Steering Committee

**COMMON SMART  
INVERTER PROFILE  
- AUSTRALIA  
- TEST PROCEDURES**

---

July 2023

Version 1.0

## About DEIP

The Distributed Energy Integration Program (DEIP) is a collaborative network of government agencies, market bodies, peak industry bodies and consumer associations working together to maximise the value of distributed energy resources (DER) for all Australian consumers.

The DEIP members exchange insights, seek industry consensus, and focus attention on priority activities to provide the necessary pre-policy evidence needed to support informed decision making in the Australian energy transition.

## Acknowledgement and Disclaimer

This 'Common Smart Inverter Profile – Australia' and these accompanying Test Procedures were developed by the DER Integration API Technical Working Group. This working group formed in 2019 as a collaboration of Australian energy sector businesses from across the supply chain, including numerous distribution networks, retailers, equipment manufacturers and aggregators.

The test procedures are provided as is, without any guarantee, representation, condition or warranty of any kind, either express, implied or statutory. ARENA does not assume any liability with respect to any reliance placed on this report by third parties. If a third party relies on the report in any way, that party assumes the entire risk as to the accuracy, currency or completeness of the information contained in the procedures.

Requests and enquiries concerning rights should be addressed to [timothy.moore1@anu.edu.au](mailto:timothy.moore1@anu.edu.au).

# TABLE OF CONTENTS

<b>1</b>	<b>Introduction</b>	<b>5</b>
<b>1.1</b>	<b>Background</b>	<b>5</b>
<b>1.2</b>	<b>Scope</b>	<b>5</b>
<b>1.3</b>	<b>Acronyms</b>	<b>6</b>
<b>1.4</b>	<b>Definitions</b>	<b>7</b>
<b>2</b>	<b>Testing Process</b>	<b>8</b>
<b>2.1</b>	<b>General</b>	<b>8</b>
<b>2.2</b>	<b>Test Setup</b>	<b>8</b>
2.2.1	Communications Setup	8
2.2.2	Electrical Setup	8
<b>2.3</b>	<b>Test Configuration</b>	<b>9</b>
2.3.1	Measurement Accuracy	9
2.3.2	Protocol Requirements	10
2.3.3	Supported Functions	10
2.3.4	Default Configuration	11
2.3.5	Support for sets of DER	11
2.3.6	Communication Interactions	11
<b>2.4</b>	<b>Test Applicability</b>	<b>13</b>
<b>3</b>	<b>General Communications Client Test Procedure</b>	<b>16</b>
<b>3.1</b>	<b>General</b>	<b>16</b>
<b>3.2</b>	<b>Registration</b>	<b>16</b>
3.2.1	ALL-01 Discovery (A, DR-A)	16
3.2.2	CON-01 Site Registration (C)	17
<b>3.3</b>	<b>Monitoring</b>	<b>18</b>
3.3.1	ALL-02 Individual Readings (A)	18
3.3.2	ALL-03 Connection Status (A)	19
3.3.3	ALL-04 Operational Mode Status (A)	20
3.3.4	ALL-05 Capabilities and Settings (A)	21
3.3.5	ALL-06 Update Post Rates (A)	21
<b>3.4</b>	<b>Control</b>	<b>22</b>
3.4.1	Polled	22
3.4.2	Subscription / Notification	31
3.4.3	ALL-12 Control Responses (A)	42
3.4.4	ALL-13 Poll Rates (A, DR-A)	43
3.4.5	ALL-14 Scheduling (A)	43
3.4.6	ALL-15 Randomisation (A)	44
3.4.7	ALL-16 Communication Loss (A)	44

<b>3.5</b>	<b>ALL-17 Extended Operations (A, DR-A)</b>	<b>46</b>
3.5.1	Purpose	46
3.5.2	Test Procedure	46
3.5.3	Criteria	46
<b>4</b>	<b>Demand Response Test Procedure</b>	<b>47</b>
<b>4.1</b>	<b>General</b>	<b>47</b>
<b>4.2</b>	<b>DRA-01 Configuration (DR-A)</b>	<b>48</b>
4.2.1	Purpose	48
4.2.2	Test Procedure	48
4.2.3	Criteria	48
<b>4.3</b>	<b>DRD-01 DRED Operational Instruction Response (DR-D)</b>	<b>49</b>
4.3.1	Purpose	49
4.3.2	Test Procedure	49
4.3.3	Criteria	51
<b>4.4</b>	<b>Electrical Products</b>	<b>51</b>
4.4.1	DRA-02 Disconnect Instruction (DR-L, DR-G)	51
4.4.2	DRL-01 Load Operational Instructions (DR-L)	52
4.4.3	DRG-01 Generation Operational Instructions (DR-G)	53

---

# 1 INTRODUCTION

## 1.1 BACKGROUND

In order to improve the integration of increasing levels of distributed energy resources (DER) in Australian distribution networks, in 2021 the DER Integration API Technical Working Group (DERIAPITWG) released the first version of the Common Smart Inverter Profile for Australia (CSIP-AUS) integration guide. This guide expanded on the CSIP implementation guide based on IEEE 2030.5 to provide a coherent set of protocols for managing Australia-specific requirements for DER-integration, with a particular focus on the implementation of Dynamic Operating Envelopes (sometimes referred to as Flexible Exports or Flexible Connections).

This document provides a framework and set of procedures to test communications clients against the specifications contained in the CSIP-AUS implementation guide.

## 1.2 SCOPE

This document contains test procedures that are designed to assess whether a communications client conforms to the requirements of CSIP-AUS v1.1a (2023). The test procedures focus primarily on validation of communications, with a limited set of tests that ensure a physical response is able to be generated. Full testing of physical responses of DER is outside the scope of this document.

This breakdown is shown in Figure 1. This diagram also shows the three expected communications paths by which a utility server may communicate with and manage DER using CSIP-AUS. These three paths are not exhaustive, and other models that make use of the key components shown can also be supported (e.g. a cloud model that also utilises an on-site gateway between the cloud platform and the DER).

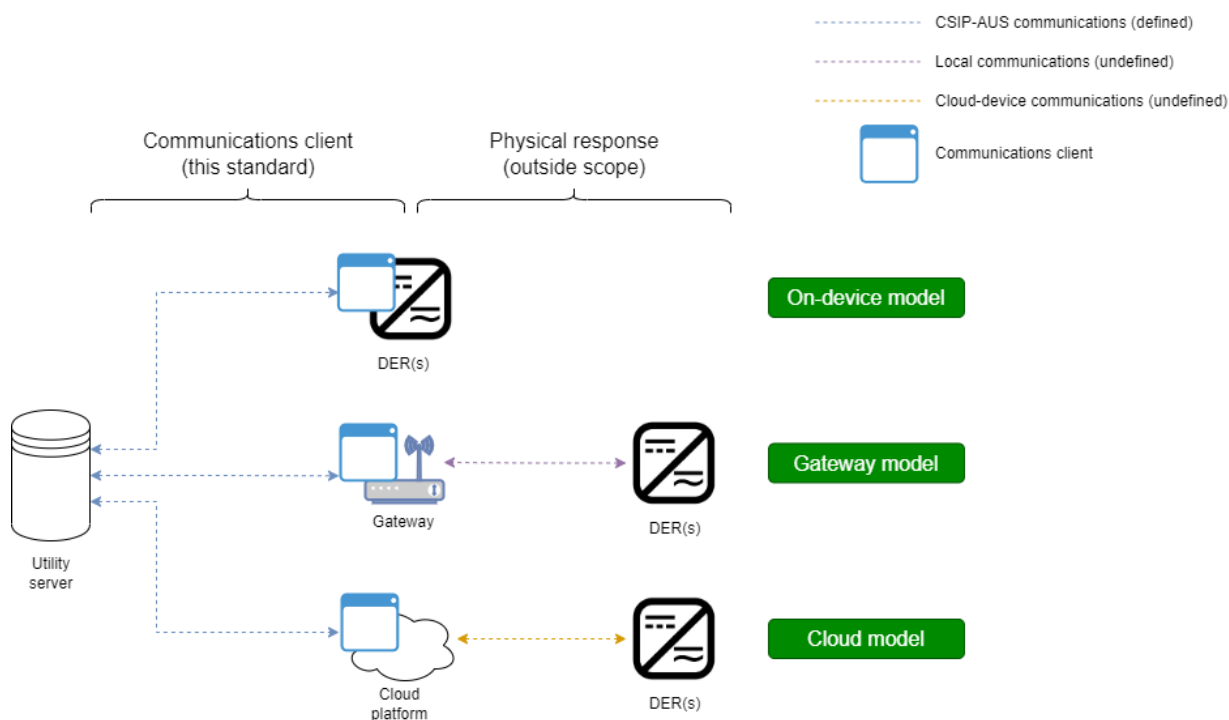


Figure 1 – Scope of testing

### 1.3 ACRONYMS

CSIP-AUS – Common Smart Inverter Profile – Australia

DER – Distributed Energy Resource

DOE – Dynamic Operating Envelope

DRED – Demand Response Enabling Device

EXI – Efficient XML Interchange

GPS – Global Positioning System

HTTP – Hypertext Transfer Protocol

NTP – Network Time Protocol

OI – Operating Instruction

REST – REpresentational State Transfer

V2G – Vehicle-to-Grid

XML – eXtensible Markup Language

## 1.4 DEFINITIONS

*Averaging window* – the time period over which an averaging calculation is applied to create time-average of the required measurement.

*Comms* – shorthand for ‘communications’.

---

## 2 TESTING PROCESS

### 2.1 GENERAL

This document consists of testing procedures that a communications client may be tested against by an entity in order to validate conformance with CSIP-AUS.

The tests detailed in Section 3 are performed by communications clients intended for DER management, for determining conformance to CSIP-AUS. Some of the tests of Section 3 include a DER system to be integrated with the client as they include a physical response that is used to verify the conformance of the communications client.

The tests detailed in Section 4 specifically relate to communications client that form part of a demand response system as defined by the AS 4755 suite of standards. This may include a DRED or an electrical product that has integral demand response communications capability.

### 2.2 TEST SETUP

#### 2.2.1 Communications Setup

The testing environment includes a communications server known as a utility server, in order to expose the appropriate HTTP end-points to implement all tests as described in Sections 3 and 4 of this document.

The utility server may implement a utility-side client with support for subscription and notification use-cases, in order to test conformance of aggregator clients against these requirements.

#### 2.2.2 ELECTRICAL SETUP

The following components are used for electrical testing and verifying conformance of communications clients with CSIP-AUS, as shown in Figure 2:

- a) A DER or set of DERs to be tested that can receive commands from a communications client;
- b) A site meter that measures site import/export and communicates this to the communications client;
- c) An optional power analyser to measure relevant parameters at the connection point for independent verification;
- d) An additional optional power analyser for each DER under test to measure device-specific parameters for independent verifications;
- e) A test load that isn't managed by the communications client, which is capable of consuming at least 500W per phase or 50% of the inverter rated active power, whichever is smaller;
- f) Power sources(s) or sink(s) for DER to function; and
- g) A real grid or simulated test grid set to 230V +/- 2.3V% and 50Hz +/- 0.5Hz.



