

SECURITY OF SUPPLY PARTICIPANT OUTAGE PLAN

Category	Operations
Type	Plan
Approved By	General Manager Network & Technology
Last Approved Revision	February 2022
Responsible Officer	Operations Manager
Next Review Date	February 2024

1. INTRODUCTION

This Participant Outage Plan (POP) is prepared by Horizon Energy Distribution Limited (Horizon Networks) to comply with the participant's obligation in clause 9.6 of the Electricity Industry Participation Code (Code) to prepare and publish a participant rolling outage plan.

Under section 9.8 of the Code, this plan is required to describe the actions that would:

- 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); and
- c) specify the actions that the specified participant will take to achieve, or contribute to achieving, reductions in the consumption of electricity (including any target level of reduction of consumption of electricity following criteria, methodologies, and principles specified in the system operator rolling outage plan) to comply with a direction from the system operator given under clause 9.15.

Rolling outages would be the last resort for managing severe energy shortages after all other forms of savings, including voluntary savings, have been achieved. Under normal conditions, they should not be necessary, but it is prudent to plan for contingencies where they may be required. Horizon Networks will always endeavour to provide a reliable supply to all customers.

The procedures outlined would be actioned in response to major generation shortages and/or significant transmission constraints. Typical events include unusual low inflows into hydro generation facilities, loss of multiple power generating stations or transmission lines.

How an event is declared and how the System Operator should communicate its requests are detailed. The main energy-saving measure described is rolling outages and how these are structured and implemented is also discussed.

2. TERMS AND DEFINITIONS

TERM	DEFINITION
AUFLS	Automatic Under Frequency Load Shedding
Feeder	An 11000 volt supply line
GEN	Grid emergency notice
GXP	Transpower Grid Exit Point
POP	Participation Outage Plan
Rolling Outages	Planned electricity disconnections spread over different areas of the Network at differing times to avoid prolonged outages at any one location
SOROP	System Operator Rolling Outage Plan

TERM	DEFINITION
System Operator	Transpower - New Zealand's Electricity System Operator
Supply Shortage Declaration	Declaration made by the System Operator under Part 9 of the code

Table 1 Definitions

3. BACKGROUND

Part 9 Subpart 2 of the Code sets out how supply shortage situations will be managed. Under the provisions of the Code, the system operator has powers to direct outages following a supply shortage declaration. As a specified participant, Horizon Networks must comply with any direction given to it following the declaration by the system operator following a supply shortage declaration. A supply shortage declaration may apply to:

- All of New Zealand; or
- Regions specified in the declaration

3.1 Electricity Authority (The Authority)

The Electricity Authority (Authority) is an independent Crown entity responsible for the efficient operation of the New Zealand electricity market. The Authority's purpose is to promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers.

The core functions of the Authority are to:

- make and administer the Electricity Industry Participation Code 2010 (Code) governing the New Zealand electricity market;
- undertake market-facilitation measures (such as providing education, guidelines, information, and model arrangements) and monitor the operation and effectiveness of market-facilitation measures;
- monitor and enforce compliance with the Code, various regulations, and the Act;
- proactively monitor the performance of the electricity industry with competition, reliable supply, and efficient operation; and
- contract service providers to operate the New Zealand electricity system and market under the Code.

3.2 Transpower NZ Limited (Transpower or System Operator)

Transpower NZ Limited, as a State Owned Enterprise, is the owner and operator of New Zealand's National Grid – the network of high voltage transmission lines and substations that transport electricity from the generation sites to many direct customers and distribution lines companies, such as Horizon Networks. As the System Operator, it also manages the real-time operation to keep the right amount of energy flow to meet the required demand.

3.3 Horizon Energy Distribution Limited (Horizon Networks)

Horizon Networks is the electricity network company that owns and maintains the distribution network including overhead lines, cables, and substations that deliver electricity from the Grid Exit Point (GXP) to consumers in the Eastern Bay of Plenty.

4. RANGE OF EVENTS

In general, events that could lead the System Operator to declare a supply shortage and can be categorized as:

- Developing Event** – Events that evolve over time. A short-term developing event could be a shortfall of generation capacity to meet a predicted peak load period. A long-term developing event could be, for example, low hydro lake or fuel levels over an extended period.
- Immediate Event** – Events that occur with little or no warning, usually because of a transmission line or major generation failure.

