

Electricity Specification 260

Issue 3 July 2023

Flexible Connections for Demand and Generation



Amendment Summary

ISSUE NO. DATE	DESCRIPTION
<p>Issue 2</p> <p>Sept 2021</p>	<p>Amendments throughout following development of the Connection Control Panel. Detail added, drawing referenced added.</p> <p>Prepared by: Peter Twomey Approved by: Policy Approval Panel and signed on its behalf by Steve Cox, Engineering and Technical Director</p>
<p>Issue 3</p> <p>July 2023</p>	<p>Significant revision with the following main changes:</p> <ul style="list-style-type: none"> Reduced the ramp down for Controlled Shut Down from 120s to 90s. Controlled Shutdown (CSD) Deleted the metering burden calculations because metering CTs will no longer be used to derive analogues. Signals will now be derived from an iStat solution. Data Analogues Commissioning test replaced with current versions. Appendix C Controlled Shutdown test procedure added Appendix D RSD Indications added Appendix E HV connection block diagram updated with metering derived analogues replaced with iStat cables. Appendix B Communications interface with ANM requirements added. Interface and Communication with Active Network Management <p>Prepared by: Peter Twomey and Steve Davenport Approved by: Policy Approval Panel and signed on its behalf by Paul Turner, PAP Chairman</p>

Contents

1	Introduction	5
2	Scope	5
3	Definitions	5
4	Functional Overview and Key Components of the System	7
4.1	Main Components of the CCS	7
4.2	Functionality of the CCS	8
4.3	Signals - Typical “Pure” Generation Connections	9
4.4	Signals - Typical “Pure” Demand Connections	12
4.5	Signals - Storage Connections	13
4.6	Flexible Services (FS)	14
4.7	Demand Signals – Project Specific	14
4.8	Failsafe Controls	15
4.9	RTU Failsafe Execution Examples	15
5	Customer Connection Panel (CCP)	16
5.1	CCP – Internal Wiring	16
5.2	CCP Types	17
6	Remote Terminal Unit (RTU)	18
6.1	Warning Labels	19
7	Network Management System (NMS)	19
7.1	Rapid Shutdown Function	19
7.2	Controlled Shutdown Function (CSD) – Customer Option	21
7.3	Restoration Sequence	22
7.4	DG Real and Reactive Power Set Point	22
7.5	Demand Control	22
7.6	NMS Graphical User Interface	22
8	Data Analogues	23
9	Control and Signal Cable Installations	23
10	Interface and Communication with Active Network Management	24
11	Commissioning Procedure	24
12	Associated Policy	25
13	Documents Referenced	25
14	Drawing Numbers	26

15	Keywords	26
	Appendix A – Overview of the Connection Control System	27
	Appendix B – Overview of a Typical Connection	28
	Appendix C – Test Schedule for Indication and RSD (always required)	30
	C1 Testing Notes	31
	C2 Response Times	32
	C3 Test 1 – Generation Failsafe Indication	33
	C4 Test 2 – Lockout / Shutdown Acknowledged	34
	C5 Test 3 – Rapid Shutdown (RSD) Procedure	35
	Appendix D – Controlled Shutdown (CSD) Procedure (if required)	39
	Testing Notes	39
	D1 Response Times	39
	D2 Test 4 – Controlled Shutdown (CSD) Procedure	40
	D3 Test 5 – Controlled Shutdown (CSD) can be overridden by an RSD	42
	D4 Test 6 – The Customers’ Controlled Shutdown (CSD) Sequence is Terminated Following an RSD Instruction	44
	Appendix E – Rapid Shutdown Indications	47
	E1 Circuit Breaker Failsafe Combination (CB status tests)	47
	Appendix F – Overview of CCP Functions and Indications	50

All Rights Reserved

The copyright of this document, which contains information of a proprietary nature, is vested in Electricity North West Limited. The contents of this document may not be used for purposes other than that for which it has been supplied and may not be reproduced, either wholly or in part, in any way whatsoever. It may not be used by, or its contents divulged to, any other person whatsoever without the prior written permission of Electricity North West Limited.

1 Introduction

There has been a large increase in Distributed Energy Resource (DER) connections, and it is expected the connection rate of new Low Carbon Technologies will increase significantly in the next few years. This has driven Distribution Network Operators to offer more flexible connections as an alternative to traditional network reinforcement. Electricity North West Limited has recently introduced a policy that new DG connections are Flexible Connections. A Flexible Connection is a connection with an agreement in the Connection Contract that Electricity North West Limited may curtail or disconnect the connection depending on network conditions.

In order to achieve a Managed Connection there is a requirement to remotely activate a run down or shutdown / reduction of the DER or load / demand. This may be done remotely by automatic sequences within Electricity North West Limited’s Network Management System (NMS), by an Electricity North West Limited Control Engineer operating the NMS, or an Electricity North West Limited Field Engineer local to the DG or load.

The system that achieves this function is called a Connection Control Scheme (CCS). The CCS has been developed only for DG connections to date, but this will be extended to control demand connections, and so encompass all DER.

This specification sets out the technical requirements for the design of Flexible Connections for use on Electricity North West distribution network.

2 Scope

This specification covers the overall functional requirements of Connection Control Schemes for use on Electricity North West distribution network for both demand and DG connections. It includes the interfaces between key components within the scheme and details the specific operational requirements. It may be applied to connections at all voltages.

The design of the connection shall be compliant with the relevant planning policy listed in [section 13](#).

3 Definitions

The following definitions are relevant to this Specification:

Customer Connection Panel (CCP)	Panel owned and maintained by Electricity North West Limited on the customer’s site that provides CCS functionality
Customer Connection Panel Lite	A variant of the CCP with less functionality
Connection Control Scheme (CCS)	A system that allows Electricity North West Limited to remotely instruction a reduction in output or complete shutdown of Demand and Distributed Generation

Jul 23

Distributed Energy Resource (DER)	A connection that can provide energy services, import or export.
Distributed Generation (DG)	Generation that is designed to operate in parallel with the Network. Embedded Generation is an alternative term. Also known as DER
Flexible Demand (FD)	Demand which can be disconnected as part of a curtailment or flexible contract. Also known as DER
Generation	An installation comprising one or more generating units, where a generating unit is a source of electrical energy and all associated interface equipment.
Generator	A person who generates electricity under licence or exemption from Section 4.1(a) of the Electricity Act 1989.
Network	The electricity distribution network owned by Electricity North West Limited, to which Embedded Generation and Demand is to be connected.
NMS	Network Management System. This is the complete computer system used in the Control Room. It comprises NIMS Servers and workstations to interface to the Control staff, and SCADA Servers to communicate with the RTUs,
Point of Supply	The point of electrical connection between the Network and the apparatus owned by a Generator.
SCADA	Supervisory Control and Data Acquisition
RTU	Remote Terminal Unit – the SCADA onsite equipment.
ANM	Active Network Management
RSD	Rapid Shutdown
CSD	Controlled Shutdown
RDR	Rapid Demand Reduction
CDR	Controlled Demand Reduction

4 Functional Overview and Key Components of the System

4.1 Main Components of the CCS

The main Components of the CCS are shown in [Appendix A](#). The system comprises:

- Standard Electricity North West Limited substation
- Remote Terminal Unit (RTU)
- Customer Connection Panel (CCP).
- Multicore cable link to customer's control equipment.

4.2 Functionality of the CCS

The functionality of the CCS is summarised in the table below.

Flexible Generation Connection

CONTROL	DESCRIPTION	HOW ACHIEVED
Controlled shutdown (CSD)	Controlled Shutdown Initiated by Electricity North West Limited causes DG to shut down in a controlled manner within 2 minutes	Shutdown initiated by Electricity North West Limited Control Engineer or NMS.
Rapid shutdown (RSD) (remote)	DG disconnected within 500mS	NMS or Control Engineer operating RSD control
Rapid shutdown (RSD) - Local	DG disconnected within 500mS	Electricity North West Limited Engineer operates RSD control via CCP on site
G99 Inhibit function	Inhibit signal prevents DG re-synchronising.	This is achieved when the RSD function is operated and reset when the RSD control is removed
Real Power Set Point (MEC)	Allows Electricity North West Limited to set real power export across the exit point.	4 to 20mA signal from the RTU. 20mA is 100% of Maximum Export Capacity (MEC) kW export. 4mA is zero kW export.
Reactive Power Set Point	Allows Electricity North West Limited to set reactive power export across the exit point.	4 to 20mA signal from the RTU. 20mA is 100% of contracted Flexible Service, 4mA is zero service.

Flexible Demand Connection (Future)

Demand Controls	Allows Electricity North West Limited to instruct change in demand. This may either be a step change or a ramped change.	The control can replicate the Controlled/ Rapid shutdown or use 4 to 20mA signalling. These will be known as Rapid Demand Reduction (RDR) and Controlled Demand Reduction (CDR).
Flexible Services (FS)	Allows Electricity North West Limited to instruct the change between curtailment and flexible service provision power flow across the exit point.	This will be performed via ANM as part of a flexible service contract. This mode can either be a curtailment signal or a flexible service signal

4.3 Signals - Typical “Pure” Generation Connections

4.3.1 Signals from Electricity North West Limited to the Customer

4.3.1.1 Rapid Shutdown (RSD)

- Volt free digital output (contact) from Electricity North West Limited.
- Open Electricity North West contact equals RSD instruction.

4.3.1.2 Controlled Shutdown (CSD)

Generation is expected to be shutdown / disconnected within 90 seconds is a maximum CSD shutdown time and not a target or preferred setting. A CSD should take no longer than is required in order to shut down the generation in a way which is sympathetic to its operational lifespan and efficiency. | Jul 23

- Volt free digital output (contact) from Electricity North West Limited.
- Open Electricity North West contact equals CSD instruction.

4.3.1.3 Real Power Set Point (PSP)

Active power change shall be achieved within 90 seconds. | Jul 23

- Analogue 4 to 20 mA current loop output from Electricity North West Limited.
- Where a connection has a MIC & MEC, 2 analogue 4 to 20mA current loop signals will be used (one in each direction).

4.3.1.4 Reactive Power Set Point (QSP)

Reactive power change shall be achieved within 90 seconds.

- Analogue 4 to 20 mA current loop output from Electricity North West Limited.
- Where a connection has a MIC & MEC, 2 analogue 4 to 20mA current loop signals will be used (one in each direction).

4.3.2 Signals from the Customer

4.3.2.1 Customer Off (COFF) & Customer On (CON)

An indication to show the state of any generation

- A double bit indication will be used to indicate the state of the generation off or on state.

4.3.2.2 Islanding Indication (ISL)

An indication to show the state of any islanding circuit breaker, where a power island maybe operating beyond.