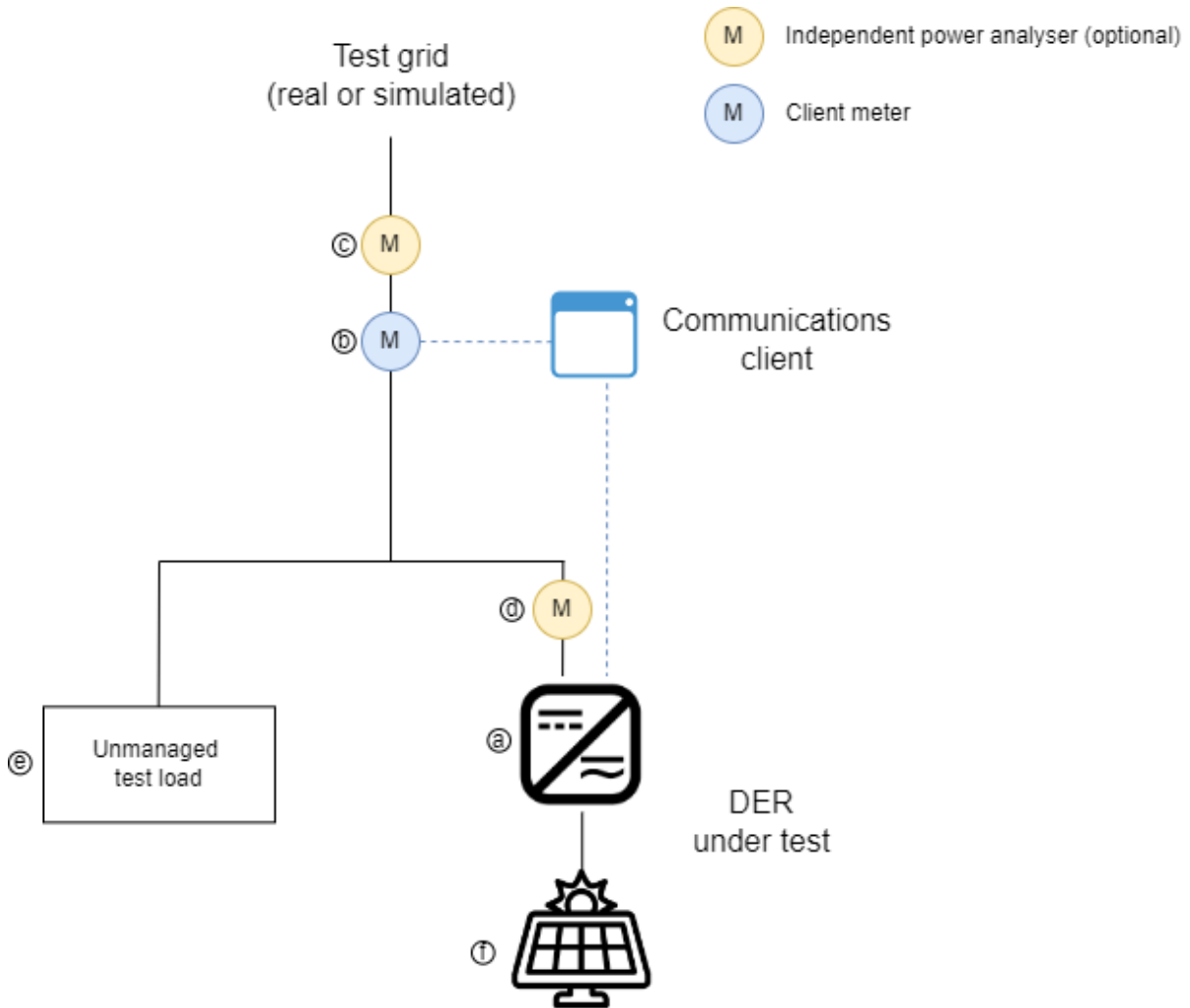


Figure 2 - Electrical test setup

## 2.3 TEST CONFIGURATION

### 2.3.1 MEASUREMENT ACCURACY

All measurements shall have measurement accuracies as described in Table 1. These accuracies are independent of the accuracy of the DER internal measurements.

Table 1 – Measurement accuracies

Measurement parameter (Symbol)	Measurement accuracy
Apparent power (S)	Lower of 4% of rated apparent power or 100VA

Active power (P)	Lower of 4% of rated active power or 100W
------------------	---

Note: These measurement accuracies are as defined in AS/NZS 4777.2.

### 2.3.2 PROTOCOL REQUIREMENTS

The test utility server, in addition to the requirements of IEEE 2030.5, supports the following communications parameters in order to conduct conformance tests for all feasible communications clients:

- a) Payloads communicated via HTTPS, in any of XML, EXI or GZip;
- b) Resources contain links to their subordinate resources;
- c) Aggregator clients support REST paging techniques to process lists from the Server that may be incomplete; and
- d) Resources use the standard IEEE 2030.5 namespace of urn:ieee:std:2030.5:ns
  - a. CSIP-AUS extensions use namespace of https://csipaus.org/ns

It is expected that any commissioning between the utility server, communications client and DER is done prior to commencing tests.

### 2.3.3 SUPPORTED FUNCTIONS

#### 2.3.3.1 General

To conform with CSIP-AUS the communications client shall specify the functions it supports, including both core and optional components.

#### 2.3.3.2 Core Functions

To conform with CSIP-AUS a communications client shall meet at least one of the following sets of CSIP-AUS DER Management controls, as determined by the type of DER the client is intended to support:

- a) All clients –
  - o *opModEnergize*
- b) DER capable of generation –
  - o *opModExpLimW*
  - o *opModGenLimW*
  - o *opModMaxLimW*
- c) DER capable of load –
  - o *opModImpLimW*
  - o *opModLoadLimW*

#### 2.3.3.3 Optional Components

A communications client may choose to comply with the following:

- a) *ConnectionPoint*; and
- b) Demand Response operations.

#### 2.3.3.4 Aggregator-only Components

The following components are specific to aggregator use-cases only.

- a) Subscription/Notification.

Gateways and DER end-devices are not expected to support these components directly, although they may form part of an aggregator solution that supports these commands.

### 2.3.4 DEFAULT CONFIGURATION

On initial discovery the test utility server shall configure the communications client with the following poll- and post-rates for the listed Resources in Table 2.

Table 2 – Default communication configurations

Resource	Value (secs)
<b>DeviceCapability</b>	300
<b>EndDeviceList</b>	300
<b>FunctionSetAssignmentsList</b>	300
<b>DERProgramList</b>	60
<b>DERList (including DERStatus, DERSettings and DERCapability)</b>	60
<b>MirrorUsagePoint</b>	60

Note: These values differ from the default values defined in CSIP-AUS and are changed for testing in order to expedite the tests.

### 2.3.5 SUPPORT FOR SETS OF DER

Communications clients that intent to support management of multiple DER simultaneously shall be tested controlling at least two DER, and that the DER that are included will cover the range of generation and load the client wishes to claim conformance with. For the purposes of this requirement a battery energy storage system can be considered as either a generator or a load but not both. That is:

- a) For clients only able to manage multiple generation-type DER (i.e. a client that supports *opModExpLimW*, *opModGenLimW* and *opModMaxLimW*) shall be tested controlling two or more DER capable of generating energy (which may include battery energy storage systems);
- b) For clients only able to manage multiple load-type DER (i.e. a client that supports *opModImpLimW* and *opModLoadLimW*) shall be tested controlling two or more DER capable of consuming energy (which may include battery energy storage systems).
- c) For clients able to manage multiple DER capable of both generation and load (i.e. a client that supports all functions listed in Section 2.3.3.2) shall be tested controlling two or more DER that collectively are capable of both generating and consuming energy.

### 2.3.6 COMMUNICATION INTERACTIONS

Figure 3 and Figure 4 below show the primary communications interactions to provide the functionality required to conform with tests described in this document. Figure 3 relates to the discovery process (tested in Section 3.2.1) while Figure 4 describes the commands involved in ongoing communication. Additional examples detailing XML payloads can be found in CSIP Sections 6 and 7, and in CSIP-AUS Annexes B and E.