The main distinction between developing events and an immediate event is that the time does not generally allow emergency shutdowns to be advertised or customers notified before the work is undertaken. Every effort must be made to advise the affected energy retailers so that they can advise their customers.

Either a developing event or an immediate event will be classed by Horizon Networks as a major incident and the General Manager Network & Technology and associated staff will follow the appropriate contingency plan to manage the incident accordingly. This also includes providing for a situation that has elements of both events at the same time.

5. HORIZON ENERGY ROLES & RESPONSIBILITIES

Role	Horizon Personnel
Receive communication from the Authority	CEO or General Manager Network & Technology
Receive communication from System Operator	Network Controllers
Preparation of load shedding schedules	Operations Manager
Implement this plan	General Manager Network & Technology
Weekly saving report	Operations Manager
Retailer notification	Network Controllers
Reporting to the Authority	General Manager Network & Technology
Reporting to media, public agencies	General Manager Network & Technology and Operations Manager

Table 2 Horizon Energy Roles & Responsibilities

Key contact details of Horizon Networks staff are maintained and published in the Electricity Industry Emergency Contact List compiled by Transpower.

6. ACTIONS FOR IMMEDIATE EVENTS

6.1 System Stability

The System Operator is required to keep enough reserve generation to cover the risk of the largest connected generator tripping or HVDC link failure. They are also required to keep the system frequency at 50 Hz. If a large generator trips, it may cause a reduction in frequency which if not rectified can result in other generators tripping and lead to cascade breakdown of the transmission systems.

As the reserve generation cannot immediately pick up the load of a disconnected generator, an immediate load reduction is required until additional generation can pick up the load. Automatic load shedding groups reduce the load in stages until the frequency stabilises.

To recover from immediate events, electricity consumption can be reduced by:

- Reserve market;
- Automatic Under Frequency Load Shedding (AUFLS);
- Manual shedding.

6.2 Reserve Market

Generators and load users with an 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 number of frequency capable relays installed and the likely revenue stream from the market less the compliance costs of a participant in the reserve market. Horizon Networks does not presently participate in this market however have a major customer that does participate in the reserve market.

GXP	Percentage of Average Annual Demand Available for Interruptible Load (MW)
Edgecumbe	Up to 8MW

Table 3 Horizon Energy Customer Interruptible Load

6.3 Disconnecting Customers

6.3.1 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. Horizon has prepared two blocks of load zone 1 and zone 2, to be dropped by automatic under frequency sensing relays. The AUFLS regime is currently under review by the system operator, the number of blocks and trip settings may change as a result.

6.3.2 AUFLS Zone 1

If the system frequency fails to recover after the reserve market load shed, AUFLS zone 1 shedding by Transpower will occur. This will shed 16% of Horizon Networks' load by disconnecting customers' supply. Refer to Appendix A for all the listed AUFLS feeders.

6.3.3 AUFLS Zone 2

If zone 1 tripping fails to restore frequency, zone 2 will activate. This will disconnect a further 16% of Horizon Networks' network instantaneous load.

6.3.4 Manual Shedding

If AUFLS zone 1 and zone 2 tripping fail to stabilise frequency, the System Operator will shed more load manually. Once the frequency has stabilised, the System Operator will advise the Horizon Networks duty controller when the load can be restored.

6.4 Supply Restoration

Restoration of the disconnected load must be in conjunction with the System Operator to prevent overloading the transmission network and further instability.

Horizon will use best endeavours to:

- Not increase or decrease demand by more than 25MW in any five minute period without the system operators prior approval
- Minimise the impact on frequency and voltage stability
- Minimise the disconnection and restoration of demand during times when typically ramping up or down in the region affected by the supply shortage (for example, either side of morning and evening peaks)"

Horizon's Energy's Control Room is responsible for monitoring for overload conditions within the Horizon network during the restoration process.

6.5 Overlap with Transmission Grid Emergency

The System Operator may request Horizon Networks to reduce load under a Grid Emergency Notice (GEN). Horizon Energy would shed load in the order described in section 7

If an immediate event is in place, the grid emergency will take precedence.

