SECURITY OF SUPPLY

PARTICIPANT ROLLING OUTAGE PLAN

ELECTRICITY NETWORK CONTINGENCY PLAN

NW20.40.09

AMENDMENT 11

DETAILS OF DOCUMENT AMENDMENT No.10			
Amendment	**Section Amended**	**Description of Amendment**	**Issue Date**
7	All	Generally updated	01.08.17
8	ALL	Generally updated	20/07/2020
9	All	Generally updated – New Schedule and Savings tables	1/05/2021
10	All	Requested changes from System Operator	17/05/2021
11	All	Biennial update	29/05/2023

The latest amendments are marked with a vertical line against the left margin.
New text is red and removed text that has been left for clarity is ~~green~~.

DOCUMENT APPROVAL	
APPROVED BY:	S Kilduff
APPROVED DATE:	29/05/2023
NEXT REVIEW DUE:	1/05/2025

TABLE OF CONTENTS

1. INTRODUCTION

This plan was written to comply with the Electricity Industry Participation Code 2010, Part 9 Security of Supply.

The procedures outlined are in response to major generation shortages and/or significant transmission constraints. Typical scenarios include unusually low inflows into hydro-generation facilities, loss of multiple thermal generating stations or multiple transmission failures.

How an event is declared and how the System Operator should communicate its requests are detailed.

The main energy saving measure listed is rolling outages and how these are structured and implemented is discussed.

2. PURPOSE

Under the Code, participant rolling outage plans (PROP) are required to specify the actions that would be taken to:

a. be consistent with the system operator rolling outage plan; and

b. comply with the requirements specified in the notice sent under clause 9.6(2)(a) of the code; and

c. specify the actions that Orion will take to achieve, or contribute to achieving, reductions in the consumption of electricity (including any target level of reduction of consumption of electricity in accordance with criteria, methodologies, and principles specified on the system operator rolling outage plan) to comply with a direction from the system operator.

Reducing demand by disconnecting supply to customers would be a last resort after all other forms of savings including voluntary savings had been exhausted. Orion will always endeavour to keep supply on to customers.

3. DEFINITIONS

Act	Electricity Industry Act 2010
AUFLS	Automatic Under Frequency Load Shedding
Authority	Electricity Authority
Code	Electricity Industry Participation Code 2010
Feeder	A high voltage supply line typically supplying between 100 and 2000 customers.
GXP	Transpower Grid Exit Point
GEN	Grid Emergency Notice
PROP	Participant Rolling Outage Plan (this plan)
NW20.40.05	Disconnection of Demand as Required by Authority Rules
OR00.00.07	Major Outage Communication Plan
Regulations	Electricity Governance (Security of Supply) Regulations 2008 and Electricity Governance (Security of Supply) Amendment Regulations 2009
Rolling Outages	Planned electricity disconnections spread over different parts of the network at differing times to avoid prolonged outages at any one location.
Security Coordinator	the person responsible for system security at the System Operator
SOROP	System Operator Rolling Outage Plan
Supply Shortage Declaration	Declaration made by the System Operator under part 9 of the Code.
System Operator	The operator of the national electricity transmission grid

4. BACKGROUND

4.1 ELECTRICITY AUTHORITY

The Authority is an independent Crown entity responsible for the efficient operation of the New Zealand electricity market.

Core functions of the Authority are to:

- make and administer the Electricity Industry Participation Code 2010 (Code) governing the New Zealand electricity market;
- monitor and enforce compliance with the Code, various regulations, and the Act;

4.2 TRANSPOWER

Transpower is a State - Owned Enterprise, tasked with owning and operating New Zealand's National Grid - the network of high voltage transmission lines and substations that connect areas of generation with town and cities across the country.

As System Operator, Transpower manages the real-time operation of New Zealand's electricity transmission system. It keeps the right amount of energy flowing to match generated supply with demand.

4.3 ORION

Orion is the electricity network company that owns and maintains the electricity lines and cables that deliver power to the Christchurch and Central Canterbury region between the Waimakariri and Rakaia rivers.