- A double bit indication will be used to indicate the state of the islanding CB open and closed state.
- These contacts to Electricity North West Limited, indicate if a private network has desynchronised from Electricity North West Limited network and is still operating and has the ability to automatically resynchronised.

Not related to standby type generation arrangement

4.3.2.3 Shutdown in Progress (SDIP)

Acknowledgement that the Controlled Shutdown signal has been received.

- A digital signal to Electricity North West Limited.
- This would remain whilst the shutdown is in progress and reset once the shutdown is completed.

4.3.2.4 Shutdown Complete (SDC)

Confirmation of the Rapid or Controlled Shutdown / lockout achieved.

- A digital signal to Electricity North West Limited.
- This remains whilst shutdown and the RSD / CSD instruction is active.
- It only resets once the RSD / CSD instruction has been cancelled by Electricity North West Limited.
- This signal shall only be in response to an Electricity North West Limited RSD / CSD instruction. No other generator activity should trigger this signal.

The following provides a list of activities which shall not trigger an SDC signal from the customer to Electricity North West Limited. It should be noted that this list is non-exhaustive and is provided for guidance.

- Customers generation plant stops running (unless following an RSD/ CSD instruction).
- Customer is participating in any commercial arrangements/ markets (unless following an RSD/CSD instruction).
- Customers generation plant starts.
- Customers G99 protection trip operates.
- Customers non-G99 protection trip operates.
- Customers Emergency Trip Button operates.
- Customers maintenance activities take place (see note below).

NOTE: Shutdown Complete (SDC) indication may be sent to Electricity North West Limited during required periodic alarm testing following a mutually agreed notice period.

4.3.2.5 Real Power Generation Availability

This signal indicates how much of the Maximum Export Capacity (MEC) is available to export. This may be either

- A digital signal indicating full or zero output. A digital signal to Electricity North West Limited.

- An analogue indicating the availability 0 to 100% of registered MEC of the connection.
- An analogue 4 to 20 mA current loop to Electricity North West Limited.

4.3.2.6 Reactive Power Generation Availability

This signal indicates how much of the Maximum Export Capacity (MEC) is available to export. This may be either

- A digital signal indicating full or zero output. A digital signal to Electricity North West Limited.
- An analogue indicating the availability 0 to 100% of registered reactive power output of the connection.
- An analogue 4 to 20 mA current loop to Electricity North West Limited.

4.4 Signals - Typical “Pure” Demand Connections

4.4.1 Signals from Electricity North West Limited to the Customer

4.4.3.1 Rapid Demand Reduction (RDR)

Flexible Demand is expected to be disconnected / reduced within 500ms

- Volt free digital output (contact) from Electricity North West Limited.
- Open Electricity North West Limited contact equals RDR instruction.

4.4.3.2 Controlled Demand Reduction (CDR)

Demand is expected to be disconnected / reduced within 90 seconds is a maximum CDR shutdown time and not a target or preferred setting.

- Volt free digital output (contact) from Electricity North West Limited.
- Open Electricity North West Limited contact equals CDR instruction.

4.4.3.3 Real Power Set Point (PSP)

Active power change shall be achieved within 90 seconds.

- Analogue 4 to 20 mA current loop output from Electricity North West Limited.

4.4.3.4 Reactive Power Set Point (QSP)

Reactive power change shall be achieved within 90 seconds.

- Analogue 4 to 20 mA current loop output from Electricity North West Limited.

4.4.2 Signals from the Customer

4.4.4.1 Managed Demand – Customer Parallel CB on (PAR) & Customer Off (ISL)

An indication to show the state of any managed demand. This utilises the customers managed demand CB to show any possible islanding situation, where generation is also on site.

When there is no generation, these signals will be used to show the state of the managed demand CB.

- A double bit indication will be used to indicate the state of the managed demand off or on state.

4.4.4.2 Islanding Indication (ISL) – an expansion of the function above

An indication to show the state of any islanding circuit breaker, where a power island maybe operating beyond.

- A double bit indication will be used to indicate the state of the islanding CB open and closed state.
- These contacts to Electricity North West Limited, indicate if a private network has desynchronised from Electricity North West Limited network and is still operating and has the ability to automatically resynchronised.

Not related to standby type generation arrangement.

Jul 23

4.4.2.3 Demand Reduction in Progress (DRIP)

Acknowledgement that the Controlled Demand Reduction signal has been received.

- A digital signal to Electricity North West Limited.
- This would remain whilst the Controlled Demand Reduction is in progress and reset once the reduction is completed.

4.4.2.4 Shutdown Complete (DRC)

Confirmation of the Rapid or Controlled Reduction / lockout achieved.

- A digital signal to Electricity North West Limited.
- This remains whilst reduction and the RDR / CDR instruction is active.
- It only resets once the RDR / CDR instruction has been cancelled by Electricity North West Limited.
- This signal shall only be in response to an Electricity North West Limited RDR / CDR instruction. No other demand management activity should trigger this signal.

The following provides a list of activities which shall not trigger an DRC signal from the customer to Electricity North West Limited. It should be noted that this list is non-exhaustive and is provided for guidance.

- Managed Demand plant stops running (unless following an RDR/ CDR instruction)
- Customer is participating in any commercial arrangements/ markets (unless following an RDR/CDR instruction)
- Customers generation plant starts
- Customers G99 protection trip operates
- Customers non-G99 protection trip operates
- Customers Emergency Trip Button operates
- Customers maintenance activities take place (see note below)

4.5 Signals - Storage Connections

4.5.1 Signals between Electricity North West Limited and the Customer

The signals to and from a customer will be a combination of the pure generation and demand connections as detailed in section [4.3](#) & [4.4](#).

The execution times are the same.

4.5.2 Analogue Signals from the Customer to Electricity North West

4.5.2.1 Real Power Discharge / Generation Availability

This signal indicates how much of the Maximum Export Capacity (MEC) is available to export. This may be either

- A digital signal indicating full or zero output. A digital signal to Electricity North West Limited.
- An analogue indicating the availability 0 to 100% of registered MEC of the connection.
- An analogue 4 to 20 mA current loop to Electricity North West Limited.

4.5.2.2 Reactive Power Discharge / Generation Availability

This signal indicates how much of the Maximum Export Capacity (MEC) is available to export. This may be either.

- A digital signal indicating full or zero output. A digital signal to Electricity North West Limited.
- An analogue indicating the availability 0 to 100% of registered reactive power output of the connection.
- An analogue 4 to 20 mA current loop to Electricity North West Limited.

Jul 23

4.6 Flexible Services (FS)

If a DER has a flexible service contract with Electricity North West Limited, then a power flow management confirmation signal (Curtailment or Flexible Contract confirmation) will be used. This will ensure the customer acknowledges what the setpoint or discrete CSD signal is referring to either a curtailment instruction or a flexible service (contract) signal

This will be in the form of a double bit indication signal from the DER

- A digital signal to Electricity North West Limited indicating curtailment acknowledgement.
- A digital signal to Electricity North West Limited indicating flexible service acknowledgement.

In normal operation the setpoint will be related to the curtailment mode.

4.7 Demand Signals – Project Specific

Typical pure demand connection, will have similar controls as per a pure generation connection

Project specific but may involve a power flow signal to indicate if the setpoint control analogue signal or discrete digital is referring to a curtailment or a flexible service.

- This will be in the form of a double bit indication signal to the DER (FS).

4.8 Failsafe Controls

As the network becomes increasingly dynamic, it is critical to ensure the control system remain in control, therefore the local RTU will also perform tasks autonomously. These may consist of but not limited to

- Loss of communications with NMS.
- Failure of the DER to respond to an instruction.
- Failure of the 4-20mA current loop to the DER.
- Continued breach of MIC or MEC.

The responses of the RTU could be:

- Setting the setpoint to zero reverse power flow across the exit point.
- Triggering a CSD.
- Triggering a RSD.
- Triggering the opening of Electricity North West Limited's incoming circuit breaker.

Time Frames for failsafe actions

Some or all failsafe's may be utilised. Their use will be network dependant and execution times shall vary depending on conditions.

4.9 RTU Failsafe Execution Examples

These failsafe features may not be enabled in all connections

4.9.1 DER Fails to Respond to a Change in Set Point

Where a DER exit point flow is managed via a set point control, any failures to respond will be acknowledged by ANM and warn the control engineer, who will assess and execute the CSD or RSD if required

4.9.2 DER Fails to respond to a Controlled Shutdown (CSD)

Should the DER fail to respond, the RSD could be executed (stage 1), followed by the incoming circuit breaker being opened (stage 2).

4.9.3 DER Fails to Respond to a Rapid Shutdown (RSD)

Should the DER fail to respond, the incoming circuit breaker being opened (stage 1).

4.9.4 Loss of 4 to 20mA Analogue Signal

Failsafe may constitute one of the following options depending upon network configuration.

- The DER will reduce to a zero-reverse flow across the exit point.

- The DER will execute a CSD within the agreed period (2 minutes).

4.9.5 Loss of RTU Communication with NMS

The same conditions would apply if the communications to the DER had failed

4.9.6 Breach of MIC or MEC

This facility could perform as an export limitation scheme, just as warning to Electricity North West Limited or the customer. The disconnection stages could be enabled if the breach of MIC or MEC continued.

5 Customer Connection Panel (CCP)

The function of the Customer Connection Panel is the interface between Electricity North West Limited's NMS and the Generator's controller or PLC. It will usually be located at Electricity North West Limited's substation, although in exceptional circumstances described in [subsection 6](#) it may be located remotely. Where the panel is located remotely, a second RTU shall be installed at the substation to ensure ability to disconnect the customer should their control systems fail.

The key functions of the Customer Connection panel are:

- Provide local generator trip function.
- Provide local generator status indication.
- Provide and receive demand signals.
- Receive inputs from the RTU and provide relevant output signal into the customer's generator controller / PLC.
- Receive inputs from the customer's generator controller / PLC and provide relevant output signal into the RTU.
- Receive analogue inputs to provide four quadrant power flow data at the point of metering.

The Customer Connection Panel is owned by Electricity North West Limited.

5.1 CCP – Internal Wiring

The wiring associated with the RSD, RDR, CSD, CDR and FS, no-volts contact circuit shall be coloured orange to signify generation or demand will be affected if open-circuited.

- Analogue setpoint cabling shall be coloured purple.
- All other control and indication cabling shall be coloured white as per ES337 5.6.
- Cable identification and ferruling shall be as per engineering drawing 900206-00054.

5.2 CCP Types

The CCP can be adapted for demand control as well and flexible generation with and without set point control. The CCP is available in 2 variants, dependant on complexity of the connection.

The CCP can accommodate all the mentioned features for generation and demand control.

The CCP Lite version can be used when pure demand or generation control is required.

Storage Sites would require the full CCP design.