Server

Client

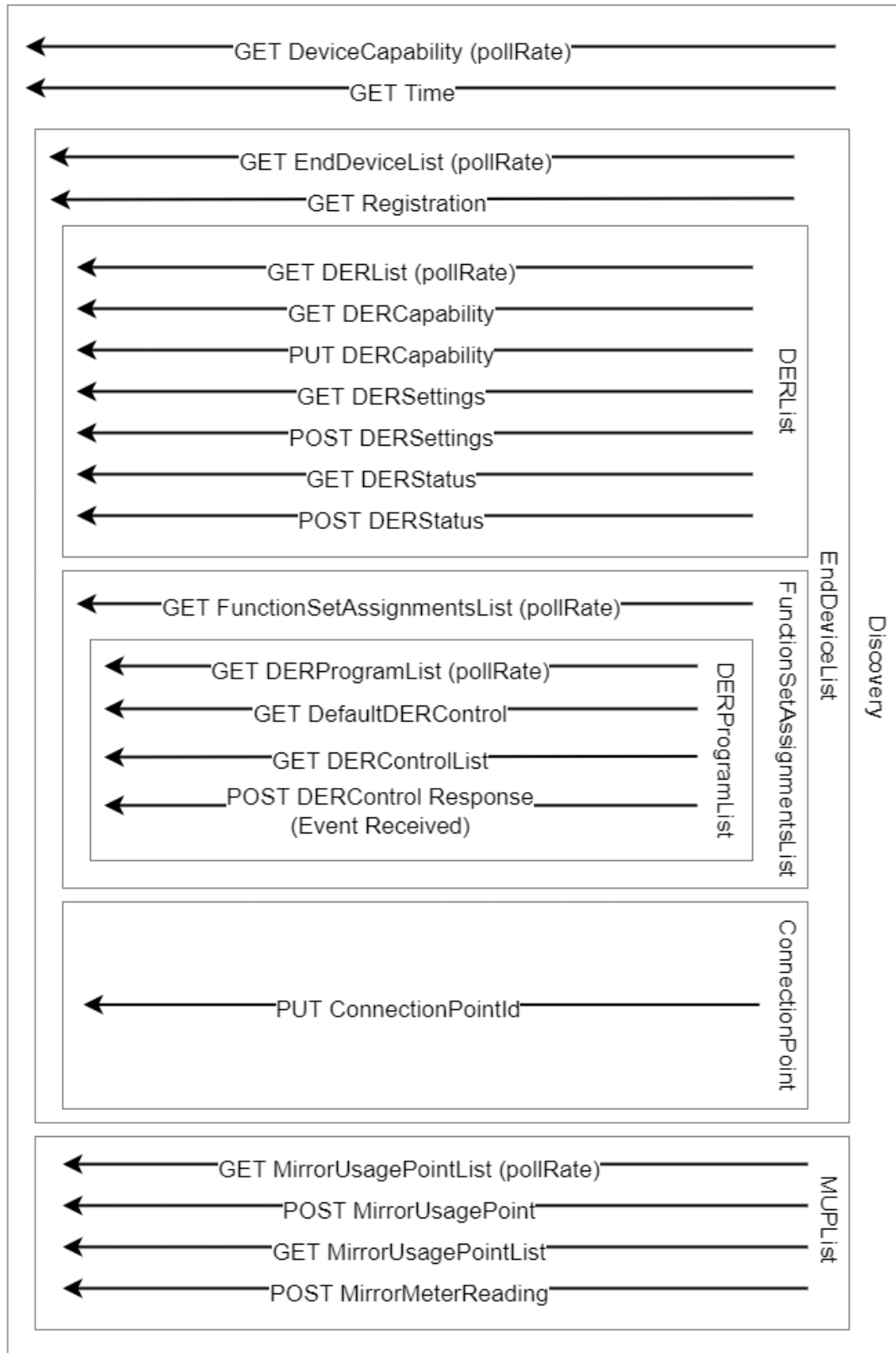


Figure 3 – Client-server interactions – Discovery

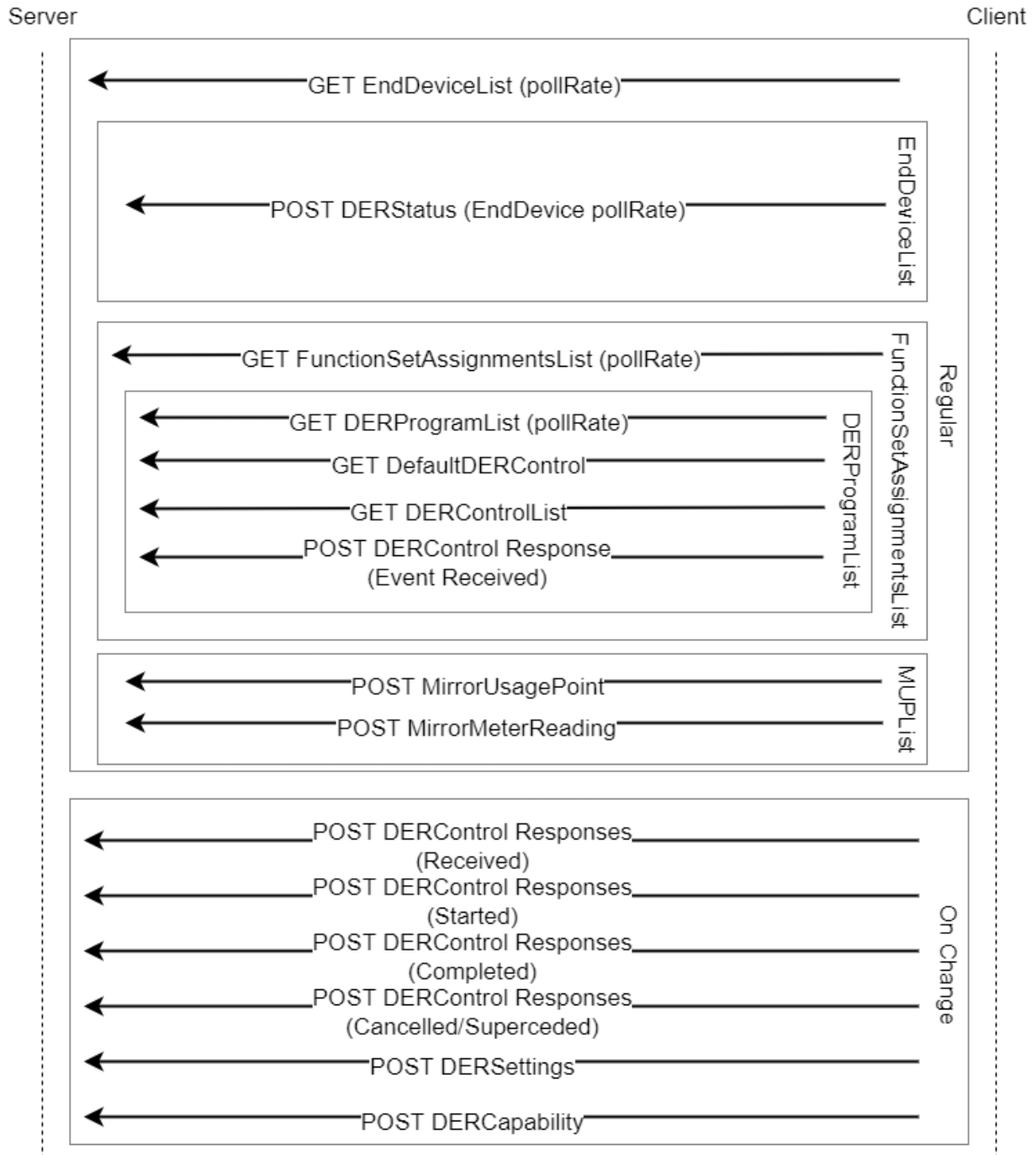


Figure 4 – Client-server interactions – Ongoing

## 2.4 TEST APPLICABILITY

Each test in Sections 3 and 4, for conformance to CSIP-AUS, includes a designation in the clause title that describes the applicability of that test to different types of communications clients, as indicated in Table 3. Broadly-speaking, tests with a designation beginning with “DR” apply to classes of demand response devices (e.g. DREDs or demand response enabled electrical products) while other tests apply to clients managing general forms of DER (e.g. solar inverters, batteries, electric vehicle chargers etc.). There are specific tests that are intended for general DER clients that can also apply to demand response devices, as detailed in Table 4.

Table 3 – Applicability of tests to classes of communications client

Test Designation	Client type
(A)	All clients managing DER that aren't claiming conformance with the demand response capabilities defined in CSIP-AUS Annex C
(G)	Clients managing generation-type or storage-type DER
(L)	Clients managing load-type or storage-type DER
(C)	Clients conforming with the ConnectionPoint extension
(S)	Clients implement Subscription/notification functionality
(DR-A)	All clients managing demand response devices, including DREDs or electrical products with demand response capabilities
(DR-D)	Clients managing or incorporated into DRED demand response devices that are not integral to an electrical product
(DR-L)	Clients managing load-type or storage-type electrical products with demand response capabilities
(DR-G)	Clients managing generation-type or storage-type electrical products with demand response capabilities

Table 4 indicates the applicability of each test to each class of communications client (based on the type of DER the client is intended to manage). Ticks (✓) indicate that a test is applicable to the specified client type, while crosses (✗) indicate that the test is not applicable. Test indicates that the test may be applicable depending on which functionality the client wishes to claim conformance with.

Table 4 – Matrix of test applicability

Test	DER - generator	DER - load	DRED	Demand response load	Demand response generator
ALL-01	✓	✓	✓	✓	✓
CON-01	ConnectionPoint only	ConnectionPoint only	x	x	x
ALL-02	✓	✓	✓*	✓*	✓*
ALL-03	✓	✓	x	x	x
ALL-04	✓	✓	x	x	x
ALL-05	✓	✓	x	x	x
ALL-06	✓	✓	✓*	✓*	✓*
GEN-01	✓	x	x	x	x
GEN-02	✓	x	x	x	x
LOA-01	x	✓	x	x	x
LOA-02	x	✓	x	x	x
GEN-03	✓	x	x	x	x
ALL-07	✓	✓	x	x	x
GEN-04	✓	x	x	x	x
GEN-05	✓	x	x	x	x
LOA-03	x	✓	x	x	x
LOA-04	x	✓	x	x	x
GEN-06	✓	x	x	x	x
ALL-08	✓	✓	x	x	x
ALL-09	Sub/noti only	Sub/noti only	x	x	x
GEN-07	Sub/noti only	x	x	x	x
GEN-08	Sub/noti only	x	x	x	x
LOA-05	x	Sub/noti only	x	x	x
LOA-06	x	Sub/noti only	x	x	x
GEN-09	Sub/noti only	x	x	x	x
ALL-10	Sub/noti only	Sub/noti only	x	x	x
GEN-10	Sub/noti only	x	x	x	x
GEN-11	Sub/noti only	x	x	x	x
LOA-07	x	Sub/noti only	x	x	x
LOA-08	x	Sub/noti only	x	x	x
GEN-12	Sub/noti only	x	x	x	x
ALL-11	Sub/noti only	Sub/noti only	x	x	x
ALL-12	✓	✓	x	x	x
ALL-13	✓	✓	✓	✓	✓
ALL-14	✓	✓	✓*	✓*	✓*
ALL-15	✓	✓	✓*	✓*	✓*
ALL-16	✓	✓	x	x	x
ALL-17	✓	✓	✓	✓	✓
DRA-01	x	x	✓	✓	✓
DRD-01	x	x	✓	x	x
DRA-02	x	x	x	✓	✓
DRL-01	x	x	x	✓	x
DRG-01	x	x	x	x	✓

Note: Entries marked with a tick and an asterix (✓\*) are optional tests that may be conducted if a device manufacturer wishes to claim conformance with the relevant functionality.

# 3 GENERAL COMMUNICATIONS CLIENT TEST PROCEDURE

## 3.1 GENERAL

The tests in this section apply to clients wishing to claim conformance with the DOE extensions specified in CSIP-AUS.

## 3.2 REGISTRATION

### 3.2.1 ALL-01 DISCOVERY (A, DR-A)

#### 3.2.1.1 Purpose

This test is intended to validate the client's ability to perform discovery against the utility server and to establish basic IEEE 2030.5-based communications.

#### 3.2.1.2 Test procedure

The steps SHALL be performed as described in Table 5. The test results SHALL be compared against the Expected Result column in Table 5, except that steps 4, 5 and 6 can occur in any order. For example, time-synchronisation may be done prior to the client requesting the *EndDeviceList* from the utility server.

Table 5 – Test steps for Communications Client – Discovery

Step No.	Manual or utility server step	Expected comms client result
1	Client communications with the utility server are initialised as appropriate for the client (e.g. client is powered on).	Client performs HTTP discovery against the pre-configured utility server URI information.
2	Utility server sends the relevant function set resource links to the client.	Client receives the function set resource links and requests resource information from the utility server's <i>DeviceCapability</i> endpoint.
3	Utility server sends the <i>DeviceCapability</i> resource including the <i>TimeLink</i> , <i>EndDeviceListLink</i> and <i>MirrorUsagePointListLink</i> resource links to the client.	Client receives <i>DeviceCapability</i> payload. Client requests resource information from the utility server's <i>EndDeviceList</i> endpoint.
4	Utility server sends the <i>EndDeviceList</i> resource containing the relevant <i>EndDeviceList</i> information including the <i>ConnectionPointLink</i> and <i>DERListLink</i> resource link to the client.	Client receives the <i>EndDeviceList</i> payload with the required <i>EndDevice</i> information including the relevant resources. Client accesses the utility server's <i>Time</i> endpoint.
5	Utility server sends the <i>Time</i> resource containing the relevant <i>EndDeviceList</i> information to the client.	Client receives the <i>Time</i> payload and is time-synchronised with the utility server to within 10 seconds (noting synchronisation may be done via GPS/NTP or other means as per



		CSIP-AUS). This will be verified through ongoing communications between the client and utility server.  Client access the utility server's <i>DERList</i> endpoint.
6	Utility server sends the <i>DERList</i> resource containing the <i>DERCapabilityLink</i> , <i>DERStatusLink</i> and <i>DERSettingsLink</i> resource links to the client.	Client receives the <i>DERList</i> payload with the required DER information including the relevant resources.

### 3.2.1.3 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The client does not perform discovery against the utility server at the pre-configured address.
- b) The client does not access the necessary function set or device capability resource links.
- c) The client becomes unsynchronised with the utility server and does not flag an error.

Notes:

- i) When test a communications client that does not claim conformance with the *ConnectionPoint* extension, the *ConnectionPointLink* resource is not reported by the utility server in step 4 of this test.

## 3.2.2 CON-01 SITE REGISTRATION (C)

### 3.2.2.1 Purpose

This test is intended to validate the client's ability to register the *ConnectionPoint* of the site to the utility server when this method is used.

### 3.2.2.2 Test procedure

This test shall only be met by clients that intend to conform to the *ConnectionPoint* extension.

The steps SHALL be performed as described in Table 6. The test results SHALL be compared against the Expected Result column in Table 6.

Table 6 – Test steps for Communications Client – Site Registration

Step No.	Manual or utility server step	Expected comms client result
1	The client completes the discovery process as detailed in test 3.2.1, including receiving the <i>EndDeviceListLink</i> and <i>ConnectionPointLink</i> resource links from the utility server.	The client posts to the utility server's <i>EndDeviceListLink</i> endpoint with an appropriate <i>EndDevice</i> payload.

2	The utility server responds to confirm the creation of the new <i>EndDevice</i> .	The client sends a valid <i>connectionPointId</i> to the <i>ConnectionPoint</i> endpoint and receives an appropriate validation from the utility server.
---	---	--

### 3.2.2.3 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The client does not provide a valid *connectionPointId* to the utility server.

## 3.3 MONITORING

This section is intended to validate a client’s ability to monitor and report data relating to the DER(s) under its management.

### 3.3.1 ALL-02 INDIVIDUAL READINGS (A)

#### 3.3.1.1 Purpose

This test is intended to validate the client’s ability to post average values for the following readings using the *MirrorMeterReading* POST method:

- a) Site real power
- b) Site reactive power
- c) DER real power
- d) DER reactive power
- e) Frequency (if supported by the communications client)
- f) Site and/or DER voltage

#### 3.3.1.2 Test procedure

The steps SHALL be performed as described in Table 7. The test results SHALL be compared against the Expected Result column in Table 7.

Table 7 – Test steps for Communications Client – Individual Readings

Step No.	Manual or utility server step	Expected comms client result
1	The client completes the discovery process as detailed in test 3.2.1, including receiving the <i>MirrorUsagePoint</i> resource link from the utility server.	Client requests resource information from the utility server’s <i>MirrorUsagePointList</i> endpoint.
2	Utility server sends the <i>MirrorUsagePointList</i> resource that should not yet contain an entry for the client’s <i>MirrorUsagePoint</i> .	The client posts a valid <i>MirrorUsagePoint</i> payload to the <i>MirrorUsagePointList</i> endpoint on the utility server.

3	The server returns a HTTP payload confirming that the <i>MirrorUsagePoint</i> is valid.	The client again requests resource information from the utility server's <i>MirrorUsagePointList</i> endpoint.
4	Utility server sends the <i>MirrorUsagePointList</i> resource that now contains an entry for the client's <i>MirrorUsagePoint</i> including relevant information such as the <i>postRate</i> required for <i>MirrorMeterReading</i> posts.	The client posts <i>MirrorMeterReading</i> or <i>MirrorMeterReadingList</i> payloads to the <i>MirrorUsagePointList</i> endpoint at the configured interval (default is 60 seconds), including all of the required and claimed data points as described above in clause 3.3.1.1.

### 3.3.1.3 3.3.1.3 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- i) The client does not post readings to the utility server.
- ii) The client fails to post some or all of the mandatory and optionally-claimed data values as specified in Section 3.3.1.1.
- iii) The client posts readings at an incorrect interval.