6.6 System Operator Declarations

For some immediate events, the System Operator may direct that rolling outages are required to be implemented. In such a situation, the procedures for developing events will need to be implemented as per Section 7.5.

7. ACTIONS FOR DEVELOPING EVENTS

If the System Operator requests a load reduction for a planned developing event, Horizon Energy would reduce supply to meet the System Operators saving targets. The targets are expected to be a weekly energy saving plan that is reviewed each week. To reduce energy usage, Horizon Energy would disconnect 11 kV feeders in a controlled sequence as shown in Appendix A to enable targets to be reached. There may be financial penalties for not meeting the targets specified by the System Operator. In general, water heating load shedding is not a practical choice for these category events.

7.1 Declaration of Developing Event

The System Operator will endeavour to provide 9 days prior notice of the requirement for weekly energy savings and an increase in the target on the weekly basis. It is also Horizon Networks' plan to notify the retailers via emails regarding the planned outage.

To make a supply shortage declaration, the System Operator would need to request a specific weekly energy saving target is to be established for a specific region within a particular time frame. A notification system similar to the GEN procedure would be appropriate.

The System Operator is expected to manage general media advertising of the need to conserve electricity and implement rolling outages when they are requested.

7.2 Civil Defence

It is possible that a natural disaster could cause a major transmission or generation outage and could also lead to the declaration of a state of emergency of local emergency under the Civil Defence Emergency Management Act 2002 (CDEM Act). In these circumstances, there may also be a substantial reduction in demand in some locations due to natural disasters. A grid emergency may also be in place.

Section 60 of the CDEM Act provides that it is a duty of lifeline utilities (including generators and lines businesses) to ensure they can function to the fullest extent possible, during and after an emergency. It is envisaged that generators and lines businesses will have plans in place to work with groups established under the CDEM Act to recover from any natural disaster that affects their ability to provide services.

In addition to the provisions within the Code to coordinate supply and demand, the EMP, this SOROP, and participant rolling outage plans could provide a useful framework for coordinating reductions in electricity demand during a civil defence emergency.

7.3 Criteria for Rolling Outages

To ensure public health and safety are preserved and costs to the economy are minimised, the Authority has provided a guideline for selecting rolling outage feeders as shown in Table 2. The rolling outage would start from the lower priority load to the higher ones. For example, the residential premises would be the first outage target followed by commercial and industrial customers and so forth.

Priority	Priority Concern	Maintain Supply to:
1	Public health and safety	Major hospitals, air traffic control centres, and emergency operation centres
2	Important public services	Energy control centres, communication networks, water and sewage pumping, fuel delivery systems, major ports, public passenger transport, and major supermarket
3	Public health and safety	Minor hospitals, medical centres, schools, and street lighting
4	Animal health and food production/storage	Dairy farms, milk production facilities
5	Domestic production	Commercial and industrial premises
6	Disruption to consumers	Residential premises

Table 4 Rolling Outage Zones Priority For Supply

Since the rolling outages are generally implemented on a feeder-by-feeder basis, it is usually not feasible to discriminate between individual consumers. Horizon Networks will generally adopt an approach that leads to fewer and shorter outages for high-priority consumers.

7.4 AUFLS and Rolling Outage Criteria

The requirement for an AUFLS event is to reduce the instantaneous load by two blocks of 16 %. Horizon has one major customer who is involved in the reserves market and can shed a portion of their load to meet the requirement of AUFLS group 1. This consumer average load is 27% of the total average network load and they can reduce up to 30% of their load.

Major industrial loads make up 48% of the total demand. To keep these loads supplied requires heavy load reduction from domestic and commercial consumers especially during off-peak times.

AUFLS priority selection is made adhering to the principles in Table 2 except that major industrial loads are not generally shed based on the presumption that an under-frequency event is a short-term transient event.

Rolling outages are about reducing energy, power * time is energy; larger area load cuts for short times are balanced against fewer cuts over longer periods. Generally, shorter outage periods over wider areas are preferred.