A Storage Sites will have a MIC that includes site auxiliary demand which will not be part of the charging mode, therefore that part of the MIC not be subject to the RDR or CDR function.

Some customers will not require the controlled ramp function, this is customer dependant.

Jul 23

6 Remote Terminal Unit (RTU)

Secondary RTUs complying with ES393 Remote Terminal Units and Control Cabinets shall be used. The RTU provides the communication link between Electricity North West Limited's NMS and the DG controller via the Connection Control panel.

An LV supply shall, where practical, be taken from the Electricity North West Limited network. Alternative arrangements may only be used where this is impractical or uneconomic.

Where the customer provides a LV supply to a HV metered connection and the LV and HV earths are separate, the cable sheath on the LV cable shall be isolated at the Electricity North West Limited substation. The LV equipment at this substation shall be connected to the HV earth. If the LV and HV earths are separated, arrangements shall be made within the design to maintain the separation of two earthing systems in accordance with CP333 Distribution Substation Earthing System Design.

The RTU shall normally be located at the Electricity North West Limited substation. In exceptional circumstances the RTU may be located remotely from the Electricity North West Limited substation. This shall only be permissible if:

The cost to install a cable between the Electricity North West Limited substation and the DG Controller is high due to length or ground conditions

There is confidence in suitable access to the RTU. Indications that access will not be unduly restricted include

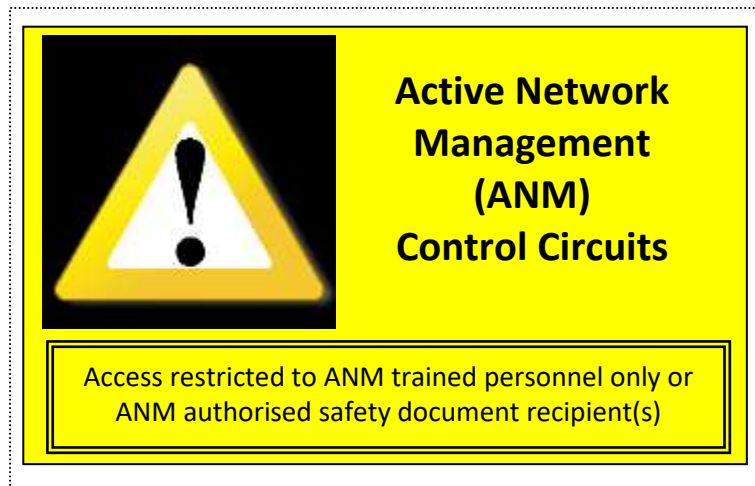
- Mature operational relationship with the customer
- The RTU is located in site where Electricity North West Limited has access, for example a customer owned substation that has an operating and maintenance agreement
- The RTU is located within a site where documented access arrangements exist, for example defined key holders

The environment of the proposed location is suitable

It is expected the RTU will only be located remotely where generation or demand is installed at an existing connection. For a new connection it is expected that multicore cables can be installed economically at the same time as power cables.

6.1 Warning Labels

All ANM or control panels associated with actively managing the network or provisioning of Flexible Service will be clearly labelled and restricted to trained personnel.



7 Network Management System (NMS)

The NMS provides functionality to instruction controlled and rapid shutdown of the generation or demand. This shall be automated in response to network events or manual in response to planned network switching.

The sequence shall be:

- (a) Instruct DG shutdown in NMS – automated or manual, firstly via the CSD function if commissioned, or the RSD if time is critical.
- (b) Signal transmitted to the CCP panel via the RTU.
- (c) DG controller responds by returning a signal confirming shutdown in progress, via the CCP and RTU.
- (d) An alarm is generated on NMS indicating ‘Shutdown in progress’.
- (e) DG shuts down. Indication of active power change across the exit point will be visible on NMS.
- (f) DG controller confirms shutdown complete. This will indicate the generation is locked out and cannot be started by any means until Electricity North West Limited remove the RSD or CSD.
- (g) DG circuit breaker opens and status visible in NMS.

7.1 Rapid Shutdown Function

The following events will take place in the order below:

SEQUENCE ORDER	ELECTRICITY NORTH WEST LIMITED	CUSTOMER
1	Instructs RSD	
2		Customer executes a rapid shutdown of the generation.
3		Generation state and Shutdown complete alarm is sent to Electricity North West Limited's RTU. This should be within a G99 protection operation timeframe
		The generation shall be locked out from starting at this stage
4	Receive generation state (OFF) & Shutdown Complete Signal	
5	RSD is cancelled by Electricity North West Limited	
6		Customers control system acknowledges, by resetting the shutdown complete alarm
7	Electricity North West Limited receives the shutdown complete reset state	
8		Customers generation is permitted to restart when required

It is important the shutdown complete alarm is not sent to Electricity North West Limited unless it is in response to a RSD instruction.

Ensure signalling criteria is followed as per [Shutdown Complete \(DRC\)](#)

7.2 Controlled Shutdown Function (CSD) – Customer Option

The following events will take place in the order below

SEQUENCE ORDER	ELECTRICITY NORTH WEST LIMITED	CUSTOMER
1	Instructs CSD	
2		Customer acknowledges the instruction with a shutdown in progress alarm
3	Receive Shutdown In progress signal	
4		A controlled shutdown should be achieved within the agreed time frame.
		Once shutdown has been achieved, the generation state will be sent along with the Shutdown Complete alarm.
		The In-progress alarm should reset
		The generation shall be locked out from starting at this stage
	Receive generation state (OFF), In progress alarm should reset & Shutdown complete should be received	
5	CSD is cancelled by Electricity North West	
6		Customers control system acknowledges, by resetting the shutdown complete alarm
7	Electricity North West Limited receives the shutdown complete reset state	
8		Customers generation is permitted to restart when required

It is important the shutdown complete alarm is not sent to Electricity North West Limited unless it is in response to a CSD instruction.

Ensure signalling criteria is followed as per [Shutdown Complete \(DRC\)](#)

A similar process is also adopted with Demand Reduction instructions

7.3 Restoration Sequence

Once network conditions permit, DG & Flexible Demand shall be allowed to reconnect by removal of the inhibit signal. This protocol ensures the reconnection of the Generation / Demand is under the control of the Electricity North West Limited.

The NMS shall automatically remove the generation / demand inhibit once the network has been restored to normal configuration after an outage or abnormal running. This will allow the Generator / Demand to reconnect their resource.

7.4 DG Real and Reactive Power Set Point

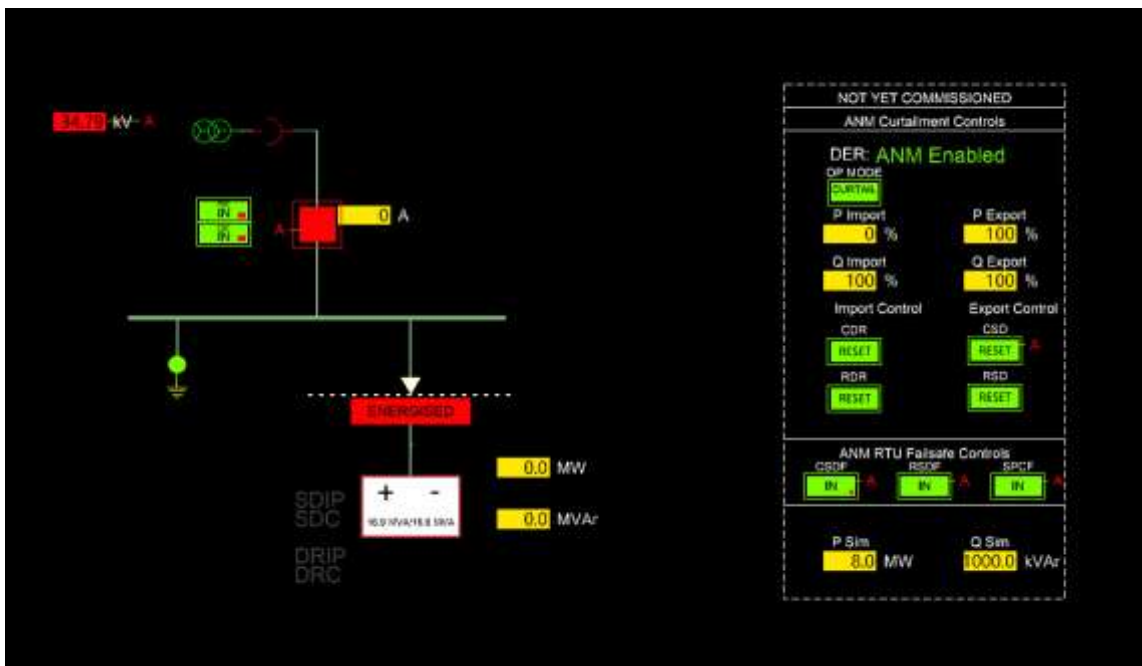
Planned developments of the NMS will provide improved ability to permit limited export following network outages, rather than complete shutdown. This will enable more DG to remain connected and exporting, based on network conditions including voltage and power flows. This will be achieved via a 4-20mA current loop between Electricity North West Limited and the customer

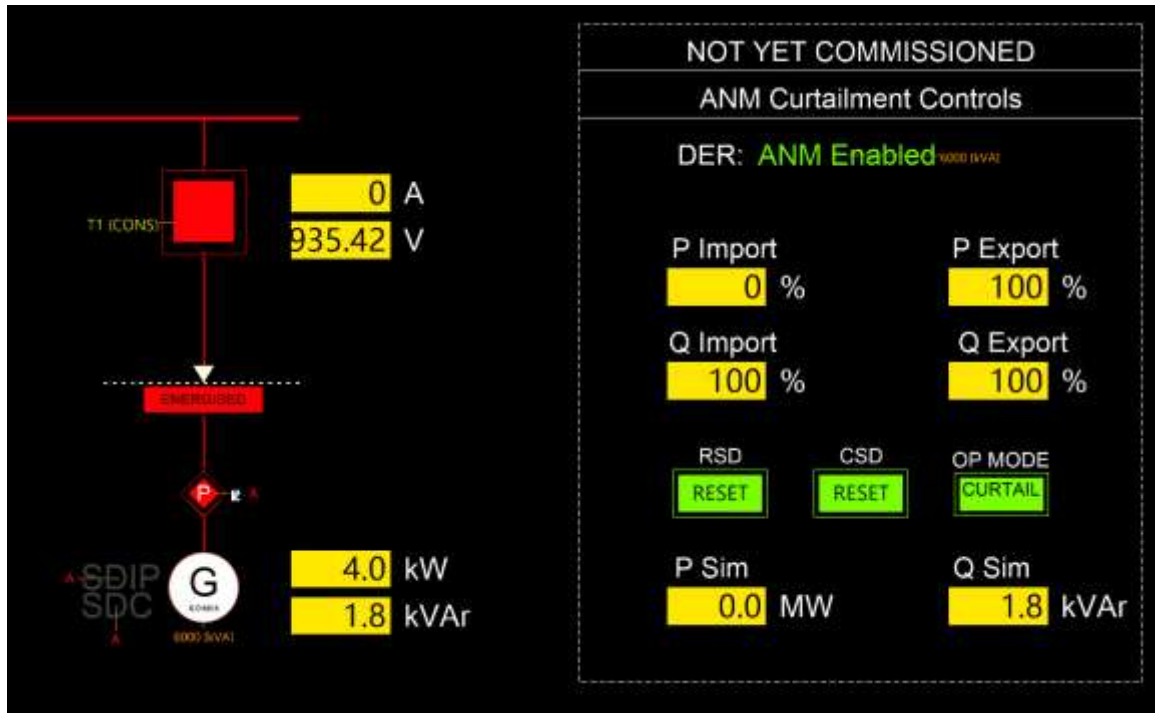
7.5 Demand Control

Demand Control capability enables Electricity North West Limited to instruct customer demand changes. This may be a binary instruction similar to the DG Rapid / Controlled Shutdown for all or some of the customer's demand, or a change in set point which would instruction a demand change to a specific value.