Notes:

- i) It has been noted that there are multiple ways a client can configure one or more *MirrorUsagePoint* resources for a site, and that different utility servers may require different configurations. This test validates that the *MirrorUsagePoint* resources are configured in a functional way, and does not specify which configuration is to be supported. Clarification on an intended configuration is expected to be provided in a future revision to CSIP-AUS.
- ii) The averaging window of data reported SHALL match the configured *MirrorUsagePoint* *postRate*.

## 3.3.2 ALL-03 CONNECTION STATUS (A)

### 3.3.2.1 Purpose

This test is intended to validate the client's ability to post DER generation connection status to the utility server.

### 3.3.2.2 Test Procedure

The steps SHALL be performed as described in Table 8. The test results SHALL be compared against the Expected Result column in Table 8.

Table 8 – Test steps for Communications Client – Connection Status

Step No.	Manual or utility server step	Expected comms client result
1	The client is online and the DER is in a connected state.	No result necessary.
2	DER is physically disconnected from the grid supply. Where a client manages multiple	The client posts to the utility server with bit 0 of <i>genConnectStatus</i> = 0.

	DER all DER are disconnected / reconnected as part of this test.	
3	DER is physically reconnected to the grid supply.	The client posts to the utility server with bit 0 <i>genConnectStatus</i> = 1.

### 3.3.2.3 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The client does not post the connection status on disconnection.
- b) The client does not post the connection status on reconnection.

Notes:

- i) During testing the client SHALL report bit 0 of *genConnectStatus* = 0 only if all DER are disconnected.

## 3.3.3 ALL-04 OPERATIONAL MODE STATUS (A)

### 3.3.3.1 Purpose

This test is intended to validate the client's ability to post DER operational mode status to the utility server.

### 3.3.3.2 Test Procedure

The steps SHALL be performed as described in Table 9. The test results SHALL be compared against the Expected Result column in Table 9.

Table 9 – Test steps for Communications Client – Operational Mode Status

Step No.	Manual or utility server step	Expected comms client result
1	The client is online and the DER is operating.	The DER is sourcing or sinking at least 2000W or 50% of the DER's active power rating, whichever value is lower.
2	DER is stopped from being capable of sourcing or sinking power (e.g. power source/sink is set to 0W).	The client posts <i>OperationalModeStatus</i> = 1 to the utility server.
3	DER resumes sourcing/sinking power.	The client posts <i>OperationalModeStatus</i> = 2 to the utility server.

### 3.3.3.3 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The client does not post *OperationalModeStatus* on ceasing power supply/draw.
- b) The client does not post *OperationalModeStatus* on recommencing power supply/draw.
- c) The client reports *OperationalModeStatus* = 0 or *OperationalModeStatus* = 3 at any time.

### 3.3.4 ALL-05 CAPABILITIES AND SETTINGS (A)

#### 3.3.4.1 Purpose

This test is intended to validate the client's ability to post DER capabilities and settings.

#### 3.3.4.2 Test Procedure

The steps SHALL be performed as described in Table 10. The test results SHALL be compared against the Expected Result column in Table 10.

Table 10 – Test steps for Communications Client – Capabilities and Settings

Step No.	Manual or utility server step	Expected comms client result
1	The client completes the discovery process as detailed in test 3.2.1, including receiving the <i>DERCapability</i> and <i>DERSettings</i> resource links from the utility server.	Client posts <i>DERCapability</i> and <i>DERSettings</i> payloads to the utility server as required (either on-connection or on-change as specified below).

#### 3.3.4.3 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The client does not post the *DERCapability* payload to the utility server on connection.
- b) The client does not post the *DERSettings* payload to the utility server on-change.
- c) The client posts incorrect capabilities or settings values to the utility server.

Notes:

- i) Where multiple DER are present their values are to be aggregated.

### 3.3.5 ALL-06 UPDATE POST RATES (A)

#### 3.3.5.1 Purpose

This test is intended to validate the client's ability to act on changes to posting rates for the Metering Mirror function set.

#### 3.3.5.2 Test Procedure

The steps SHALL be performed as described in Table 11. The test results SHALL be compared against the Expected Result column in Table 11.

Table 11 – Test steps for Communications Client – Update Post Rates

Step No.	Manual or utility server step	Expected comms client result
1	The server updates the postRate value from the default of 60s to 300s.	The client receives the new posting rate (either on next poll of the <i>MirrorUsagePointListLink</i> for direct clients or immediately for subscription/notification clients) and the next <i>MirrorMeterReading</i> is posted by the client after 300s.

2	The server updates the postRate value to 60s.	The client receives the new posting rate (either on next poll of the <i>MirrorUsagePointListLink</i> for direct clients or immediately for subscription/notification clients) and the next <i>MirrorMeterReading</i> is posted by the client after 60s.
---	---	---

### 3.3.5.3 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The client does not correctly update posting rates.

## 3.4 CONTROL

### 3.4.1 POLLED

#### 3.4.1.1 General

This section of the test procedures applies to all DER-management clients including aggregator clients that also implement Subscription/Notification, as polling is still required as a fallback in case the subscription system fails.

#### 3.4.1.2 GEN-01 Active Control – Export Limit (G)

##### 3.4.1.2.1 Purpose

This test is intended to validate the client’s ability to receive and respond to active export controls using *opModExpLimW*.

##### 3.4.1.2.2 Precondition

A DER capable of generating active power is under the management of the client and is exporting at the connection point at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModExpLimW* set to 10000W.

##### 3.4.1.2.3 Test Procedure

The steps SHALL be performed as described in Table 12. The test results SHALL be compared against the Expected Result column in Table 12.

Table 12 – Test steps for Communications Client – Polled Active Controls, Export Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures an active control with <i>opModExpLimW</i> = 0W.	On the next poll of the utility server the client receives and starts the updated active control, by reducing export to no more than 0W (or such that the system is importing active power at the connection point) after accounting for the measurement accuracy as specified in Section 2.3.1.

#### 3.4.1.2.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- i) The DER does not reduce export power to 0W.

Notes:

- (A) AS/NZS 4777.2 requires that any exceedance of the soft-limit to be contained within 15 seconds.

### 3.4.1.3 GEN-02 Active Control – Generation Limit (G)

#### 3.4.1.3.1 Purpose

This test is intended to validate the client’s ability to receive and respond to active generation controls using *opModGenLimW*. The utility has a current active control in operation, with *opModGenLimW* set to 10000W.

#### 3.4.1.3.2 Precondition

A DER capable of generating active power is under the management of the client and is generating at least 2000W or 50% of its rated power, whichever is smaller.

#### 3.4.1.3.3 Test Procedure

The steps SHALL be performed as described in Table 13. The test results SHALL be compared against the Expected Result column in Table 13.

Table 13 – Test steps for Communications Client – Polled Active Controls, Generation Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures an active control with <i>opModGenLimW</i> = 0W.	On the next poll of the utility server the client receives and enacts the updated active control, by reducing generation to 0W after accounting for the measurement accuracy as specified in Section 2.3.1.

#### 3.4.1.3.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce generation to 0W.

Notes:

- i) AS/NZS 4777.2 requires that any exceedance of the soft-limit to be contained within 15 seconds.

### 3.4.1.4 LOA-01 Active Control – Import Limit (L)

#### 3.4.1.4.1 Purpose

This test is intended to validate the client’s ability to receive and respond to import controls using *opModImpLimW*.

#### 3.4.1.4.2 Precondition

A DER capable of consuming active power is under the management of the client and is importing at the connection point at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModImpLimW* set to 10000W.

#### 3.4.1.4.3 Test Procedure

The steps SHALL be performed as described in Table 14. The test results SHALL be compared against the Expected Result column in Table 14.

Table 14 – Test steps for Communications Client – Polled Active Controls, Import Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures an active control with <i>opModImpLimW</i> = 0W.	On the next poll of the utility server the client receives and enacts the updated active control, by reducing import to 0W (or such that the system is exporting active power at the connection point) after accounting for the measurement accuracy as specified in Section 2.3.1.

#### 3.4.1.4.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce import power to 0W.

Notes:

- i) Completion of response to active load control signals can be expected to occur within 15sec to align with gen requirements.

### 3.4.1.5 LOA-02 Active Control – Load Limit (L)

#### 3.4.1.5.1 Purpose

This test is intended to validate the client’s ability to receive and respond to load controls using *opModLoadLimW*.

#### 3.4.1.5.2 Precondition

A DER capable of consuming active power is under the management of the client and is consuming at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModLoadLimW* set to 10000W.



### 3.4.1.5.3 Test Procedure

The steps SHALL be performed as described in Table 15. The test results SHALL be compared against the Expected Result column in Table 15.

Table 15 – Test steps for Communications Client – Polled Active Controls, Load Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures an active control with <i>opModLoadLimW</i> = 0W.	On the next poll of the utility server the client receives and enacts the updated active control, by reducing load to 0W after accounting for the measurement accuracy as specified in Section 2.3.1.

### 3.4.1.5.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce load to 0W.

Notes:

- i) Completion of response to active load control signals can be expected to occur within 15sec to align with generation requirements.

### 3.4.1.6 GEN-03 Active Control – Export Limit, Percentage (G)

#### 3.4.1.6.1 Purpose

This test is intended to validate the client’s ability to receive and respond to export controls using *opModMaxLimW*.

#### 3.4.1.6.2 Precondition

A DER capable of generating active power is under the management of the client and is exporting at least 2000W or 50% of its rated power at the connection point, whichever is smaller. The utility has a current active control in operation, with *opModMaxLimW* set to 100%.

#### 3.4.1.6.3 Test Procedure

The steps SHALL be performed as described in Table 15. The test results SHALL be compared against the Expected Result column in Table 15.

Table 16 – Test steps for Communications Client – Polled Active Controls, Percentage Export Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures an active control with <i>opModMaxLimW</i> = 1%.	On the next poll of the utility server the client receives and enacts the updated active control, by reducing export to no more than 1% of rated active power (or such that the system is importing active power at the connection point) after accounting for the measurement accuracy as specified in Section 2.3.1.

#### 3.4.1.6.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce export to no more than 1% of rated power.

Notes:

- i) AS/NZS 4777.2 requires that any exceedance of the soft-limit to be contained within 15 seconds.
- ii) *opModMaxLimW* is represented in hundredths of a percentage point, 0 to 10,000 (i.e. 100 = 1%).

### 3.4.1.7 ALL-07 Active Control – Energise / De-energise (A)

#### 3.4.1.7.1 Purpose

This test is intended to validate the client's ability to receive and respond to commands to energise & de-energise using *opModEnergize*.

#### 3.4.1.7.2 Precondition

The client has *opModEnergize* set to *true* and the DER is generating or consuming active power of at least 2000W or 50% of its rated power.

#### 3.4.1.7.3 Test Procedure

The steps SHALL be performed as described in Table 17. The test results SHALL be compared against the Expected Result column in Table 17.

Table 17 – Test steps for Communications Client – Polled Active Controls, Energize/De-energize

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures an active control with a start for 5 minutes in the future, with a duration of 10 minutes and <i>opModEnergize = false</i> .	On the next poll of the <i>DERProgramList</i> the client receives the new active control and commences at the scheduled start time, and updates <i>DERStatus</i> to confirm that the DER is de-energised.
2	After 10 minutes the active control completes.	The client ceases the active control and updates <i>DERStatus</i> to confirm that the DER is re-energised.

#### 3.4.1.7.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The client does not de-energise and re-energise the DER.

Notes:

- i) AS/NZS 4777.2 requires that a disconnect in response to an external signal occurs within 2 seconds.
- ii) When testing multiple DER under the management of a single communications client, all DER are expected to disconnect when a control with *opModEnergize = false* is received.

### 3.4.1.8 GEN-04 Default Control – Export Limit (G)

#### 3.4.1.8.1 Purpose

This test is intended to validate the client’s ability to receive and respond to *DefaultDERControl* export limits.

#### 3.4.1.8.2 Precondition

A DER capable of generating active power is under the management of the client and is exporting at the connection point at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModExpLimW* set to 10000W.

#### 3.4.1.8.3 Test Procedure

The steps SHALL be performed as described in Table 18. The test results SHALL be compared against the Expected Result column in Table 18.