5. RANGE OF EVENTS

Events that could lead the System Operator to make a Supply Shortage Declaration can in general terms be categorized as;

- **Developing (Category A) Event** – Events that evolve over time, for example low hydro lake or fuel levels.
- **Immediate (Category B) Events** – Events that occur with little or no warning, usually as a result of a transmission line or major generation failure.

5.1 MAJOR INCIDENT

A Category A or Category B event will be classed by Orion as a major incident and Orion's management team will activate the appropriate contingency plan and will manage the incident accordingly.

Communication with retailers, civil defence, and other stakeholders will be as per notification procedures described in our Crisis Communication Plan OR00.00.07

6. ORION STAFF RESPONSIBILITIES

ROLE	ORION PERSONNEL
Receive communication from System Operator	CEO, Head of Regulatory and Commercial or Head of Operations
Implement this plan	Control Centre Manager
Preparation of load shedding schedules	Control Centre Manager
Customer notification	Release Planning Manager/ Customer Support Lead/ Head of Customer and Communications
Weekly savings reporting	Commercial Analyst
Revoking rolling outages	Head of Regulatory and Commercial
Reporting to System Operator	Head of Regulator and Commercial
Reporting to media, public agencies, Stakeholders	External Engagement Lead
Reporting to CDEM and Lifelines	Head of Operations

7. COMMUNICATION WITH THE SYSTEM OPERATOR

The System Operator can contact Orion using the following details:

Orion New Zealand Ltd
PH 0800 363 9898
03 363 9898
P.O. Box 13896, Christchurch 8053
565 Wairakei Rd, Christchurch 8053

8. ACTIONS FOR IMMEDIATE (CATEGORY B) EVENTS

8.1 SYSTEM STABILITY

Transpower, as the System Operator, is required to keep enough reserve generation to cover the risk of the largest connected generator tripping. They are also required to keep the system frequency at 50Hz. If a large generator trips, it may cause a reduction in frequency which if not rectified can result in other generators tripping and could lead to cascade failure of the transmission system. As reserve generation cannot immediately pick up the load of a disconnected generator, an immediate load reduction is required until additional generation can pick up load. Automatic load shedding groups reduce load in stages until the frequency stabilises.

To recover from category B events electricity consumption can be reduced by;

8.2 RESERVE MARKET

Generators and load users with interruptible load such as distribution networks may offer in reserve capacity to cover the risk of the largest generating unit or a critical transmission line tripping. The ability to do this is affected by the numbers of frequency capable relays installed and the likely revenue stream from the market less the compliance costs of participating in the reserve market. Orion does not presently participate in this market.

8.2.1 Disconnecting Customers

8.2.1.1 Automatic Under Frequency Load Shedding (AUFLS)

If the load shed by the Reserve Market tripping is insufficient to stabilise the network, further automatic load reduction is required.

In the South Island, Transpower is responsible for ensuring each distribution network company must (unless exempted) have available at all times two blocks of load each of 16% of its total load to be shed by automatic under frequency relays.

8.2.1.2 AUFLS Zone 1

If system frequency fails to recover after Reserve Market load shed, AUFLS Zone 1 shedding will occur by disconnecting customer's supply. In the Orion Network the tripping relays are either owned by Transpower or Orion and a combination of feeders and whole zone substations are tripped. AUFLS feeders are listed in NW20.40.05.

8.2.1.3 AUFLS Zone 2

If Zone 1 tripping fails to restore frequency, the next stage, Zone 2 activates. This will disconnect a further 16% of Orion's Network.

8.2.1.4 Manual Shedding

If AUFLS Zone 1 and Zone 2 tripping fails to stabilise frequency the System Operator will shed more load. Emergency load shedding feeders are listed in NW20.40.05.

Once the frequency has stabilised the System Operator will advise the Orion Control Centre when load can be restored.

8.3 SUPPLY RESTORATION

Disconnected load must be restored in conjunction with the System Operator. This is to prevent overloading the transmission grid and/or creating further instability.

8.4 TRANSMISSION GRID EMERGENCY

The System Operator may request Orion to reduce load under a Grid Emergency Notice (GEN). Orion will shed all water heating load, the System Operator will be advised and if more shedding is required the System Operator will instruct Orion to disconnect more load, or as per the emergency load shedding feeders listed in NW20.40.05.