7.6 NMS Graphical User Interface

Typical Representation – for demonstration purposes only.





8 Data Analogues

Analogues shall be derived at the incoming circuit breaker(s) at the site. These analogues shall include voltage, current, real and reactive power, in accordance with ES259 Generation Connected to the Electricity North West Limited Network subsection 7.

Jul 23

Analogues shall be gathered by the local RTU for transmission to the NMS.

Power flow directions shall use conventions described in CP320 SCADA Input / Output Data Standards.

Alternatively, analogues may be derived from interposing CTs.

9 Control and Signal Cable Installations

The customer will provide the 24vDC to be used to power the interposing relays in the CCP.

Customers will provide a minimum of 1.5m wide wall space from floor to ceiling to accommodate the CCP and a RTU. Electricity North West Limited reserve the right to request additional floor / wall space.

Cable construction & core capacity shall be as per engineering diagram 900206-00057.

Steel wire armoured type signalling cable shall be insulated at both ends, 6 metres of cable will be left spare at the substation end.

Each interfacing cable e.g. analogue and indication cable shall be run in separate cables.

A separate multi core will be used to carry the CT measurements and the VT measurement.

The customer may opt to install the additional analogue and digital communications cable for any future setpoint control or digital communications between Electricity North West Limited and the DER.

All armoured cable will be externally identified in accordance to engineering drawing 900206-00057.

All control and signal cabling to comply with ES400-C13.

10 Interface and Communication with Active Network Management

Jul 23

The method of communication with ANM shall be dependent on connection voltage. These methods are summarised in the table below.

VOLTAGE	METHOD	RTU	COMMENT
LV network connection	Fuse down at cut out	None	Short curtailment period expected
LV dedicated way	Weezap set to temp MIC	None	Short curtailment period expected
HV network connection	RTU via cellular	Secondary RTU	
HV direct to primary with dedicated CB	RTU via wired connection	Primary RTU	Enhanced comms security because these are likely to be very large connections relative to the network
33kV	RTU via wired connection	Primary RTU	
132kV	RTU via wired connection	Primary RTU	

11 Commissioning Procedure

The commissioning procedure is detailed in [Appendix C](#) and [Appendix D](#). Appendix C describes the procedure for commissioning the Rapid Shutdown which will be required for all connections. Appendix D describes the procedure for Controlled Shutdown which will not always be required.

12 Associated Policy

New connections shall be designed in accordance with relevant policy documents in the table below.

CP258	Connections of Industrial and Commercial Customers
CP259	Generation Connected to the Electricity North West Limited Distribution Network
EPD259	Private Generation Connected to the Network
EPD280	Distribution System Design – 132kV Network
EPD281	Distribution System Design – 33kV Network
EPD282	Distribution System Design – 11/6.6kV Network
EPD283	Low Voltage Network Design Manual
ES216	11/6.6kV Connections up to 15MVA Capacity
ES217	33kV Connections up to 90MVA Capacity
ES218	Connections up to 240MVA Capacity
ES259	Generation Connected to the Electricity North West Limited Distribution Network
ES400-C13	Multipair & Multicore Auxiliary Cables
ES337	Specification for Protection and Control Relay Panels

13 Documents Referenced

DOCUMENTS REFERENCED	
CP258	Connections of Industrial and Commercial Customers
CP259	Generation Connected to the Electricity North West Limited Distribution Network
EPD259	Private Generation Connected to the Network
EPD280	Distribution System Design – 132kV Network
EPD281	Distribution System Design – 33kV Network
EPD282	Distribution System Design – 11/6.6kV Network
EPD283	Low Voltage Network Design Manual
ES216	11-6.6kV Connections up to 15MVA Capacity

ES217	33kV Connections up to 90MVA Capacity
ES218	Connections up to 240MVA Capacity
ES259	Generation Connected to the Electricity North West Limited Distribution Network
ES314	12kV and 7.2kV 21.9kA rated Distribution Switchgear

14 Drawing Numbers

900206-00054 Multicore Block Diagrams

900206-00055 Multicore Schedules

900206-00056 Wiring Diagrams

900206-00057 Schematic Diagrams

These drawings are available from the Grid & Primary Design team.

Business Connections drawings:

MCBD-001 Multicore Cable Block Diagrams

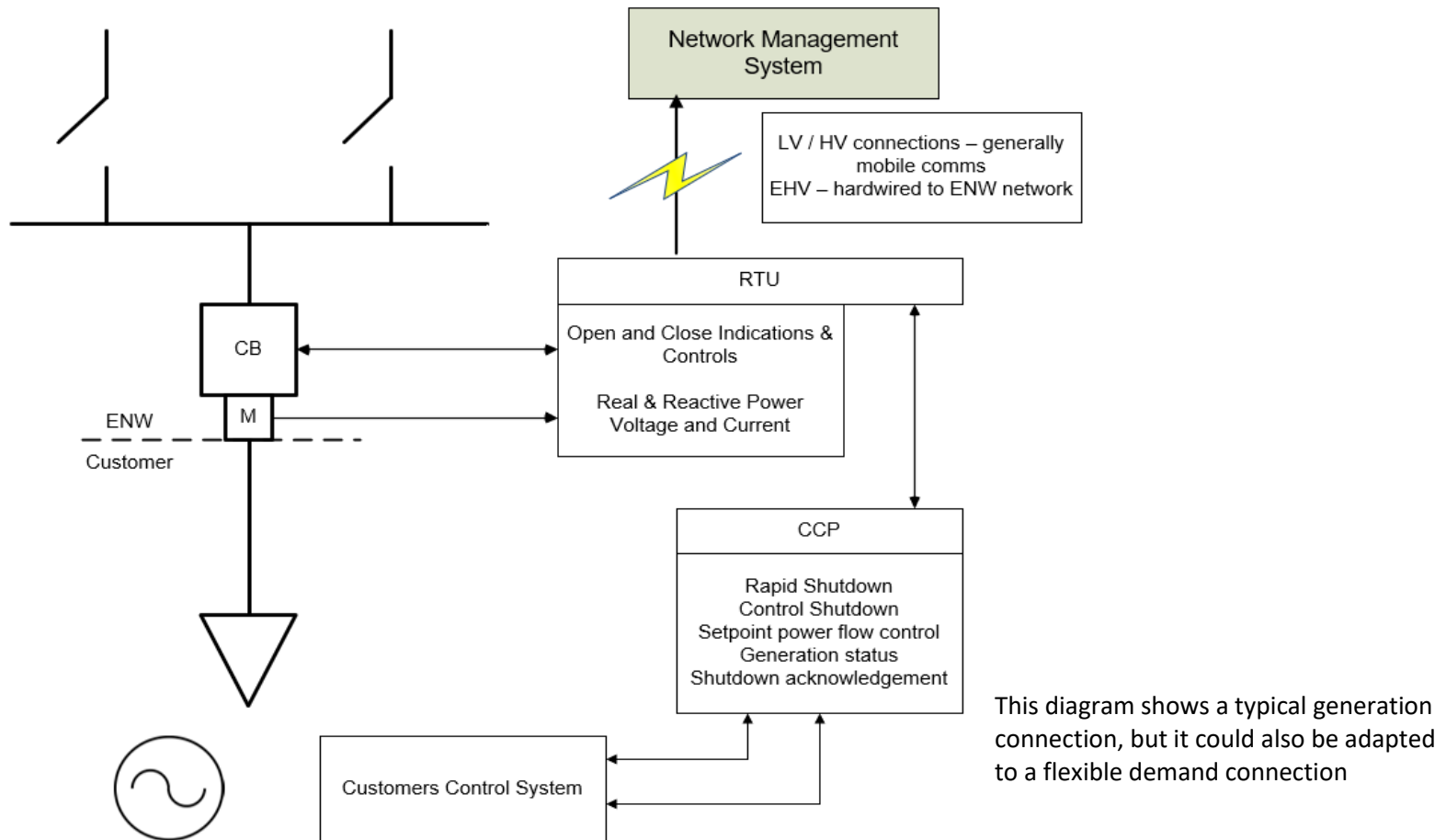
This diagram is available from the Energy Solutions team.