Table 18 – Test steps for Communications Client – Polled Default Controls, Export Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures a <i>DefaultDERControl</i> with <i>opModExpLimW = 0W</i> .	On the next poll of the utility server the client receives the updated <i>DefaultDERControl</i> .
2	The server cancels all active controls.	On the next poll of the utility server the client cancels all active controls and ramps down export to 0W after accounting for the measurement accuracy as specified in Section 2.3.1, at the value of <i>setGradW</i> (default 0.27% per second).

#### 3.4.1.8.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce export power to 0W.

### 3.4.1.9 GEN-05 Default Control – Generation Limit (G)

#### 3.4.1.9.1 Purpose

This test is intended to validate the client’s ability to receive and respond to *DefaultDERControl* generation limits.

#### 3.4.1.9.2 Precondition

A DER capable of generating active power is under the management of the client and is generating at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModGenLimW* set to 10000W.

#### 3.4.1.9.3 Test Procedure

The steps SHALL be performed as described in Table 19. The test results SHALL be compared against the Expected Result column in Table 19.

Table 19 – Test steps for Communications Client – Polled Default Controls, Generation Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures a <i>DefaultDERControl</i> with <i>opModGenLimW</i> = 0W.	On the next poll of the utility server the client receives the updated <i>DefaultDERControl</i> .
2	The server cancels all active controls.	On the next poll of the utility server the client cancels all active controls and ramps down generation to 0W after accounting for the measurement accuracy as specified in Section 2.3.1, at the value of <i>setGradW</i> (default 0.27% per second).

#### 3.4.1.9.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce generation power to 0W.

### 3.4.1.10 LOA-03 Default Control – Import Limit (L)

#### 3.4.1.10.1 Purpose

This test is intended to validate the client’s ability to receive and respond to *DefaultDERControl* import limits.

#### 3.4.1.10.2 Precondition

A DER capable of consuming active power is under the management of the client and is importing at the connection point at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModImpLimW* set to 10000W.

#### 3.4.1.10.3 Test Procedure

The steps SHALL be performed as described in Table 20. The test results SHALL be compared against the Expected Result column in Table 20.

Table 20 – Test steps for Communications Client – Polled Default Controls, Import Limit

Step No.	Manual or utility server step	Expected comms client result
----------	-------------------------------	------------------------------

1	The utility server configures a <i>DefaultDERControl</i> with <i>opModImpLimW = 0W</i> .	On the next poll of the utility server the client receives the updated <i>DefaultDERControl</i> .
2	The server cancels all active controls.	On the next poll of the utility server the client cancels all active controls and ramps down import to 0W after accounting for the measurement accuracy as specified in Section 2.3.1, at the value of <i>setGradW</i> (default 0.27% per second).

#### 3.4.1.10.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce import power to 0W.

### 3.4.1.11 LOA-04 Default Control – Load Limit (L)

#### 3.4.1.11.1 Purpose

This test is intended to validate the client’s ability to receive and respond to *DefaultDERControl* load limits.

#### 3.4.1.11.2 Precondition

A DER capable of consuming active power is under the management of the client and is consuming at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModLoadLimW* set to 10000W.

#### 3.4.1.11.3 Test Procedure

The steps SHALL be performed as described in Table 21. The test results SHALL be compared against the Expected Result column in Table 21.

Table 21 – Test steps for Communications Client – Polled Default Controls, Load Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures a <i>DefaultDERControl</i> with <i>opModLoadLimW = 0W</i> .	On the next poll of the utility server the client receives the updated <i>DefaultDERControl</i> .
2	The server cancels all active controls.	On the next poll of the utility server the client cancels all active controls and ramps down consumption to 0W after accounting for the measurement accuracy as specified in Section 2.3.1, at the value of <i>setGradW</i> (default 0.27% per second).

#### 3.4.1.11.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce consumption to 0W.

### 3.4.1.12 GEN-06 Default Control – Export Limit, Percentage (G)

#### 3.4.1.12.1 Purpose

This test is intended to validate the client’s ability to receive and respond to *DefaultDERControl* export limits using *opModMaxLimW*.

#### 3.4.1.12.2 Precondition

A DER capable of generating active power is under the management of the client and is generating at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModMaxLimW* set to 100%.

#### 3.4.1.12.3 Test Procedure

The steps SHALL be performed as described in Table 22. The test results SHALL be compared against the Expected Result column in Table 22.

Table 22 – Test steps for Communications Client – Polled Default Controls, Percentage Export Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures a <i>DefaultDERControl</i> with <i>opModMaxLimW</i> = 1%.	On the next poll of the utility server the client receives the updated <i>DefaultDERControl</i> .
2	The server cancels all active controls.	On the next poll of the utility server the client cancels all active controls and ramps down export to no more than 1% of rated active power (or such that the system is importing active power at the connection point) after accounting for the measurement accuracy as specified in Section 2.3.1, at the value of <i>setGradW</i> (default 0.27% per second).

#### 3.4.1.12.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce export to no more than 1% of rated power.
- b) *opModMaxLimW* is represented in hundredths of a percentage point, 0 to 10,000 (i.e. 100 = 1%).

Notes:

- i) *opModMaxLimW* is represented in hundredths of a percentage point, 0 to 10,000 (i.e. 100 = 1%).

### 3.4.1.13 ALL-08 Default Controls – Ramp Rate (A)

#### 3.4.1.13.1 Purpose

This test is intended to validate the client’s ability to receive and update the ramp-rate gradient using *setGradW*.

### 3.4.1.13.2 Test Procedure

The steps SHALL be performed as described in Table 23. The test results SHALL be compared against the Expected Result column in Table 23.

Table 23 – Test steps for Communications Client – Polled Default Controls, Ramp Rate

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures a <i>DefaultDERControl</i> with <i>setGradW</i> = 1% per second.	On the next poll of the <i>DERProgramList</i> the client receives the new <i>DefaultDERControl</i> . The utility server confirms the new value for <i>setGradW</i> in the next <i>DERSettings</i> post.

### 3.4.1.13.3 Post-test:

- a) The utility server updates the *DefaultDERControl*'s *setGradW* value back to the default of 0.27%.

### 3.4.1.13.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The client does not update the value of *setGradW*.

Notes:

- i) The default ramp-rate of 0.27% per second is approximately equal to 16.67% per minute, which is the default value for  $W_{gra}$  in AS/NZS 4777.2.

## 3.4.2 SUBSCRIPTION / NOTIFICATION

### 3.4.2.1 General

This section only applies to aggregator clients that are intending to support subscription / notification functionality. Clients integral to gateways and DER are not expected to support subscription / notification capabilities.

### 3.4.2.2 ALL-09 Subscribe (S)

#### 3.4.2.2.1 Purpose

This test is intended to validate test the client's ability to subscribe to updates to the each of following:

- a) *EndDeviceList*
- b) *DERControlList*
- c) *DefaultDERControl*

#### 3.4.2.2.2 Test Procedure

The steps SHALL be performed as described in Table 24. The test results SHALL be compared against the Expected Result column in Table 24.

Table 24 – Test steps for Communications Client – Subscribe

Step No.	Manual or utility server step	Expected comms client result
1	The client has previously been configured against the utility server, and an <i>EndDeviceList</i> subscription request is triggered within the aggregator client.	The client subscribes to <i>EndDeviceList</i> on the utility server, and provides a resource URI for the server to send notifications to.
2	The utility server sends a notification for <i>EndDeviceList</i> to the specified endpoint on the client.	The client receives the notification and implements it as appropriate.
3	The client has previously been configured against the utility server, and an <i>DERControlList</i> subscription request is triggered within the aggregator client	The client subscribes to <i>DERControlList</i> on the utility server, and provides a resource URI for the server to send notifications to.
4	The utility server sends a notification for <i>DERControlList</i> to the specified endpoint on the client.	The client receives the notification and implements it as appropriate.
5	The client has previously been configured against the utility server, and an <i>DefaultDERControl</i> subscription request is triggered within the aggregator client	The client subscribes to <i>DefaultDERControl</i> on the utility server, and provides a resource URI for the server to send notifications to.
6	The utility server sends a notification for <i>DefaultDERControl</i> to the specified endpoint on the client.	The client receives the notification and implements it as appropriate.

3.4.2.2.3 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- i) The client does not subscribe to the specified resource.
- ii) The notification resource provided by the client is unable to be accessed by the utility server.

Notes:

- (A) The steps of this test should be performed for each of the subscribable resources listed above.

3.4.2.3 GEN-07 Active Controls - Export Limit (G, S)

3.4.2.3.1 Purpose

This test is intended to validate the client’s ability to receive and respond to subscribed active controls using *opModExpLimW*.



### 3.4.2.3.2 Precondition

A DER capable of generating active power is under the management of the client and is exporting at the connection point at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModExpLimW* set to 10000W.

### 3.4.2.3.3 Test Procedure

The steps SHALL be performed as described in Table 25. The test results SHALL be compared against the Expected Result column in Table 25.

Table 25 – Test steps for Communications Client – Subscription Active Controls, Export Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures a new active control with <i>opModExpLimW</i> = 0 that is 5 minutes in the future and notifies the client of this control.	The client receives and commences the active control. The export power is reduced to 0W (or such that the system is importing active power at the connection point) after accounting for the measurement accuracy as specified in Section 2.3.1.

### 3.4.2.3.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce export power to 0W.

Notes:

- i) AS/NZS 4777.2 requires that any exceedance of the soft-limit to be contained within 15 seconds.

## 3.4.2.4 GEN-08 Active Controls – Generation Limit (G, S)

### 3.4.2.4.1 Purpose

This test is intended to validate the client’s ability to receive and respond to subscribed active controls using *opModGenLimW*.

### 3.4.2.4.2 Precondition

A DER capable of generating active power is under the management of the client and is generating at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModGenLimW* set to 10000W.

### 3.4.2.4.3 Test Procedure

The steps SHALL be performed as described in Table 26. The test results SHALL be compared against the Expected Result column in Table 26.

Table 26 – Test steps for Communications Client – Subscription Active Controls, Generation Limit

Step No.	Manual or utility server step	Expected comms client result
----------	-------------------------------	------------------------------

1	The utility server configures a new active control with <i>opModGenLimW</i> = 0 that is 5 minutes in the future and notifies the client of this control.	The client receives and commences the active control. The generation power is reduced to 0W (or such that the system is consuming active power) after accounting for the measurement accuracy as specified in Section 2.3.1.
---	--	--

#### 3.4.2.4.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce generation to 0W.

Notes:

- i) AS/NZS 4777.2 requires that any exceedance of the soft-limit to be contained within 15 seconds.

### 3.4.2.5 LOA-05 Active Controls – Import Limit (L, S)

#### 3.4.2.5.1 Purpose

This test is intended to validate the client’s ability to receive and respond to subscribed active controls using *opModExpLimW*.

#### 3.4.2.5.2 Precondition

A DER capable of consuming active power is under the management of the client and is importing at the connection point at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModImpLimW* set to 10000W.

#### 3.4.2.5.3 Test Procedure

The steps SHALL be performed as described in Table 27. The test results SHALL be compared against the Expected Result column in Table 27.

Table 27 – Test steps for Communications Client – Subscription Active Controls, Import Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures a new active control with <i>opModImpLimW</i> = 0 that is 5 minutes in the future and notifies the client of this control.	The client receives and commences the active control, by reducing import to 0W (or such that the system is exporting active power at the connection point) after accounting for the measurement accuracy as specified in Section 2.3.1.

#### 3.4.2.5.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce import power to 0W.

Notes:

- i) Completion of response to active load control signals can be expected to occur within 15sec to align with gen requirements.

### 3.4.2.6 LOA-06 Active Controls – Load Limit (L, S)

#### 3.4.2.6.1 Purpose

This test is intended to validate the client’s ability to receive and respond to subscribed active controls using *opModLoadLimW*.

#### 3.4.2.6.2 Precondition

A DER capable of consuming active power is under the management of the client and is consuming at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModLoadLimW* set to 10000W.

#### 3.4.2.6.3 Test Procedure

The steps SHALL be performed as described in Table 28. The test results SHALL be compared against the Expected Result column in Table 28.

Table 28 – Test steps for Communications Client – Subscription Active Controls, Load Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures a new active control with <i>opModLoadLimW</i> = 0 that is 5 minutes in the future and notifies the client of this control.	The client receives and commences the active control, by reducing load to 0W (or such that the system is generating active power) after accounting for the measurement accuracy as specified in Section 2.3.1.