If a category B event is in place, the grid emergency will take precedence.

If the System Operator declares a supply shortage during a Grid Emergency, then Orion will respond by implementing rolling outages as described in the following "Developing Events" section.

9. DEVELOPING (CATEGORY A) EVENTS

If the System Operator requests a load reduction for a planned category A event, Orion must reduce supply to meet the System Operator targets. The targets are likely to be in the form of a weekly energy savings target that is reviewed each week. To reduce energy usage Orion would disconnect feeders or groups of feeders where they belong to a parallel or ring supply (rolling outage feeders) in a controlled manner to enable targets to be reached.

Orion has a legal obligation to comply with the targets specified by the System Operator.

Water heating load shedding is generally not an option for energy savings.

10. DECLARATION OF CATEGORY A EVENT

The System Operator will endeavour to provide 9 days prior notice of the requirement for weekly energy savings and any increase in the weekly energy savings target.

To declare a Category A event the System Operator will specify the energy savings target to be enforced for a specific region for a specified time-frame.

The System Operator is responsible for general media advertising of the need to conserve electricity and the impending rolling outages when they are requested if a Public Conservation Campaign has been declared in accordance with the Code.

If Orion plans to issue a public message related to rolling outages then this will be sent to the System Operator for review before being released. Any such communication will give a time for response from the System Operator, so as their feedback can be included before Orion issues the message to the public.

On receipt of a declaration of a Category A event, Orion will update Appendix A with current load data.

11. CRITERIA FOR ROLLING OUTAGES

To ensure public health and safety is preserved and costs to the economy are minimised the following table shows a desired criteria for selecting rolling outage feeders to be included in rolling outages.

11.1 TABLE 1:PRIORITY LOADS

Priority	Priority Concerns	Maintain Supply to:	Examples
1	Public health & safety	Major hospitals, air traffic control centres, & emergency operation centres	CDHB hospitals CHCH International Airport Urban police & fire stations Orion main building
2	Important public services	Energy control centres, communication networks, water & sewage pumping, fuel delivery systems, and major port	Major telecommunications connections Major malls & supermarkets Rural fire & police stations Lyttelton Port Lyttelton Tunnel Burnham military Major passenger transport connections CCC & SDC water pumping & waste water connections
3	Public health & safety	Minor hospitals, medical centres, schools & street lighting	Dental surgeries Medical centres & doctor surgeries Colleges Universities & polytechnics Prisons Major Hotels Non-CDHB hospitals & Rest homes All lighting category connections
4	Food production	Dairy farms & milk production facilities	All irrigation category connections All rural connections with a description that includes dairy, farm, irrigation, pig, poultry, cow or an ANZSIC code of A016 (Dairy farming)
5	Domestic production	Commercial & industrial premises	'BUS' connections not covered by priority groups 1 to 4 Minor Communications connections (Phone box, Sky TV) Temporary supplies
6	Disruption to consumers	Residential premises	All 'RES' connections Churches Parks (mainly lighting & irrigation)

Rolling outage feeders will all contain a variety of customers. The priority for each rolling outage feeder will be based on the priority ratings assessed for the connections within each feeder, according to the following:

Priority	Criteria
1	Any feeder that has one or more priority 1 connection
2	Any feeder that has three or more priority 2 connections or where the minimum of the simple and volume based weighted average priority < 2.5
3	Feeders where the minimum of the simple and volume based weighted average priority ≥ 2.5 and < 3.5
4	Feeders where the minimum of the simple and volume based weighted average priority ≥ 3.5 and < 4.5 or where the feeder includes large capacity connections
5	Feeders where the minimum of the simple and volume based weighted average priority ≥ 4.5 and < 5.5
6	Feeders where the minimum of the simple and volume based weighted average priority ≥ 5.5

Rolling outage plans will focus on lower priority feeders to the extent possible, and the higher priority feeders being selected only at the higher required savings levels.

Rolling outage feeders with the same priority and in the same area (according to our grid exit areas) are grouped together into rolling outage groups. This level of grouping simplifies the planning, management and notification of rolling outages. The areas (GXPs for rolling outages) are:

Area	GXP	Rolling Outages may occur
A	Bromley	Y
B	Hororata	Y
C	Islington 33	Y
D	Islington 66	Y
E	Kimberley	Y
F	Arthurs Pass	N*
G	Castle Hill	Y
H	Coleridge	Y

*Note: No SCADA control at Arthurs Pass GXP.