15 Keywords

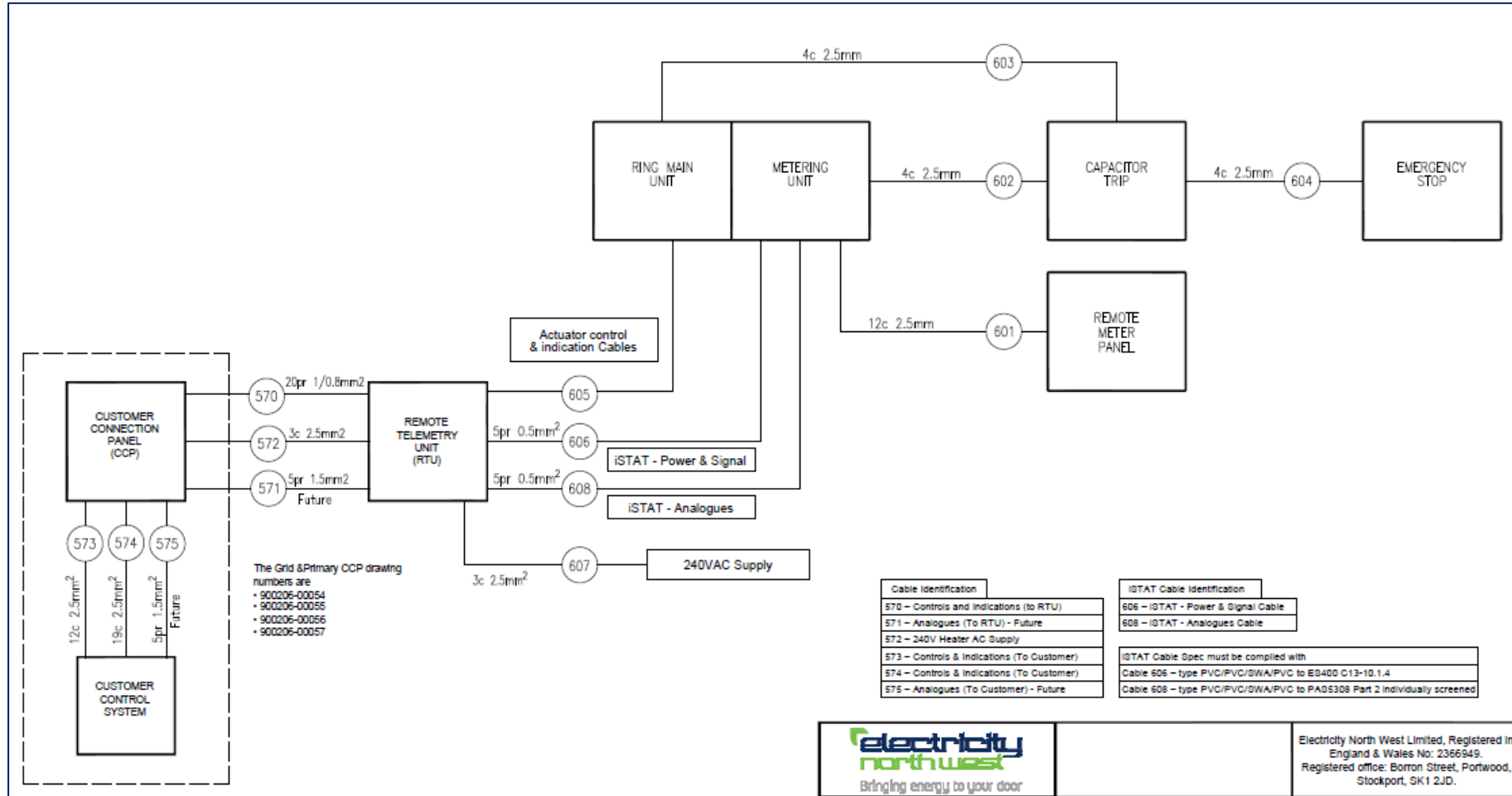
ct, Customer, Generation, Generator, Monitoring, Network, Voltage, vt

Appendix A – Overview of the Connection Control System

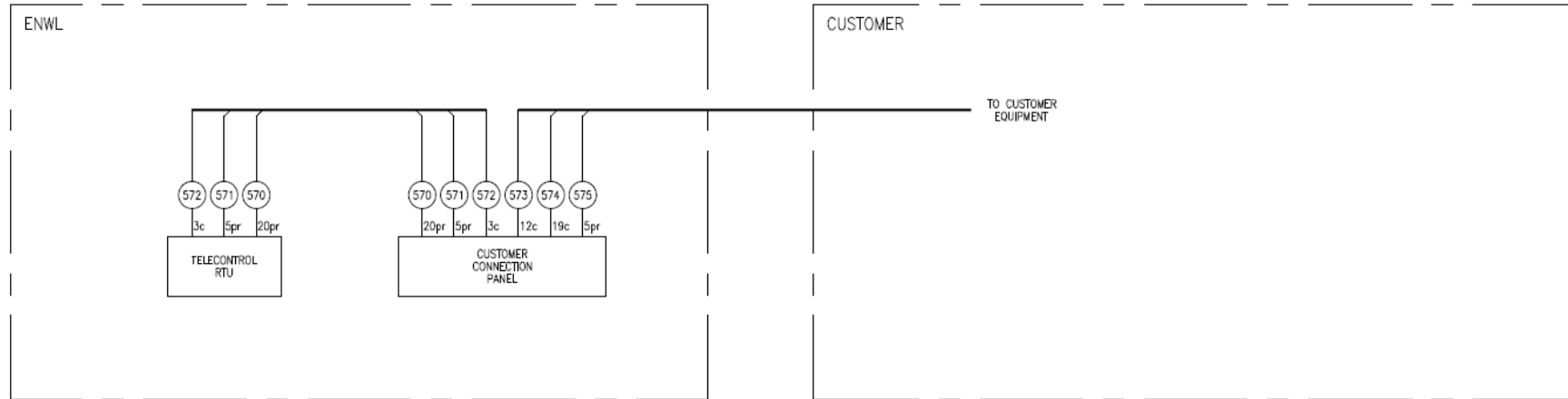
Jul 23



Appendix B – Overview of a Typical Connection



Jul 23



Appendix C – Test Schedule for Indication and RSD (always required)

Jul 23

(whole
appendix)

On Site Active Network Management

OUTAGE DETAILS	
Outage Number:	
System Amendment Number (SATS):	
Substation Name:	Also Update Appendix Header
Substation Number:	Also Update Appendix Header
Date Commissioning Started:	
Energy Solutions Engineer:	
Contact Number:	
Protection / Commissioning Engineer (SAP):	
APPENDICES TO BE TESTED:	TICK
Appendix C - Failsafe Indications, Lockout Control & Rapid Shutdown Function	✓
Appendix D - Control Shutdown Function (Optional)	
COMMISSIONING COMPLETED	
Add temporary note to NMS to says "Commissioned"	
System Amendments (SATS) Completed:	
Control Engineer:	
Date:	

C1 Testing Notes

This is not a switching programme.

The procedure is split into sections to confirm each function is tested to the same standard

The following appendices will test the following conditions

Appendix C

- Failsafe Indications / Lockout Control & RSD function.
- Test 1 - Generation Failsafe Indication.
- Test 2 - Lockout; With generation previously switched 'off' the customer acknowledges a new shutdown (RSD) instruction whilst in that 'off' state.
- Test 3 - Rapid Shutdown (RSD).

Appendix D

- Control Shutdown Function.
- Test 4 - Controlled Shutdown (CSD).
- Test 5 - Controlled Shutdown can be overridden by an RSD.

Appendix E

- Circuit Breaker Failsafe Indication test notes.

Not all tests will be required.

When a customer doesn't require the Control Shutdown Function, generally when the technology is inverter connected the Control Shutdown (CSD) tests, Tests 4 & 5 are not required.

"Generation Off" indication must be Failsafe. This condition is indicated when all generation circuit breakers are in the open state. Testing must cover every combination of these generation circuit breaker states.

An energised GEN CB relay in the CCP panel indicates all the generation is off.

Text below in bold refers to alarm description or generation state indication on the SCADA.

The functions will be abbreviated as follows,

- Rapid Shutdown will be known as RSD.
- Controlled Shutdown will be known as CSD.
- Shutdown Complete will be known as SDC.



- Shutdown in Progress will be known as SDIP.

C2 Response Times



The rapid shutdown response time should be within 500mS of the instruction

The controlled shutdown response should be less than 90 seconds or within the previously agreed customer declared response rate following a CSD. In all cases it should not exceed 90 seconds.

C3 Test 1 – Generation Failsafe Indication

STAGE	TEST ACTION	PASS / FAIL
Initial Conditions		
1	Confirm with Control that testing can commence	
2	Check the CCP indication is correct: <ul style="list-style-type: none"> • Generation Off (Open) Green lamp on • Rapid Shutdown (Off) Blue lamp off • If applicable Controlled Shutdown (Off) Blue lamp off 	
3	Confirm with Control <ul style="list-style-type: none"> • RSD and CSD are not active • Generation CB(s) is/are showing Off (Open) • No Alarms are being received from this site 	Control 
The following section confirms the generation indication is failsafe		
4	Ensure that the generation is off / disconnected i.e. all generator CBs at this site are Off (Open)	
5	Confirm the correct lamp (green lamp / Generation Off) is on at the CCP panel	
6	Open the Generation CB status link – lamp should change to red (failsafe condition / Generation On)	
7	Confirm with Control the Generation CB is showing On (Closed)	
8	Close Generation CB status link – lamp should change to green (failsafe condition / Generation Off)	
8	Where multiple Generators are installed, additional testing maybe required. See Appendix C	

C4 Test 2 – Lockout / Shutdown Acknowledged

STAGE	TEST ACTION	PASS / FAIL
<p>The following test confirms that the customer continues to monitor shutdown instructions, even if the generation is not running. The shutdown complete indication is the acknowledgement the customers' generation will not start if Electricity North West Limited have locked out / operated the RSD for any reason.</p>		
<p>Skip stage 1 – 3 if they have been previously tested</p>		
1	Ensure the generation is off / disconnected	
2	Check the CCP indication is correct: <ul style="list-style-type: none"> • Generation Off (Open) Green • Rapid Shutdown (Off) Blue • If applicable Controlled Shutdown (Off) Blue 	
3	Confirm with Control <ul style="list-style-type: none"> • RSD and CSD are not active • Generation CB is showing OFF (open) • No Alarms are being received from this site 	Control 
4	Request Control to switch IN the RSD control shutdown function	
5	Check the correct lamp (Rapid Shutdown/ Blue lamp) is on at the CCP panel	
6	Confirm with Control that the SDC alarm is received.	
7	Confirm with Control that the SDIP alarm was not received	
8	Request the customer to attempt to parallel generation	
9	Witness the generation did not start	
10	Confirm with Control they did not receiving Generation On indication	
11	Confirm Control are receiving no further alarms	
12	Request Control to switch OUT the RSD control shutdown function	
<p>Skip stages 13 & 14 if testing is continuing</p>		
13	Request that the customer run their generation in parallel with Electricity North West Limited Network	
14	Witness the generation running in parallel with Electricity North West Limited Network	

C5 Test 3 – Rapid Shutdown (RSD) Procedure

STAGE	TEST ACTION	PASS / FAIL			
Initial Conditions					
Skip stage 1 – 3 if they have been previously tested					
1	Confirm with Control testing can commence				
2	Check the CCP indication is correct: <ul style="list-style-type: none"> • Generation Off (Open) Green lamp on • Rapid Shutdown (Off) Blue lamp off • If applicable Controlled Shutdown (Off) Blue lamp off 	<table border="1" style="margin: auto;"> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> </table>			
3	Confirm with Control <ul style="list-style-type: none"> • RSD and CSD are not active • Generation CB is showing Off (Open) • No Alarms are being received from this site 	<p>Control</p> <table border="1" style="margin: auto;"> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="width: 20px; height: 20px;"></td></tr> </table>			
The following will test the rapid shutdown function locally					
4	Request that the customer run their generation in parallel with Electricity North West Limited Network				
5	Witness the generation running in parallel with network				
6	Check the correct lamp (Generation On/ red lamp) is on at the CCP panel				
7	Confirm Control are receiving no alarms from this site				
8	Confirm with Control they are receiving Generation On indication				
9	Press the rapid shutdown (RSD) button on the panel				
10	Witness (all) the generation CB(s) opening				
11	Check the correct lamp (Generation Off/ green lamp) is on at the CCP panel				
12	Check the correct lamp RSD Active/ blue lamp) is on at the CCP panel				
13	Confirm with control the RSD Control indicates IN				
14	Confirm with Control they are receiving the ' Shut Down Complete ' (SDC) alarm				
15	Confirm with control they are receiving Generation Off indication				
16	Request that the generator attempt to be re-paralleled with Electricity North West Network				
17	Witness that the generator cannot be run in parallel with Electricity North West Network				
18	Press the Shutdown Reset button on the CCP panel				