#### 3.4.2.6.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce load to 0W.

Notes:

- i) Completion of response to active load control signals can be expected to occur within 15sec to align with gen requirements.

### 3.4.2.7 GEN-09 Active Controls – Export Limit, Percentage (G, S)

#### 3.4.2.7.1 Purpose

This test is intended to validate the client’s ability to receive and respond to subscribed active export controls using *opModMaxLimW*.

### 3.4.2.7.2 Precondition

A DER capable of generating active power is under the management of the client and is generating at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModMaxLimW* set to 100%.

### 3.4.2.7.3 Test Procedure

The steps SHALL be performed as described in Table 28. The test results SHALL be compared against the Expected Result column in Table 28.

Table 29 – Test steps for Communications Client – Subscription Active Controls, Percentage Export Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures a new active control with <i>opModMaxLimW</i> = 0 that is 5 minutes in the future and notifies the client of this control.	The client receives and commences the active control, by reducing export to no more than 1% of rated active power (or such that the system is importing active power at the connection point) after accounting for the measurement accuracy as specified in Section 2.3.1.

### 3.4.2.7.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce export to no more than 1% of rated power.

Notes:

- i) AS/NZS 4777.2 requires that any exceedance of the soft-limit to be contained within 15 seconds.
- ii) *opModMaxLimW* is represented in hundredths of a percentage point, 0 to 10,000 (i.e. 100 = 1%).

## 3.4.2.8 ALL-10 Active Controls – Energise (A, S)

### 3.4.2.8.1 Purpose

This test is intended to validate the client’s ability to receive and respond to subscribed active controls using *opModEnergize*.

### 3.4.2.8.2 Precondition

The client has *opModEnergize* set to *true* and the DER is generating or consuming active power of at least 2000W or 50% of its rated power.

### 3.4.2.8.3 Test Procedure

The steps SHALL be performed as described in Table 30. The test results SHALL be compared against the Expected Result column in Table 30.

Table 30 – Test steps for Communications Client – Subscription Active Controls, Energise

Step No.	Manual or utility server step	Expected comms client result
----------	-------------------------------	------------------------------

1	The utility server configures an active control with <i>opModEnergize = false</i> and notifies the client.	The client receives and commences the active control, and updates <i>DERStatus</i> to confirm that the DER is de-energised.
2	The utility server configures an active control with <i>opModEnergize = true</i> and notifies the client.	The client receives and commences the active control, and updates <i>DERStatus</i> to confirm that the DER is re-energised.

#### 3.4.2.8.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The client does not de-energise and re-energise the DER.

. Notes:

- i) For clients capable of managing multiple DER all managed DER are to disconnect and reconnect when instructed by *opModEnergize*.

#### 3.4.2.9 GEN-10 Default Controls – Export Limit (G, S)

##### 3.4.2.9.1 Purpose

This test is intended to validate the client’s ability to receive and respond to subscribed *DefaultDERControl*s using *opModExpLimW*.

##### 3.4.2.9.2 Precondition

A DER capable of generating active power is under the management of the client and is exporting at the connection point at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModExpLimW* set to 10000W.

##### 3.4.2.9.3 Test Procedure

The steps SHALL be performed as described in Table 31. The test results SHALL be compared against the Expected Result column in Table 31.

Table 31 – Test steps for Communications Client – Subscription Default Controls, Export Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures a new <i>DefaultDERControl</i> with <i>opModExpLimW = 0</i> and notifies the client of this control.	The client receives the default control.
2	The utility server notifies the client of cancellation of all active controls.	The client receives the cancellation and falls back to the <i>DefaultDERControl</i> export limit of 0W after accounting for the measurement accuracy as specified in Section 2.3.1, at the value of <i>setGradW</i> (default 0.27% per second).

#### 3.4.2.9.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce export power to 0W.

### 3.4.2.10 GEN-11 Default Controls – Generation Limit (G, S)

#### 3.4.2.10.1 Purpose

This test is intended to validate the client’s ability to receive and respond to subscribed *DefaultDERControl*s using *opModGenLimW*.

#### 3.4.2.10.2 Precondition

A DER capable of generating active power is under the management of the client and is generating at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModGenLimW* set to 10000W.

#### 3.4.2.10.3 Test Procedure

The steps SHALL be performed as described in Table 32. The test results SHALL be compared against the Expected Result column in Table 32.

Table 32 – Test steps for Communications Client – Subscription Default Controls, Generation Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures a new <i>DefaultDERControl</i> with <i>opModGenLimW</i> = 0 and notifies the client of this control.	The client receives the default control.
2	The utility server notifies the client of cancellation of all active controls.	The client receives the cancellation and falls back to the <i>DefaultDERControl</i> generation limit of 0W after accounting for the measurement accuracy as specified in Section 2.3.1, at the value of <i>setGradW</i> (default 0.27% per second).

#### 3.4.2.10.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce generation power to 0W.

### 3.4.2.11 LOA-07 Default Controls – Import Limit (L, S)

#### 3.4.2.11.1 Purpose

This test is intended to validate the client’s ability to receive and respond to subscribed *DefaultDERControl*s using *opModImpLimW*.

#### 3.4.2.11.2 Precondition

A DER capable of consuming active power is under the management of the client and is importing at the connection point at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModImpLimW* set to 10000W.

#### 3.4.2.11.3 Test Procedure

The steps SHALL be performed as described in Table 33. The test results SHALL be compared against the Expected Result column in Table 33.

Table 33 – Test steps for Communications Client – Subscription Default Controls, Import Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures a new <i>DefaultDERControl</i> with <i>opModImpLimW</i> = 0 and notifies the client of this control.	The client receives the default control.
2	The utility server notifies the client of cancellation of all active controls.	The client receives the cancellation and falls back to the <i>DefaultDERControl</i> import limit of 0W after accounting for the measurement accuracy as specified in Section 2.3.1, at the value of <i>setGradW</i> (default 0.27% per second).

#### 3.4.2.11.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce import power to 0W.

### 3.4.2.12 LOA-08 Default Controls – Load Limit (L, S)

#### 3.4.2.12.1 Purpose

This test is intended to validate the client's ability to receive and respond to subscribed *DefaultDERControl*s using *opModLoadLimW*.

#### 3.4.2.12.2 Precondition

A DER capable of consuming active power is under the management of the client and is consuming at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModLoadLimW* set to 10000W.

#### 3.4.2.12.3 Test Procedure

The steps SHALL be performed as described in Table 34. The test results SHALL be compared against the Expected Result column in Table 34.

Table 34 – Test steps for Communications Client – Subscription Default Controls, Load Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures a new <i>DefaultDERControl</i> with <i>opModLoadLimW</i> = 0 and notifies the client of this control.	The client receives the default control.
2	The utility server notifies the client of cancellation of all active controls.	The client receives the cancellation and falls back to the <i>DefaultDERControl</i> load limit of 0W after accounting for the measurement accuracy as specified in Section 2.3.1, at the value of <i>setGradW</i> (default 0.27% per second).

#### 3.4.2.12.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce load power to 0W.

#### 3.4.2.13 GEN-12 Default Controls – Export Limit, Percentage (G, S)

##### 3.4.2.13.1 Purpose

This test is intended to validate the client’s ability to receive and respond to subscribed export *DefaultDERControl*s using *opModMaxLimW*.

##### 3.4.2.13.2 Precondition

A DER capable of generating active power is under the management of the client and is generating at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModMaxLimW* set to 100%.

##### 3.4.2.13.3 Test Procedure

The steps SHALL be performed as described in Table 35. The test results SHALL be compared against the Expected Result column in Table 35.

Table 35 – Test steps for Communications Client – Subscription Default Controls, Percentage Export Limit

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures a new <i>DefaultDERControl</i> with <i>opModMaxLimW</i> = 0 and notifies the client of this control.	The client receives the default control.
2	The utility server notifies the client of cancellation of all active controls.	The client receives the cancellation and falls back to no more than the <i>DefaultDERControl</i> export limit of 1% of rated power (or such that the system is importing active power at the connection point) after accounting for the



		measurement accuracy as specified in Section 2.3.1, at the value of <i>setGradW</i> (default 0.27% per second).
--	--	---

#### 3.4.2.13.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER does not reduce export to 1% of rated power.

Notes:

- i) *opModMaxLimW* is represented in hundredths of a percentage point, 0 to 10,000 (i.e. 100 = 1%).

### 3.4.2.14 ALL-11 Default Controls – Ramp Rate (A, S)

#### 3.4.2.14.1 Purpose

This test is intended to validate the client’s ability to receive subscribed updates to the ramp-rate gradient using *setGradW*.

#### 3.4.2.14.2 Test Procedure

The steps SHALL be performed as described in Table 36. The test results SHALL be compared against the Expected Result column in Table 36.

Table 36 – Test steps for Communications Client – Subscription Default Controls, Ramp Rate

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures a <i>DefaultDERControl</i> with <i>setGradW</i> = 1% per second and notifies the client.	The client receives and configures the new <i>DefaultDERControl</i> . The utility server confirms the update to <i>setGradW</i> in the next update to <i>DERSettings</i> .

#### 3.4.2.14.3 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The client does not update the value of *setGradW*.

Notes:

- i) The default ramp-rate of 0.27% per second is approximately equal to 16.67% per minute, which is the default value for  $W_{gra}$  in 4777.2.
- ii) Adhering to ramp-rates as defined by *setGradW* is only intended to apply to DER where mandated by AS/NZS 4777.2, however other devices that are capable of achieving this may elect to support this functionality.

### 3.4.3 ALL-12 CONTROL RESPONSES (A)

#### 3.4.3.1 Purpose

This test is intended to validate the client's ability to provide control responses for the following control events:

- a) 1. Event received
- b) 2. Event started
- c) 3. Event completed
- d) 6. The event has been cancelled
- e) 7. The event has been superseded

#### 3.4.3.2 Test Procedure

The steps SHALL be performed as described in Table 37. The test results SHALL be compared against the Expected Result column in Table 37.

Table 37 – Test steps for Communications Client – Control Responses

Step No.	DER or utility server step	Expected comms client result
1	The utility server configures an active control with <i>opModExpLimW</i> / <i>opModImpLimW</i> = 10000W.	On the next poll/notification of the <i>DERProgramList</i> the client receives the active control and posts back control response = 1 (received).
2	The DER starts the active control.	The client posts back control response = 2 (started).
3	The DER completes the active control.	The client posts back control response = 3 (completed).
4	The utility server configures an active control with <i>opModExpLimW</i> / <i>opModImpLimW</i> = 10000W, and after commencement cancels the control.	On next poll/notification of the <i>DERProgramList</i> the client receives the cancellation, ends the active control and posts back control response = 6 (cancelled).
5	The utility server configures and active control for a period in the future. Prior to the start of the control the utility server cancels the control.	On next poll/notification of the <i>DERProgramList</i> the client receives the cancellation and posts back control response = 6 (cancelled).
6	The utility server configures an active control with <i>opModExpLimW</i> / <i>opModImpLimW</i> = 10000W, and then creates a second active control with an overlapping control window.	On next poll/notification of the <i>DERProgramList</i> the client receives the new active control and posts back control response = 7 (superseded).

#### 3.4.3.3 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- i) The DER does not provide the correct poll responses.

Notes:

- (A) In the case of cloud aggregators 'receives' indicates that the message has been received locally (either at the gateway or the DER) and in the case of outages will be enacted when communications has been reestablished.
  - (1) Where a client manages multiple DER, the client SHALL only flag receipt when all DER that may be impacted by the control have received it.
- (B) This test is designed for either generation or load type DER – either *opModExpLimW* or *opModImpLimW* is used depending on the type of DER under test. DER capable of both generation and consumption (e.g. energy storage or V2G) may use either.

3.4.4 ALL-13 POLL RATES (A, DR-A)

**3.4.4.1 Purpose**

This test is intended to validate the client’s ability to change the pollRate of *FunctionSetAssignmentsList*.

**3.4.4.2 Test Procedure**

The steps SHALL be performed as described in Table 38. The test results SHALL be compared against the Expected Result column in Table 38.

Table 38 – Test steps for Communications Client – Poll Rates

Step No.	Manual or utility server step	Expected comms client result
1	The utility server updates pollRate from the default of 300s to 60s.	On next poll of the <i>FunctionSetAssignmentsList</i> the client receives and updates to the new pollRate. The next <i>FunctionSetAssignmentsList</i> poll is made to the utility server after 60s.