11.2 VULNERABLE CUSTOMERS AND PRIORITY SITES

It is not possible for Orion to prevent rolling outages affecting individual vulnerable customers and priority sites. In addition to the prioritisation of rolling outage feeders, Orion will:

- provide information in its public notices and website alerting vulnerable customers to the risks, and
- request that retailers consider individually notifying their vulnerable customers.

11.3 RETAILER AGREEMENTS

Currently Orion do not have any agreements with retailers or consumers which would adversely affect Orion's ability to comply with System Operator directions.

12. INTERRUPTIBLE LOAD

12.1 AUFLS UNDER ROLLING OUTAGES

The level of AUFLS during rolling outages needs to be maintained. Orion will either:

- Exclude the current AUFLS feeders from its rolling outage plans, which means that supply to lower value loads may be maintained while higher value loads are cut, or
- Include AUFLS feeder shedding but limit the shedding to ensure that two AUFLS blocks of 16% are maintained. That is, if we shed 20% of our network load we would also shed up to 20% of the AUFLS load.
- Arm additional higher value load feeders to supplement the AUFLS load and exclude these from its rolling outage plan.

This document is drafted assuming that AUFLS feeders are excluded from shedding. However, if needed we would disarm AUFLS relays on the higher value load feeders, where 16% total can be maintained. Normally Orion switch AUFLS relays on and off to maintain 16% of total network load available for AUFLS control.

12.2 AUVLS

Automatic Under Voltage Load Shedding can be armed on some feeders on the Orion network, the table below shows the percentage of load that can be available for AUVLS. AUVLS will only be armed after direction from Transpower.

12.3 ATOTS

Automatic Thermal Overload Tripping System is normally armed on the Orion ISL – SPN 66kV circuits. The load available for this is listed below.

12.4 LOAD SHEDDING %

Load shedding scheme	GXP	Percentage of average annual demand	Percentage normally armed for shedding
AUFLS B1	ISL 66	20	17
	BRY	1.3	1.3
AUFLS B2	ISL 33	7.5	7.5
	ISL 66	8	5
	BRY	3	3
	HOR	1	1
AUVLS	ISL 66	5	0
	HOR	3	3
ATOTS	ISL 66	6.5	6.5

13. SHUTDOWN NOTIFICATION

With the wide scale impact of rolling outages it is not feasible to use our standard planned outage notification process (mainly because retail and postal systems could not process the hundreds of thousands of outage notifications required).

When implementing a rolling outage plan, Orion will notify the outages in a number of ways:

- **Public notices** - Orion will place public notice printed advertisements (see draft in Appendix B) providing a rolling outage timetable showing the times and areas affected by rolling outages. The advertisement will provide details of our website page for customers that wish to seek more information. Radio may also be utilised.
- **Online Social Media** – will be utilised as appropriate.
- **Orion website** - a dedicated website page will be set up which shows the rolling outage timetable.
- **Customer Support Team** - will communicate with customers throughout.
- **Retailer notification** - Orion will provide the rolling outage timetable to all electricity retailers together with a schedule showing the rolling outage group for all ICPs (it is not appropriate to filter the schedule for an individual retailer's ICPs as this puts switching ICPs at risk).

Where possible, Orion will provide 7 days' notice of all rolling outage plans, generally publishing and issuing notifications on a Monday to apply from the following Monday.

14. COMMUNICATION WITH SYSTEM OPERATOR

All communications with the System Operator will be between Orion's Control Centre and Transpower's National Grid Operating Centre (NGOC) using normal communication systems.

Prior to notifying and implementing a rolling outage plan, Orion will consult with the System Operator Security Coordinator to establish a process for shedding and restoration, which may include a MW load cap to operate under during restoration phases. Unless agreed with the System Operator, load shedding and restoration shall be no more than 25MW per 5 minutes.