STAGE	TEST ACTION	PASS / FAIL
19	Confirm with Control that the RSD Control indicates OUT	
20	Confirm RSD Lamp indicates OUT on the CCP panel	
21	Confirm with Control the ' Shut Down Complete ' (SDC) alarm has reset	
22	Request that the customer run their generation in parallel with Electricity North West Limited Network	

***** Control Engineer Catch up time *****

The following will test the rapid shutdown function remotely via the Control Centre

23	Witness the generation running in parallel with the Electricity North West Limited Network	
24	Request Control to switch IN the RSD Control Shutdown function	
25	Witness the generation CB opening	
26	Check the correct lamp (Generation OFF/ green lamp) & RSD Active/ blue lamp is on at the CCP panel	
27	Confirm with Control they are receiving the SDC alarm	
28	Confirm with Control they are receiving Generation Off indication	
29	Request that the customer attempt to run their generation once again in parallel with Electricity North West Limited Network	
30	Witness that the generator cannot be run in parallel with Electricity North West Network	
31	Request Control to switch OUT the RSD Rapid shutdown function	
32	Request Control to "Alarm Inhibit" embedded generation symbol on the SCADA	
33	Confirm symbol displays "Alarm Bell" symbol	

The following test sequence will prove when a generator is operating in a commercial environment no alarms are received, e.g. No SDC is received but the generation has changed state. This to prevent any SDIP / SDC alarms being sent to Electricity North West Limited when not related to a RSD / CSD instruction.

The Customer must prove that no alarms are received for follow example types,

- G99 operation,
- Protection trips (e.g. thermal trips)
- Emergency trips
- Plant shutdown – commercial Grid Services

STAGE	TEST ACTION	PASS / FAIL
34	Request that the customer run their generator in parallel with the Electricity North West Limited Network and then out of parallel with the Electricity North West Limited Network, without any Electricity North West Limited instruction (either via Electricity North West SCADA or CCP) being received, for the above examples.	
35	Confirm with Control that the Generation OFF and ON indication has changed and the SDC alarm does NOT come through.	
36	Request Control to leave generation symbol "Alarm Inhibited."	
If Controlled Shutdown function is available, the next test stages should be executed		
37	If a CSD functionality is installed carry out carry out tests 4 - 5	
38	If no CSD functionality exists continue to next item in this test.	
39	Give the customer permission to re-parallel	
40	Confirm with control that tests are complete, and the generator has been left to run in parallel with Electricity North West Limited Network	
41	Confirm Customer Connection Panel (CCP) tests have been successfully completed	

Witness Declaration

By signing this the customers witnessing engineer confirms that they have witnessed the above test procedure and that the customers control system will not be modified without Electricity North West Limited approval and/or re-commissioning. Failure to respond appropriately to curtailment signals, in accordance with the customers connection agreement, may result in prolonged disconnection from the network; and may result in wider interruption of the customers entire site supplies (import and export). The customers witnessing engineer also certifies that they have connected the CCP in accordance with ES 260 section 7 and all diagrams supplied by Electricity North West Limited and their representatives.

The following tests have been witnessed by the customer.

TEST		ELECTRICITY NORTH WEST LIMITED SIGN / INITIAL OR NOT APPLICABLE (NA)
1	Generation Failsafe Indication	Electricity North West Limited
2	Lockout; With generation previously switched 'off' the customer acknowledges a new shutdown (RSD) instruction whilst in that 'off' state.	Electricity North West Limited
3	Rapid Shutdown (RSD)	Electricity North West Limited

Commissioning Completed	Signature
Customer Witnessing Engineer:	
Electricity North West Limited Site Representative:	
Date:	

Appendix D – Controlled Shutdown (CSD) Procedure (if required)

Onsite Active Network Management
Controlled Shutdown Commissioning procedure

Outage Details	
Outage Number:	
Substation Name:	<i>Also Update Appendix Header</i>
Substation Number:	<i>Also Update Appendix Header</i>

Testing Notes

This is not a switching programme.

This section of the commissioning procedure covers:

- [Appendix D - Controlled Shutdown \(CSD\) Function](#)
- [Test 4 - Controlled Shutdown \(CSD\)](#)
- [Test 5 - Controlled Shutdown can be overridden by an RSD](#)
- [Test 6 - The customers' CSD sequence is terminated following an RSD instruction](#)

Text below in **bold** refers to alarm description or generation state indication on the SCADA.

The functions will be abbreviated as follows,

- Rapid Shutdown will be known as RSD.
- Controlled Shutdown will be known as CSD.
- Shutdown Complete will be known as SDC.
- Shutdown in Progress will be known as SDIP.



D1 Response Times

The rapid shutdown response time should be within 500mS of the instruction

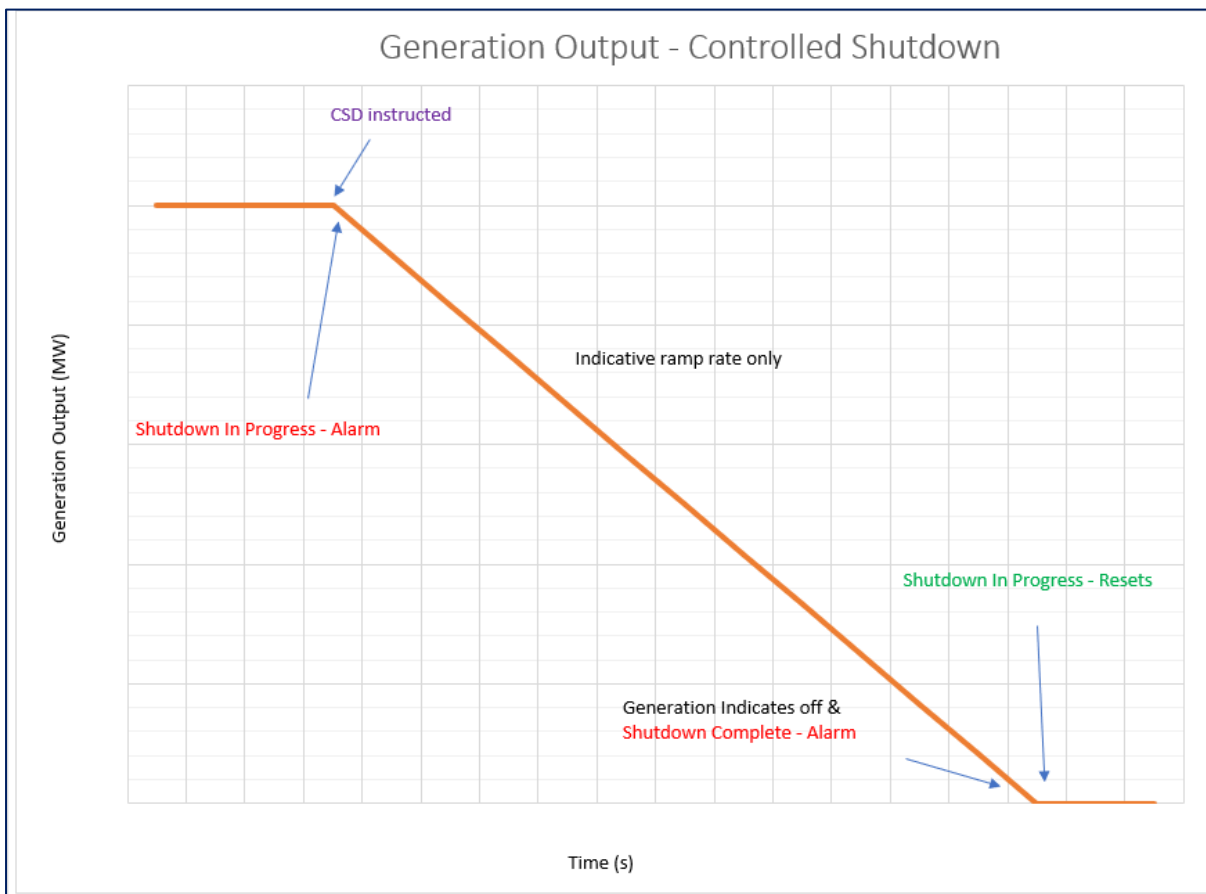
The controlled shutdown response should be less than 90 seconds or within the customer declared response rate following a CSD. In all cases it should not exceed 90 seconds

The controlled shutdown is not a local option. This is a function to provide a sympathetic ramp down of the customers plant and an efficient control method via the control centre SCADA system. This should therefore eliminate the need for a site visit, hence no local CSD controls on the CCP.