**3.4.4.3 Post-test**

- a) The utility server updates the pollRate back to 300s.

**3.4.4.4 Criteria**

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- i) The DER does not update the pollRate correctly.

3.4.5 ALL-14 SCHEDULING (A)

**3.4.5.1 Purpose**

This test is intended to validate the client’s ability to receive a schedule of controls.

**3.4.5.2 Test Procedure**

The steps SHALL be performed as described in Table 39. The test results SHALL be compared against the Expected Result column in Table 39.

Table 39 – Test steps for Communications Client – Scheduling

Step No.	Manual or utility server step	Expected comms client result
1	The utility server generates a schedule of 24 sequential controls.	The client receives the schedule of controls (either by notification or polling) and provides a control response = 1 (received) for each control. The client progresses through the schedule of controls, send a control response = 2 (started) as each commences.

### 3.4.5.3 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The client does not receive and respond correctly to the schedule of controls.

## 3.4.6 ALL-15 RANDOMISATION (A)

### 3.4.6.1 Purpose

This test is intended to validate the client’s support for randomization using the *randomizeStart* attribute.

### 3.4.6.2 Test Procedure

The steps SHALL be performed as described in Table 40. The test results SHALL be compared against the Expected Result column in Table 40.

Table 40 – Test steps for Communications Client – Randomisation

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures a schedule of five active controls, each with the following attributes: <ul style="list-style-type: none"> <li>• Duration = 120s</li> <li>• <i>randomizeStart</i> = 60s</li> <li>• <i>opModExpLimW</i> = 10000W</li> </ul>	The client receives the schedule of controls and then executes the entire schedule. The utility server will validate the randomness of start times through the received control responses.

### 3.4.6.3 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The client does not properly implement randomisation.

## 3.4.7 ALL-16 COMMUNICATION LOSS (A)

### 3.4.7.1 Purpose

This test is intended to validate the client’s ability to ramp to the *DefaultDERControl* when communications are lost with the utility server.

### 3.4.7.2 Precondition

The DER is importing or exporting at the connection point at least 2000W or 50% of its rated power, whichever is smaller. The utility has a current active control in operation, with *opModImpLimW* / *opModExpLimW* set to 10000W.

### 3.4.7.3 Test Procedure

The steps SHALL be performed as described in Table 41. The test results SHALL be compared against the Expected Result column in Table 41.

Table 41 – Test steps for Communications Client – Communications Loss

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures a <i>DefaultDERControl</i> with <i>opModExpLimW</i> / <i>opModImpLimW</i> = 0.	The client receives the new <i>DefaultDERControl</i> .
2	Prior to completion of the existing active control schedule communications between the utility server and client are lost.	The client completes the current schedule of controls. On completion of the active control schedule the DER begins ramping down to 0W and a ramp-rate equal to <i>setGradW</i> (default 0.27%/sec). After a period the DER is operating at 0 import/export or less.
3	Communications between the utility server and client are reestablished 5 minute after the expiry of the current schedule. An active control is issued with <i>opModImpLimW</i> / <i>opModExpLimW</i> = 10000W.	The client receives and ramps up to the new active control using <i>setGradW</i> default 0.27%/sec).

### 3.4.7.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DER ramps down immediately on loss of communications, rather than waiting for the active control schedule to complete.
- b) The DER continues to import/export at a higher level than the *DefaultDERControl* after the active control schedule expires.
- c) The DER generation/load ramps up immediately on restoration of communications, rather than waiting for a new active control to be provided.

Notes:

- i) This test is designed for either generation or load type DER – either *opModExpLimW* or *opModImpLimW* is used depending on the type of DER under test. DER capable of both generation and consumption (e.g. energy storage or V2G) may use either.
- ii) The tester is responsible for determining an appropriate way to create a loss of communications between the comms client and test utility server. Examples may include disabling of physical

networking (e.g. unplugging of Ethernet cable or turning off of WiFi router), shutting down the test utility server, etc.

### 3.5 ALL-17 EXTENDED OPERATIONS (A, DR-A)

#### 3.5.1 PURPOSE

This test is intended to validate the client's ability to maintain compliant communications and operations over an extended period.

#### 3.5.2 TEST PROCEDURE

The steps SHALL be performed as described in Table 42. The test results SHALL be compared against the Expected Result column in Table 42.

Table 42 – Test steps for Communications Client – Extended Operations

Step No.	Manual or utility server step	Expected comms client result
1	A connection between the utility server and client is established and maintained for 3 consecutive days (72 hours).	The client maintains communications for this period.

#### 3.5.3 CRITERIA

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) Communications are not maintained throughout the specified period.

Notes:

- i) Clients that cannot be configured to always be online due to a reliance on a variable power source (e.g. sunlight) may lose maintain communications when the source is unavailable (e.g. outside daylight hours) however are expected to maintain communications when the power source is available.

# 4 DEMAND RESPONSE TEST PROCEDURE

## 4.1 GENERAL

This section determines conformance of a communications client to the AS 4755-type demand response signals defined in Annex C of CSIP-AUS, and as such is only applicable to clients that wish to claim conformance to that section of the guide. These may be DREDS, controllable appliances with integral comms clients, or non-DRED gateways managing downstream DREDS or DR-enabled appliances.

Figure 5 describes the possible architectures by which a utility server (termed a “remote agent” in the AS 4755 suite of standards) can communicate with an appliance capable of demand response via the CSIP-AUS architecture. The communications are to be supported by a suitable communications client, which may be:

- 1) integral to the appliance without a gateway;
- 2) integral to the appliance but supported by a gateway; or
- 3) located on a DRED that communicates OIs to the appliance via relays as defined in AS/NZS 4755.1.

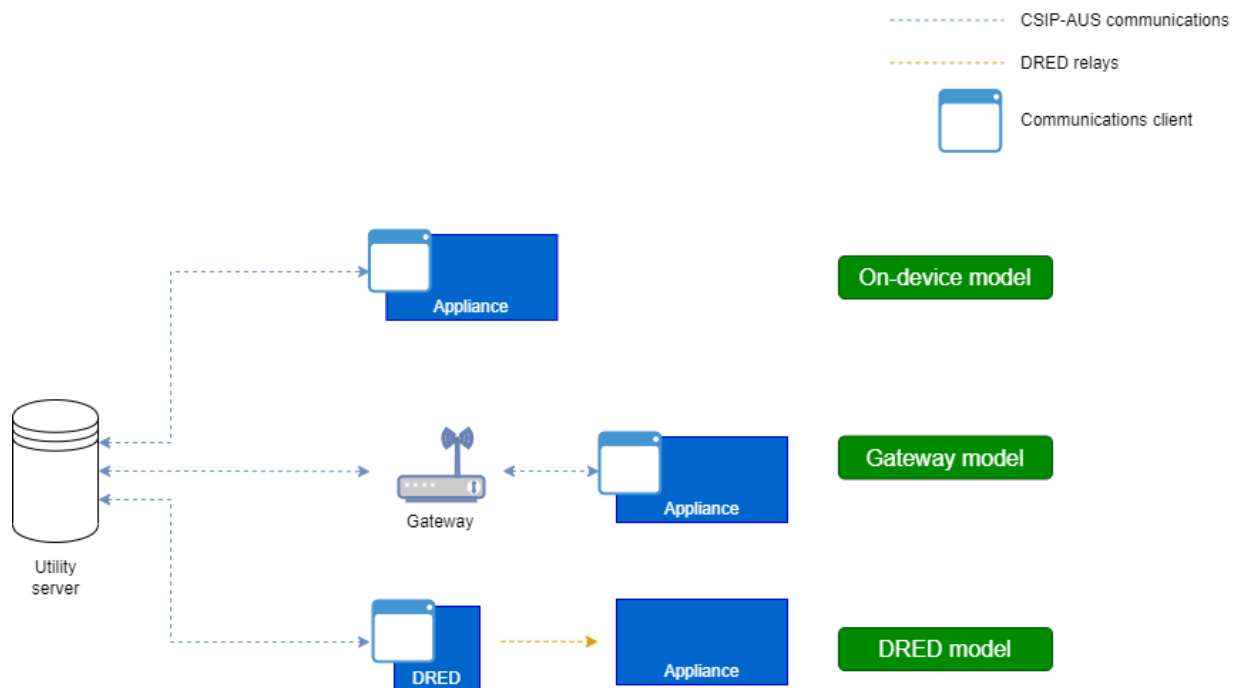


Figure 5 – Demand response architectures

The responses of demand response communications clients to OIs are as per the relevant standard:

- a) for DREDS, a relay response as defined in AS/NZS 4755.1 clause 3.3.2;
- b) for appliances with integral communications clients, a change in energy generated or consumed as per the relevant appendix of AS 4755.2.

For the purposes of these test procedures, the term “utility server” is intended to be equivalent to a “remote agent” as defined in the AS 4755 suite of standards.

The tests detailed in this section are intended to ensure that a communications client correctly interpret and acts upon the signals it receives from a utility server via CSIP-AUS. It is not intended to validate the physical response of a demand response system, however in some tests a physical response is used as a

proxy for validating the correct interpretation of an operating signal. Full descriptions of expected physical responses can be found in the relevant standard as described in Table 43:

Table 43 – Standards specifying physical response of demand response systems

<b>Device / appliance type</b>	<b>DRED-control</b>	<b>Integral to appliance</b>
DRED	AS/NZS 4755.1	N/A
Air conditioner	AS/NZS 4755.3.1	DR-AS 4755.2 appendix A
Pool pump controller	AS/NZS 4755.3.2	DR-AS 4755.2 appendix B
Electric water heater	AS/NZS 4755.3.3	DR-AS 4755.2 appendix C
Electrical energy storage system	AS/NZS 4755.3.5	DR-AS 4755.2 appendix D

Note: AS 4755.2 is currently in draft, and as such references to specific sections of this standard may change at time of publication.

## 4.2 DRA-01 CONFIGURATION (DR-A)

### 4.2.1 PURPOSE

This test is intended to validate that the client sets appropriate values for *DERCapability*.

### 4.2.2 TEST PROCEDURE

The steps SHALL be performed as described in Table 44. The test results SHALL be compared against the Expected Result column in Table 44.

Table 44 – Test steps for Communications Client – Demand Response Configuration

<b>Step No.</b>	<b>Manual or utility server step</b>	<b>Expected comms client result</b>
1	The client completes the discovery process as detailed in test 3.2.1, including receiving the <i>DERCapability</i> and <i>DERSettings</i> resource links from the utility server.	Client posts a <i>DERCapability</i> payload to the utility server on connection. The payload includes a <i>modesSupported</i> value with bit 7 ( <i>opModFixedW</i> ) asserted, and a <i>type</i> value with the appropriate bit asserted as per the controlled device type – <ul style="list-style-type: none"> <li>• Hot water system – bit 3</li> <li>• Pool pump controller – bit 4</li> <li>• Air conditioner – bit 7</li> <li>• Electric vehicle charger – bit 17</li> </ul>

### 4.2.3 CRITERIA

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) Bit 7 of *modesSupported* is not asserted.
- b) The *type* field bits asserted do not match the type of device under control.



## 4.3 DRD-01 DRED OPERATIONAL INSTRUCTION RESPONSE (DR-D)

### 4.3.1 PURPOSE

This test is intended to validate the client's ability to respond to all operational instructions.