Rolling Outages are generally a longer-term planned event, so there is time to inform consumers of planned outages. This provides major industries time to organise controlled shutdowns. To reduce economic impacts the rolling outage plan focuses on domestic and rural feeders over industrial and commercial feeders to make savings up to the first 10% reduction. To achieve 15% or more reduction requires industries to shut down on a rolling basis. Negotiations would be undertaken with industries to arrange outage times.

It is highly likely with an electrical supply shortage that the Energy Market will incur high costs for energy. Industries are likely to make commercial decisions regarding their production vs costs independently of the rolling outage plans proposed and may voluntarily reduce loads. In this case, the total consumption will reduce, and the planned rolling outage areas or durations can be modified to accommodate these load reductions.

7.5 Grid Emergency – GEN – Immediate Event

If the System Operator declares an immediate event grid emergency or an immediate event grid emergency during a developing event, the grid emergency will take priority,

For an immediate event, load management to meet the requested load reduction targets required by the System Operator will be carried out in the following order.

- 1) Hot water load shedding
- 2) Operation of embedded backup generation
- 3) Initiate pre-agreed load shedding from major industrial customers
- 4) Activate the rolling outage groups listed in Appendix A

To minimise the overall customer impact, it is preferable to prioritise disconnecting large loads before disconnecting multiple feeders.

The notification time from the System Operator for a fast-developing immediate event may be from minutes to hours. A short-term grid emergency event is likely to be only for the duration of a single peak period and is unlikely to exceed 4 hours.

For a long-term event, the plan outlined in Appendix A will be used.

7.6 Rolling Outage and Methodology for Long-Term Developing Events.

Rolling outages are a last resort measure for managing severe energy shortages. Under normal conditions, they should not be necessary, but it is prudent to plan for contingencies where they may be required. The General Manager Network, Operations Manager, and Planning Engineer will review the weekly saving target and prepare or modify the plan for the coming week based on the updated saving target required from the Authority.

In general, a daily week-ahead forecast should be provided to the security coordinator at the System Operator and a variation of $\pm 20\%$ in the forecast will need to be notified. The plan will also be forwarded to the retailers for consumer and media notification. Rolling outages will wherever possible disconnect feeders following the priority listed in table 2 in the appendix. The number of feeders and the outage period for every week will depend on the level of saving required to meet the target.

If required historical data for the same period of the previous year will be used to update the energy flows on a feeder by feeder basis for future rolling outage schedules. Both the average daily power flow and the power flow between key times per feeder will be analysed to provide a closer prediction on the coming energy-saving plan as most of the outages will take place during the daytime for health and safety concerns. However, the schedule for processing the outage during the week will be approximate and could vary daily due to the network or System Operator's constraint. Horizon will endeavour to keep rolling outages to any consumer no longer than 4 hours per day for a 5% saving target.

The network has been divided into 7 load groups, A-G.

Load Group	Description	Estimated % load of network	Average MW per hour
A	Rural	6.3%	3.7
B	Rural	6.3%	3.7
C	Mixed rural and urban	7.1%	4.2
D	Mostly urban	15.3%	9.0
E	Higher priority urban, commercial	16.4	9.7
F	Large Industrial	20.3%	12.0
G	Direct Connect Industrial Load	28.3%	16.7
M	Operational Discretion	Varies	Varies

Table 5 Feeder Load Groups

Load groups to achieve each target daily saving are below;

% saving	Load Group	Outage duration per 24 hours	
5%	A,B,C,D	4 hours	Outage duration will be amended depending on industrial outages for groups F and G
10%	A,B,C,D,E	5 hours	
15%	A,B,C,D,E,F	5 hours	
20% or	G	17 hours	
20%	A,B,C,D,E,F	7 hours	
25% or	A,B,C,D,E,F	10 hours	
25%	G	24 hours	

Table 6 Load Groups Estimated Daily Savings

Groups A-E will be rotated for different times during the day. It may be more desirable to have two or shorter outage periods per group per day rather than one longer outage.

Groups F, G will generally be by agreed outage start times and duration.

7.7 Target Monitoring

As part of the monitoring process, Horizon Energy is required to report compliance to the System Operator. The energy-saving against the target from our historical data will be reviewed as a parallel check with our saving feedback from the System Operator. Horizon will review and coordinate the status (increase, decrease, or no change) of rolling outages for the next seven days based on the updated requirement from the System Operator.