D2 Test 4 – Controlled Shutdown (CSD) Procedure

STAGE	TEST ACTION	PASS / FAIL
The following will test the controlled shutdown CSD function remotely via the Control Centre		
Initial Conditions:		
1	Ensure the generation is off / disconnected	
2	Check the CCP indication is correct: <ul style="list-style-type: none"> • Generation Off (Open) Green lamp on • Rapid Shutdown (Off) Blue lamp off • Controlled Shutdown (Off) Blue lamp off 	
3	Confirm with Control <ul style="list-style-type: none"> • RSD and CSD are not active • Generation CB is showing OFF (open) • No Alarms are being received from this site 	Control 
4	Request that the customer run their generation in parallel with Electricity North West Limited Network	
5	Witness the generation running in parallel with Electricity North West Limited Network	
6	Check the correct lamp (Generation ON/ red lamp) is on at the CCP panel	
7	Confirm Control are receiving no alarms from this site	
8	Request Control to switch IN the CSD control shutdown function	
9	Record the Shutdown Instruction Time (SIT) i.e. the time when the CSD is executed. When the blue CSD lamp illuminates	HH: MM: SS
10	Confirm with Control they are receiving the 'Shut Down In Progress' (SDIP) alarm	
11	Witness the generation CB opening and record when it occurs	HH: MM: SS
12	Calculate the duration from CSD execution to generation total shutdown.	MM: SS
13	Confirm shutdown period did not exceed 90 seconds.	
14	Check the correct lamp (Generation Off/ green lamp) is on at the CCP panel	
15	Confirm with Control the SDIP alarm cancel's and the SDC alarm is received.	
16	Confirm with Control they are receiving Generation Off indication	

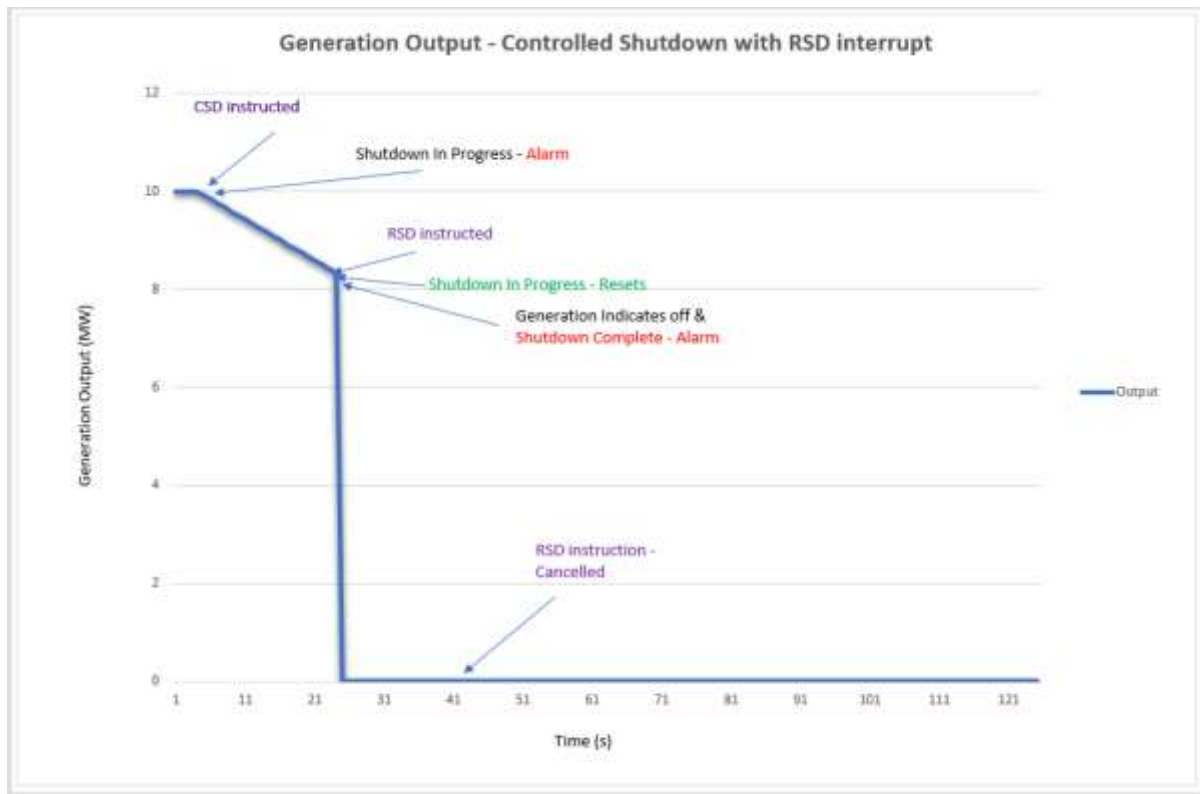
STAGE	TEST ACTION	PASS / FAIL
17	Request that the customer attempt to run their generation once again in parallel with Electricity North West Limited Network	
18	Witness that the generator cannot be run in parallel with Electricity North West Limited Network	
19	Request control to switch OUT the CSD Control Shutdown function	





D3 Test 5 – Controlled Shutdown (CSD) can be overridden by an RSD

STAGE	TEST ACTION	PASS / FAIL
The following test will confirm Electricity North West Limited still have control over the generation during a CSD execution – 90 seconds period		
NB. During the following Controlled Shutdown, a Rapid Shutdown function will be executed.		
1	Ensure the generation is off / disconnected	
2	Check the CCP indication is correct: <ul style="list-style-type: none"> • Generation Off (Open) Green lamp on • Rapid Shutdown (Off) Blue lamp off • Controlled Shutdown (Off) Blue lamp off 	
3	Confirm with Control <ul style="list-style-type: none"> • RSD and CSD are not active • Generation CB is showing OFF (open) • No Alarms are being received from this site 	Control 
4	Check the correct lamp (Generation On/ red lamp) is on at the CCP panel	
5	Request that the customer run their generation in parallel with Electricity North West Limited Network	
6	Witness the generation running in parallel with Electricity North West Limited Network	
7	Check the correct lamp (Generation On/ red lamp) is on at the CCP panel	
8	Confirm Control are receiving no alarms	
9	Request Control to switch IN the CSD control shutdown function	
10	Record the Shutdown Instruction Time (SIT) i.e. the time when the CSD is executed. When the blue CSD lamp illuminates	HH: MM: SS
11	Confirm with Control they are receiving the 'Shut Down In Progress' (SDIP) alarm	
12	Whilst the generation is shutting down approx. SIT+ 20 seconds later (must not exceed 60 seconds), request Control to execute the RSD function	
13	Witness the generation CB opening and record the time it opens at	HH: MM: SS
14	Confirm generation shuts down immediately	
15	Confirm with control the SDIP alarm is reset and the SDC alarm is received.	

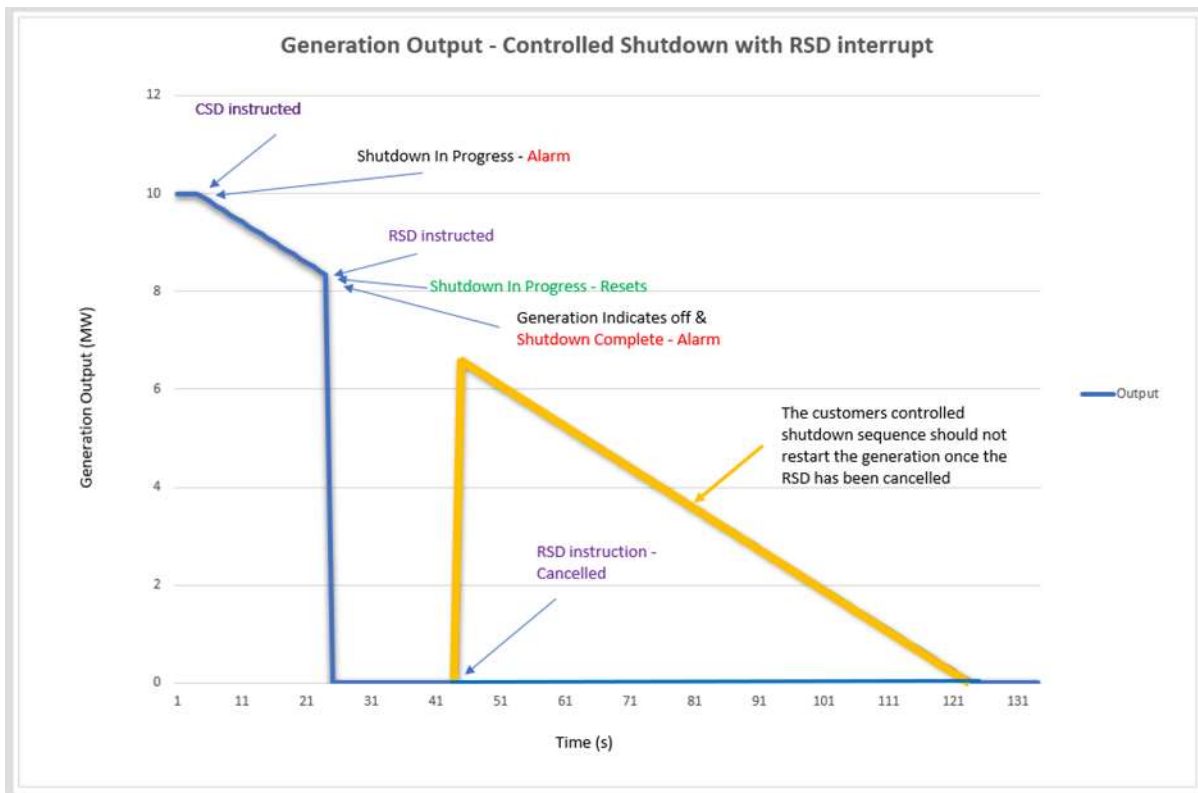
STAGE	TEST ACTION	PASS / FAIL
16	Confirm with control they are receiving generation off indication	
17	Request that the customer attempt to run their generation once again in parallel with Electricity North West Limited Network	
18	Witness that the generator cannot be run in parallel with Electricity North West Limited Network	
19	Wait 90 + seconds (allows CSD period to expire)	
20	Request Control to switch OUT the RSD Control Shutdown function	
21	Confirm customer Generation does not attempt to restart	
22	Request control to switch OUT the CSD Control Shutdown function	
23	Request that the customer run their generation in parallel with Electricity North West Limited Network	
24	Witness the generation running in parallel with Electricity North West Limited Network	



D4 Test 6 – The Customers’ Controlled Shutdown (CSD) Sequence is Terminated Following an RSD Instruction

Stage	Test Action	Pass / Fail
The following test confirms the Controlled Shutdown sequence is terminated once the RSD has been executed and reset within approx. 20 seconds of the RSD execution. The CSD sequence should not recommence and generation does not restart, once RSD has been executed and reset.		
1	Ensure the generation is off / disconnected	
2	Check the CCP indication is correct: <ul style="list-style-type: none"> • Generation Off (Open) Green • Rapid Shutdown (Off) Blue • If applicable Controlled Shutdown (Off) Blue 	
3	Confirm with Control <ul style="list-style-type: none"> • RSD and CSD are not active • Generation CB is showing OFF (open) <p>No Alarms are being received from this site</p>	Control 
4	Request the customer to parallel generation	
5	Witness the generation in parallel with network	
6	Check the correct lamp (red lamp / generation on) is on at the CCP panel	
7	Confirm control are receiving no alarms	
8	Request Control to switch IN the CSD control shutdown function	
9	Record the Shutdown Instruction Time (SIT) i.e. the time when the CSD is executed	HH: MM: SS
10	Check the correct lamp (Controlled Shutdown/ Blue lamp) is on at the CCP panel	
11	Confirm with Control they are receiving the 'Shut Down in Progress' (SDIP) alarm	
12	Whilst the generation is shutting down approx. SIT + 20 seconds later, request Control to switch IN the RSD function	
13	Witness the generation CB opening	
14	Confirm generation shuts down immediately after the RSD function as executed by Control	
15	Confirm with Control that the SDIP alarm is reset	
15	Confirm with Control that the SDC alarm is received.	
16	Confirm with Control they are receiving Generation Off indication	

Stage	Test Action	Pass / Fail
17	Allow a further 20 seconds (SIT + 40 seconds) post RSD execution then request Control switch OUT (remotely reset) the RSD control shutdown function	
18	Witness the generator does not successfully re-parallel with the Electricity North West Limited Network, thus confirming the customer CSD sequence has been terminated.	
19	Request Control to switch OUT the CSD control shutdown function	
20	Request that the customer run their generation in parallel with Electricity North West Limited Network	
21	Witness the generation running in parallel with Electricity North West Limited Network	



Witness Declaration

By signing this the customers witnessing engineer confirms that they have witnessed the above test procedure and that the customers control system will not be modified without Electricity North West Limited approval and/or re-commissioning. Failure to respond appropriately to curtailment signals, in accordance with the customers connection agreement, may result in prolonged disconnection from the network; and may result in wider interruption of the customers entire site supplies (import and export). The customers witnessing engineer also certifies that they have connected the CCP in accordance with section **Error! Reference source not found.** and all diagrams supplied by Electricity North West Limited and their representatives.