Orion will acknowledge receipt of direction from System Operator to save energy by responding to system.operator@transpower.co.nz

15. GRID EMERGENCY DURING CATEGORY A EVENT

If the system operator declares a grid emergency during a category A event, the grid emergency will take priority. As water heating load generally would not be used to reduce load in a category A event, Orion would have water heating load available for load reduction when required for the grid emergency. This load would be shed, the System Operator advised and if more shedding is required the System Operator will instruct Orion to disconnect more load or as per the list of emergency load shedding feeders in NW20.40.05.

Note: Some Local service transformers are connected to a feeder that also supplies customers. Configurations such as this will create problems if ZS batteries run out. Feeder CBs will need manual operation and ripple injection will not work.

After the grid emergency is cancelled the rolling outages pattern would continue.

16. ROLLING OUTAGES STRATEGY AND METHODOLOGY

The Head of Operations, Control Centre Manager, and Release Planning Manager will review weekly targets and prepare plans for weekly rolling outages based on savings required.

The methodology is:

- Each distribution feeder exiting a zone substation (or switching station, or group of feeders where they belong to a parallel or ring supply) will be named as a "Rolling outage feeder".
- Rolling outage feeders will be assigned a priority according to the criteria specified in section 11. Rolling outage feeders in the same GXP area with the same priority will be grouped together for switching (creating 36 rolling outage groups, A1 to F6). Feeders that belong to AUFLS block 1 and 2, or alternative AUFLS feeders where implemented, will be excluded from rolling outage groups unless we apply the alternative AUFLS arrangements outlined in section 12.
- A set of switching schedules will be prepared for each rolling outage group.
- A winter weekday 8am – 5pm average energy volume will be estimated for each group, based on the average July daytime loadings.
- A plan will be prepared to target the required savings level, taking account of any under or over savings carried forward from earlier periods in the security of supply rolling outage plan. As far as possible, groups should be selected depending on the saving level required, as follows:

Savings required	Priority groups used
0 to 5%	5 and 6
5 to 10%	3, 4, 5 and 6
Greater than 10%	all groups

Further, as far as possible, the total outage durations should be determined to meet the following relationship:

Group Priority	Relative duration
6	9
5	7
4	6
3	4
2	4
1	2

To the extent possible, outages should be programmed to be held during daylight hours, between 8am and 5pm, but extending into the evening where necessary to achieve the required savings level or accommodate switching logistics. Best endeavours will be made to:

1. Minimise the impact on frequency and voltage stability.
2. Minimise the disconnection and restoration of demand during times when demand is typically ramping up or down in the region affected by the supply shortage (for example, either side of morning and evening peaks).

Unless advised otherwise by the System Operator, the rolling outages plan must provide sufficient time for switching of load to ensure that Orion's load does not increase or decrease by more than 25MW in any 5 minute period. The Controllers carrying out switching are to monitor their activities in relation to this limit.

Having established the week ahead rolling outage plan and despite significant uncertainty in predicting customer behaviour during these types of events, Orion will use best endeavours to produce a rolling week ahead half hourly load for each GXP. This will be updated daily to reflect any adjustments to our plan and forwarded to the System Operator in the format outlined below.

Date: (table for each of the next 7 days)			
Trading period	**GXP name**	**GXP name**	**……..**
1	MW load	MW load	MW load
2	MW load	MW load	MW load
⇓	MW load	MW load	MW load
48	MW load	MW load	MW load

If Orion is unable for some reason to meet the load disconnection/restoration ramp rates, or if there is expected to be a material departure (greater than 20%) from the previously provided half hourly GXP load forecast / load profile, then Orion would communicate directly with the System Operator (i.e. the Security Coordinator) to ensure that real time security issues can be managed. Using the methodology and excluding current AUFLS feeders, indicative plans for savings are:

5% Savings Plan				10% Savings Plan			
Group priority	Cuts per Week	Cut duration (hours)	Weekly Savings (MWh)	Group priority	Cuts per Week	Cut duration (hours)	Weekly Savings (MWh)
6	5	6	1,650	6	7	7.5	2,887
5	5	4.75	2,466	5	7	6	4,362
4	0	0	0	4	6	6	874
3	0	0	0	3	6	5	118
2	0	0	0	2	0	0	0
1	0	0	0	1	0	0	0
			4,116				8,241
Average weekly winter volume			82,595	Average weekly winter volume			82,595
Estimated percentage savings			5.0%	Estimated percentage savings			10.0%
15% Savings Plan				**20% Savings Plan**			
Group priority	Cuts per Week	Cut duration (hours)	Weekly Savings (MWh)	Group priority	Cuts per Week	Cut duration (hours)	Weekly Savings (MWh)
6	7	9.25	3,561	6	7	12	4,619
5	7	7.25	5,270	5	7	9.5	6,906
4	7	6.5	1,104	4	7	8.5	1,444
3	5	6	118	3	6	6.5	154
2	4	6	1,390	2	6	6	2,085
1	3	5	975	1	5	4	1,300
			12,419				16,508
Average weekly winter volume			82,595	Average weekly winter volume			82,595
Estimated percentage savings			15.0%	Estimated percentage savings			20.0%

25% Savings Plan			
Group priority	Cuts per Week	Cut duration (hours)	Weekly Savings (MWh)
6	7	15	5,774
5	7	12	8,724
4	7	10	1,699
3	7	7	193
2	7	6	2,432
1	7	4	1,820
			20,642
Average weekly winter volume			82,595
Estimated percentage savings			25.0%

17. TARGET MONITORING

To avoid discrepancy over the accuracy of different data sources, the System Operator will report on actual demand versus the target.

For load shedding to a weekly target, the Commercial Analyst will monitor the System Operator report of our savings results to our target and together with the Head of Regulatory and Commercial or Head of Operations, review future load shedding to increase or decrease number of rolling outages to enable the weekly target to be met. In parallel (as a check) with the System Operator, the Commercial Analyst will be responsible for daily and weekly reporting of consumption relative to target levels (using our data sources).

In the case of daily or real time limits where the System Operator reporting will be too slow for real time action to be taken, the Head of Operations with the assistance of the Commercial Analyst will monitor our savings and adjust accordingly in the timeframe required. These savings will be calculated using GXP loads measured by our SCADA system and compared with the targets supplied by the system operator.

18. LOG OF ROLLING OUTAGES

Controllers will enter in the Rolling Outage Log, times of disconnection and reconnection of all feeder interruptions. The log sheet to be used by Controllers is shown in Appendix A.

19. CONTINGENT EVENTS

If an unplanned event occurs that will alter planned rolling outages, the Control Centre Manager will be responsible for all decisions. Where possible, any changes to the planned timetable should be published on Orion's website and communicated to retailers.

20. NW21.70.58 ROLLING OFF HOURS – FEEDER SHEDDER UTILITY MANUAL

This manual has been developed as an instruction on how to use the current feeder shedder application which is installed on all Control Centre ADMS PCs.

This manual is to be used in conjunction with ADMS to create switching schedules based on the energy savings requirements while ensuring AUFLS feeders are not used for rolling outage savings.

21. APPENDIX A – ROLLING OUTAGE LOG

The operating order used to carry out the switching for rolling outages can be used as a log and exported to PDF or Excel. However, failing that the below table can be used to record outages.

SUBSTATION _____ DATE _____

TOTAL MW OFF _____ ON _____

CIRCUIT BREAKER NAME	CIRCUIT BREAKER #	TIME OPENED	TIME CLOSED	

22. APPENDIX B – DRAFT ROLLING OUTAGE PUBLIC COMMUNICATION

Provided below is a draft print advertisement which would be refined at the time to align with Transpower's messaging to ensure a co-ordinated, consistent approach. This advertisement focusses on advising people of impending power outages. We would also develop advertising and communications on the need to conserve power, as needed.

Advertising would be placed in newspapers serving Orion's customers in the region: *The Press*, the *Star*, *Akaroa Mail* and *Selwyn Times*. In addition to these publications, Orion would also communicate with customers via other channels, including:

- Social media
- Online media
- Radio
- Outage Notification service – opt-in
- Website
- Customer Support team, available 24/7
- Key stakeholder communications

Our advertising and communications are designed to channel customers to Orion's website where we will feature a dedicated section providing up-to-date information to as detailed a level as possible, about when outages will occur, and where. In addition, the website will provide people with advice on preparing for power outages, and safety information.