### 4.3.2 TEST PROCEDURE

The steps SHALL be performed as described in Table 47. The test results SHALL be compared against the Expected Result column in Table 47

Table 45 – Test steps for Communications Client – DRED OI Response

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures an active control with an immediate start and <i>opModConnect</i> = false (representing OI0).	On the next poll of the utility server the client receives and starts the active control, by asserting the relevant switch(es) as detailed in AS-NZS 4755.1. On the next update to <i>DERStatus</i> the client reports an <i>operationalModeStatus</i> of 100 and <i>alarmStatus</i> = 0.
2	The utility server configures an active control with an immediate start and <i>opModConnect</i> = true to cease the operational instruction.	On the next poll of the utility server the client receives and starts the active control, by relaxing the relevant switch(es) as detailed in AS-NZS 4755.1.
3	The utility server configures an active control with <i>opModFixedW</i> = -75% (representing OI3) to start no more than 5 minutes in the future.	On the next poll of the utility server the client receives the active control. At the appropriate time (including any randomisation) the DRED begins the active control by asserting the relevant switch(es) as detailed in AS-NZS 4755.1. On the next update to <i>DERStatus</i> the client reports an <i>operationalModeStatus</i> of 103 and <i>alarmStatus</i> = 0, and on next update to <i>DERSettings</i> with bit 7 of <i>modesEnabled</i> (i.e. <i>opModFixedW</i> ) asserted.
4	The utility server configures an active control with <i>opModFixedW</i> = -50% (representing OI2) to start no more than 5 minutes in the future.	On the next poll of the utility server the client receives the active control. At the appropriate time (including any randomisation) the DRED begins the active control by asserting the relevant switch(es) as detailed in AS-NZS 4755.1. On the next update to <i>DERStatus</i> the client reports an <i>operationalModeStatus</i> of 102 and <i>alarmStatus</i> = 0, and on next update to <i>DERSettings</i> with bit 7 of <i>modesEnabled</i> (i.e. <i>opModFixedW</i> ) asserted.
5	The utility server configures an active control with <i>opModFixedW</i> = -0.01% (representing OI1) to start no more than 5 minutes in the future.	On the next poll of the utility server the client receives the active control. At the appropriate time (including any randomisation) the DRED begins the active control by asserting the relevant switch(es) as detailed in AS-NZS 4755.1. On the next update to <i>DERStatus</i> the client reports an <i>operationalModeStatus</i> of 101 and <i>alarmStatus</i> = 0,

		and on next update to <i>DERSettings</i> with bit 7 of <i>modesEnabled</i> (i.e. <i>opModFixedW</i> ) asserted.
6	The utility server configures an active control with <i>opModFixedW</i> = -100% (representing OI4) to start no more than 5 minutes in the future.	On the next poll of the utility server the client receives the active control. At the appropriate time (including any randomisation) the DRED begins the active control by asserting the relevant switch(es) as detailed in AS-NZS 4755.1. On the next update to <i>DERStatus</i> the client reports an <i>operationalModeStatus</i> of 104 and <i>alarmStatus</i> = 0, and on next update to <i>DERSettings</i> with bit 7 of <i>modesEnabled</i> (i.e. <i>opModFixedW</i> ) asserted.
7	The utility server configures an active control with <i>opModFixedW</i> = 75% (representing OI7) to start no more than 5 minutes in the future.	On the next poll of the utility server the client receives the active control. At the appropriate time (including any randomisation) the DRED begins the active control by asserting the relevant switch(es) as detailed in AS-NZS 4755.1. On the next update to <i>DERStatus</i> the client reports an <i>operationalModeStatus</i> of 107 and <i>alarmStatus</i> = 0, and on next update to <i>DERSettings</i> with bit 7 of <i>modesEnabled</i> (i.e. <i>opModFixedW</i> ) asserted.
8	The utility server configures an active control with <i>opModFixedW</i> = 50% (representing OI6) to start no more than 5 minutes in the future.	On the next poll of the utility server the client receives the active control. At the appropriate time (including any randomisation) the DRED begins the active control by asserting the relevant switch(es) as detailed in AS-NZS 4755.1. On the next update to <i>DERStatus</i> the client reports an <i>operationalModeStatus</i> of 106 and <i>alarmStatus</i> = 0, and on next update to <i>DERSettings</i> with bit 7 of <i>modesEnabled</i> (i.e. <i>opModFixedW</i> ) asserted.
9	The utility server configures an active control with <i>opModFixedW</i> = 0% (representing OI5) to start no more than 5 minutes in the future.	On the next poll of the utility server the client receives the active control. At the appropriate time (including any randomisation) the DRED begins the active control by asserting the relevant switch(es) as detailed in AS-NZS 4755.1. On the next update to <i>DERStatus</i> the client reports an <i>operationalModeStatus</i> of 105 and <i>alarmStatus</i> = 0, and on next update to <i>DERSettings</i> with bit 7 of <i>modesEnabled</i> (i.e. <i>opModFixedW</i> ) asserted.
10	The utility server configures an active control with <i>opModFixedW</i> = 100% (representing OI8) to start no more than 5 minutes in the future.	On the next poll of the utility server the client receives the active control. At the appropriate time (including any randomisation) the DRED begins the active control by asserting the relevant switch(es) as detailed in AS-NZS 4755.1. On the next update to <i>DERStatus</i> the client reports an <i>operationalModeStatus</i> of 108 and <i>alarmStatus</i> = 0,

		and on next update to <i>DERSettings</i> with bit 7 of <i>modesEnabled</i> (i.e. <i>opModFixedW</i> ) asserted.
--	--	---

### 4.3.3 CRITERIA

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The DRED fails to assert the correct switch(es) after the active control is scheduled to commence (accounting for any randomisation).
- b) The DRED reports a *DERStatus* with no or an incorrect value for *operationalModeStatus*.

#### Notes

- i) The requirement for DREDs to report *operationalModeStatus* in *DERSettings* resources is present in the DEIP-published version of CSIP-AUS, however is no longer present in the SA HB 218 version of CSIP-AUS produced by Standards Australia. As such this test may be modified to reflect the appropriate version of CSIP-AUS that a client is intended to conform to.

## 4.4 ELECTRICAL PRODUCTS

### 4.4.1 DRA-02 DISCONNECT INSTRUCTION (DR-L, DR-G)

#### 4.4.1.1 Purpose

This test is intended to validate the client’s ability to respond to a disconnection signal.

#### 4.4.1.2 Precondition

The controlled device is connected to the grid and consuming or generating power of at least 50% of its nameplate rating in kW.

#### 4.4.1.3 Test Procedure

The steps SHALL be performed as described in Table 46. The test results SHALL be compared against the Expected Result column in Table 46.

Table 46 – Test steps for Communications Client – Demand Response Disconnection Instruction

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures an active control with an immediate start and <i>opModConnect</i> = false (representing OI0).	On the next poll of the utility server the client receives and starts the active control, by reducing load or generation (as appropriate) to 0W as determined in the relevant standard (see Table 43). On the next update to <i>DERStatus</i> the client reports an <i>operationalModeStatus</i> of 100 and <i>alarmStatus</i> = 0.

#### 4.4.1.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- a) The controlled device continues to consume or generate power after receiving the active control.
- b) The controlled device reports a *DERStatus* with no or an incorrect value for *operationalModeStatus*.

Notes:

- i) This test is only applicable to clients that intend to support OI0.
- ii) The requirement for demand response enabled electrical products to report *operationalModeStatus* in *DERSettings* resources is present in the DEIP-published version of CSIP-AUS, however is no longer present in the SA HB 218 version of CSIP-AUS produced by Standards Australia. As such this test may be modified to reflect the appropriate version of CSIP-AUS that a client is intended to conform to.

#### 4.4.2 DRL-01 LOAD OPERATIONAL INSTRUCTIONS (DR-L)

##### 4.4.2.1 Purpose

This test is intended to validate the client’s ability to respond to the load operational instructions for which it wishes to claim conformance.

##### 4.4.2.2 Precondition

The controlled device is connected to the grid and consuming power of 90% +/- 5% of its nameplate rating in kW.

##### 4.4.2.3 Test Procedure

The steps SHALL be performed as described in Table 47. The test results SHALL be compared against the Expected Result column in Table 47.

Table 47 – Test steps for Communications Client – Demand Response Load OIs

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures an active control with <i>opModFixedW</i> = -75% (representing OI3) to start no more than 5 minutes in the future.	On the next poll of the utility server the client receives the active control. At the appropriate time (including any randomisation) the controlled device begins the active control by reducing load to no more than 75% of the reference value as determined in the relevant standard (see Table 43). On the next update to <i>DERStatus</i> the client reports an <i>operationalModeStatus</i> of 103 and <i>alarmStatus</i> = 0, and on next update to <i>DERSettings</i> with bit 7 of <i>modesEnabled</i> (i.e. <i>opModFixedW</i> ) asserted.
2	The utility server configures an active control with <i>opModFixedW</i> = -50% (representing OI2) to start no more than 5 minutes in the future.	On the next poll of the utility server the client receives the active control. At the appropriate time (including any randomisation) the controlled device begins the active control by reducing load to no more than 50% of the reference value as determined in the relevant standard (see Table 43). On the next update to <i>DERStatus</i> the client reports an <i>operationalModeStatus</i> of 102 and <i>alarmStatus</i> = 0,

		and on next update to <i>DERSettings</i> with bit 7 of <i>modesEnabled</i> (i.e. <i>opModFixedW</i> ) asserted.
3	The utility server configures an active control with <i>opModFixedW</i> = -0.01% (representing OI1) to start no more than 5 minutes in the future.	On the next poll of the utility server the client receives the active control. At the appropriate time (including any randomisation) the controlled device begins the active control by ceasing to consume load as determined in the relevant standard (see Table 43). On the next update to <i>DERStatus</i> the client reports an <i>operationalModeStatus</i> of 101 and <i>alarmStatus</i> = 0, and on next update to <i>DERSettings</i> with bit 7 of <i>modesEnabled</i> (i.e. <i>opModFixedW</i> ) asserted.
4	The utility server configures an active control with <i>opModFixedW</i> = -100% (representing OI4) to start no more than 5 minutes in the future.	On the next poll of the utility server the client receives the active control. At the appropriate time (including any randomisation) the controlled device begins the active control by increasing load to more than 90% of the reference value as determined in the relevant standard (see Table 43). On the next update to <i>DERStatus</i> the client reports an <i>operationalModeStatus</i> of 104 and <i>alarmStatus</i> = 0, and on next update to <i>DERSettings</i> with bit 7 of <i>modesEnabled</i> (i.e. <i>opModFixedW</i> ) asserted.

#### 4.4.2.4 Criteria

If during testing the client experiences one of the following events these are considered non-conformances with this requirement:

- c) The controlled device continues to consume power more than the specified power after the active control is scheduled to commence (accounting for any randomisation).
- d) The controlled device reports a *DERStatus* with no or an incorrect value for *operationalModeStatus*.

Notes:

- i) Step 1 in Table 47 is only applicable to clients that wish to claim conformance with OI3.
- ii) Step 2 in Table 47 is only applicable to clients that wish to claim conformance with OI2.
- iii) Step 4 in Table 47 is only applicable to clients that wish to claim conformance with OI4.
- iv) The requirement for demand response enabled electrical products to report *operationalModeStatus* in *DERSettings* resources is present in the DEIP-published version of CSIP-AUS, however is no longer present in the SA HB 218 version of CSIP-AUS produced by Standards Australia. As such this test may be modified to reflect the appropriate version of CSIP-AUS that a client is intended to conform to.

### 4.4.3 DRG-01 GENERATION OPERATIONAL INSTRUCTIONS (DR-G)

#### 4.4.3.1 Purpose

This test is intended to validate the client's ability to respond to the generation operational instructions for which it wishes to claim conformance.

#### 4.4.3.2 Precondition

The controlled device is connected to the grid and generating power of 90% +/- 5% of its nameplate rating in kW.

#### 4.4.3.3 Test Procedure

The steps SHALL be performed as described in Table 48. The test results SHALL be compared against the Expected Result column in Table 48.

Table 48 – Test steps for Communications Client – Demand Response Generation OIs

Step No.	Manual or utility server step	Expected comms client result
1	The utility server configures an active control with <i>opModFixedW</i> = 75% (representing OI7) to start no more than 5 minutes in the future.	On the next poll of the utility server the client receives the active control. At the appropriate time (including any randomisation) the controlled device begins the active control by reducing generation to no more than 75% of the reference value as determined in the relevant standard (see Table 43). On the next update to <i>DERStatus</i> the client reports an <i>operationalModeStatus</i> of 107 and <i>alarmStatus</i> = 0, and on next update to <i>DERSettings</i> with bit 7 of <i>modesEnabled</i> (i.e. <i>opModFixedW</i> ) asserted.
2	The utility server configures an active control with <i>opModFixedW</i> = 50% (representing OI6) to start no more than 5 minutes in the future.	On the next poll of the utility server the client receives the active control. At the appropriate time (including any randomisation) the controlled device begins the active control by reducing generation to no more than 50% of the reference value as determined in the relevant standard (see Table 43). On the next update to <i>DERStatus</i> the client reports an <i>operationalModeStatus</i> of 106 and <i>alarmStatus</i> = 0, and on next update to <i>DERSettings</i> with bit 7 of <i>modesEnabled</i> (i.e. <i>opModFixedW</i> ) asserted.