The following tests have been witnessed by the customer.

TEST		SIGN / INITIAL OR NOT APPLICABLE (NA)
4	Controlled Shutdown (CSD)	
5	Controlled Shutdown can be overridden by an RSD	
6	The customers' CSD sequence is terminated following an RSD instruction.	

COMMISSIONING COMPLETED	SIGNATURE
Customer Witnessing Engineer:	
Electricity North West Limited Site Representative:	
Date:	

Appendix E – Rapid Shutdown Indications

On Site Active Network Management
Circuit Breaker Indication Guidance Notes

E1 Circuit Breaker Failsafe Combination (CB status tests)

Example Generator circuit breaker open combination test

For Example, 4 generator installation

Generator = “0” means generator CB auxiliary contact is closed when the CB is in the open (Off) position.

Generation State = “Off” means the Generation Off (Open) Green lamp is on i.e. all Generation CBs are open (OFF), GEN CB relay in CCP is energised.

Generation State	Generator 4	Generator 3	Generator 2	Generator 1
Off	0	0	0	0
On	0	0	0	1
On	0	0	1	0
On	0	0	1	1
On	0	1	0	0
On	0	1	0	1
On	0	1	1	0
On	0	1	1	1
On	1	0	0	0
On	1	0	0	1
On	1	0	1	0
On	1	0	1	1
On	1	1	0	0
On	1	1	0	1
On	1	1	1	0
On	1	1	1	1

The above CB status tests do not all need to be done under live on-load conditions. However, at the formal commissioning stage, they must be performed with the CB(s) in its (their) normal “In-Service” position(s), if withdrawable CB(s) are used. If non-withdrawable CB(s) are used, then the tests must be performed with its (their) circuit/bus-bar isolators in their normal “Service” positions.

Prior to the formal commissioning stage, such as during wiring checks, the CB status checks can be performed with CB(s) isolated if required. During formal commissioning the CB(s) must all be in their “In-Service” position(s). This is to verify that circuit/busbar isolator position (or the restoration of the CB secondary contacts) does not affect the results of the tests.

As shown in the table the number of tests required is equal to 2^n , where n = number of generator CBs. When many generator CBs are installed at a site, then the number of CB status tests will become very large. However, all these tests shall be done as it is possible that secondary wiring mistakes at the CB(s) may cause a potentially dangerous false positive indication of “Generator Off” on the CCP.

NOTE: Some customers may be unable to close their generator CBs whilst they are in a dead state (i.e. under-voltage CB close lockout) and in their normal service condition (busbar/ circuit isolators closed or racked into normal service position). For commissioning this under-voltage CB close lockout protection must be temporarily disabled to allow dead testing to take place. If this is not possible or the customer is unwilling to temporarily disable this under-voltage CB lockout protection then every combination of CB status testing shall be conducted in an onload (live) condition, irrespective of the number of tests this will require.

A false positive condition could be caused by a wiring mistake where two or more CBs auxiliary status signals are wired in parallel, rather than in series. It could also be caused by one or more of the CBs incorrectly using a normally open contact for CB auxiliary status signal, rather than a normally closed contact. When this occurs a CB, which is closed (ON), will have its normally open contact in the closed position rather than open position. Assuming all the other CBs are wired correctly, and they are all open (OFF), then this will complete the series loop through all the CBs auxiliary contacts. It will then appear that all the CBs are open (OFF), even when the one using the wrong type of auxiliary contact is closed (ON).

When 3 or more generators are on site then a wiring fault may lead to a situation which cannot be found by progressive or sequential closing/opening of the CBs. Where an incorrectly used normally open CB auxiliary contact is placed in parallel with another generators correctly selected normally open CB auxiliary contact then, under progressive/ sequential testing, this wiring mistake will not be found. These types of wiring mistakes can only be found by testing every combination of CB positions.

A wiring fault of the kind described could lead to an incorrect and potentially dangerous situation where the CCP and Control believed that all generation CBs are open (OFF) but one is still closed (ON). This condition is dangerous for several reasons but is especially so if the generation on the site is being constrained due to fault level reasons.

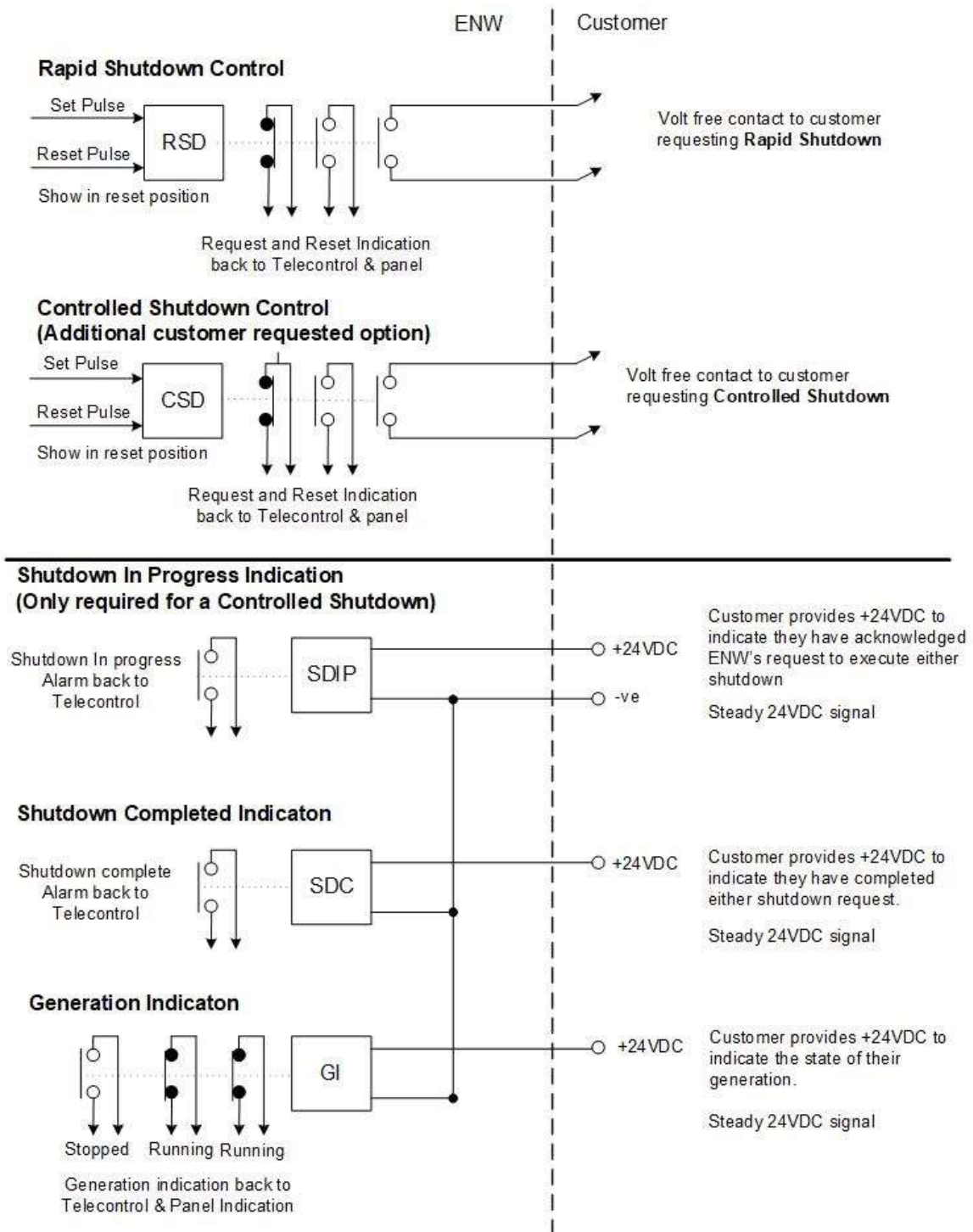
Due to these risks, and irrespective of the number of generators on site, all combinations of CB status must be tested and witnessed by Electricity North West Limited with CB(s) in their normal “In-Service” condition. Most of these tests may be performed whilst the CBs are dead, however the following must be performed during onload (live) conditions.

- (a) All CBs open (OFF) and check “Generator Off” lamp is illuminated.
- (b) Close only one CB (ON) and confirm “Generator Off” lamp is not illuminated and “Generator On” lamp is illuminated. Open this CB to OFF and confirm “Generator Off” lamp is illuminated.
- (c) Move to next CB and repeat previous step until all CBs have been closed and opened.

- (d) Confirm all CBs open (OFF) and check “Generator Off” lamp is illuminated.
- (e) Close only one CB (ON) and confirm “Generator Off” lamp is not illuminated and “Generator On” lamp is illuminated. Do not open this CB.
- (f) Move to next CB. Close this CB (ON) and confirm “Generator Off” lamp is not illuminated and “Generator On” lamp is illuminated. Do not open this CB.
- (g) Repeat previous step until all CBs are closed (ON) and confirm “Generator Off” lamp is not illuminated and “Generator On” lamp is illuminated.
- (h) Open the CB to OFF that you first closed in step 5. Confirm “Generator Off” lamp is not illuminated and “Generator On” lamp is illuminated.
- (i) Move to the CB you closed in step 6 and Open that CB to OFF. Confirm “Generator Off” lamp is not illuminated and “Generator On” lamp is illuminated.
- (j) Keep repeating the previous step i.e. opening the CBs to OFF in the order that you previously closed them.
- (k) Once all CBs have been opened to OFF confirm “Generator Off” lamp is illuminated and “Generator On” lamp is not illuminated.

Appendix F – Overview of CCP Functions and Indications

Generation Shutdown – Concept diagram



v9