Horizon Networks, Network Controllers may use remote-controlled switches to refine their ability to meet the load control requirements.

7.8 Log of Rolling Outages

The Network Controller is required to fill in the rolling outage log sheet, which includes the times of disconnection and reconnection of all feeder interruptions. This will be used to monitor the rolling outage program. The log sheet is shown in Appendix B.

7.9 Contingent Events

If an unplanned event occurs, such as Civil Defence Emergency that could alter the planned rolling outage, the control room will be responsible for communicating with retailers of any changes to the advertised program.

8. COMMUNICATION

The System Operator can contact Horizon Networks using the following details:

Mail Address

Horizon Energy Distribution Ltd.
P.O. Box 281
Whakatane
3158

Physical Address

Level 4 Commerce Plaza
52 Commerce Street
Whakatane
3120

Phone: 07 306 2900
Fax: 07 306 2907

8.1 Shutdown Notification

Horizon Networks will acknowledge receipt of a direction to save energy, as required under Section 6.13 of the System Operator's PROP. The Network Controller will acknowledge that they have received the direction to save energy by return email to the System Operator.

Before implementing the rolling outage plan, Horizon Networks will notify the outages via a public notice, and publish the rolling schedule through local media. The time and extend of advertised outages will be approximate. The retailers will also be advised in advance regarding the pending outages via emails. Horizon Networks will also be in contact with other agencies such as Civil Defence, Local and Regional Councils regarding outages

For immediate events, Horizon is unlikely to be able to notify consumers in advance but would attempt to notify by radio, social media, and the Outage Portal website and phone apps.

Emergency events (AUFLS) outage events will be notified in arrears on Horizon Networks website Outage Portal and Horizon Networks Outage phone app.

8.2 Communication with System Operator

Prior to notifying and implementing a rolling outage plan, Horizon Networks will consult with the System Operator Security Coordinator to establish a process for shedding and restoration.

All communications with the System Operator will be between Horizon's Control Room and Transpower's Regional Operating Centre through normal communication systems (telephone & email)

8.3 Consumer Liaison

For major consumers, with dedicated HV feeder supplies, short-term rolling outages may not be appropriate. As an alternative, longer single outages could be offered if that was easier for them to plan for.

Other consumers are advised to contact their retailer for information on the priority of the feeder they are supplied from and outage times.

8.4 Retailer Agreements

Horizon Energy has no agreements with retailers or consumers on the Horizon network that may adversely affect Horizon Network's ability to comply with System Operator directions, as required under Section 6.10 of the System Operator's PROP.

8.4 Vulnerable Consumers

Retailers maintain lists of consumers with health and safety issues. It is not feasible for Horizon Networks to prevent rolling outages affecting individual vulnerable consumers. During rolling outages, Horizon Energy will notify retailers so that they can in turn notify vulnerable consumers.

8.5 System Operator – Contact Details

Horizon Energy will contact the System Operator for administration purposes (including reporting performance against targets) using the following details:

System Operator
 Ph: 04 590 7000
 22 Boulcott Street
 PO Box 1021
 Wellington 6011

Email: system.operator@transpower.co.nz

RELATED POLICIES, PROCEDURES AND FORMS

REFERENCE	TITLE & DESCRIPTION
393S045	Automatic Under-Frequency Load System Maintenance

10. CONTACT FOR FURTHER INFORMATION

If you have any queries regarding the content of this Standard Operating Procedure or need further clarification, contact the Operations Manager, Horizon Energy Distribution Limited, 07 306 2943 or email: controlroom@horizonnetworks.nz

11. REVISION HISTORY

REVISION	PUBLISH DATE	DESCRIPTION OF CHANGE
1.0	05/07/2017	Changed to Horizon Networks throughout the document – Updated tables
2.0	06/11/2020	Document transferred onto a new template, Section 7.4 and Appendix tables updated
3.0	25/02/2022	Grid emergency actions updated, Section 7.5

12. APPENDIX A – ROLLING FEEDER LOADS AND CUSTOMERS

GXP	Rolling Outages may Occur (Yes / No)	Reasons for there being no rolling outages
EDGEKUMBE	Yes	N/A
KAWERAU	Yes	N/A
WAIOTAHU	Yes	N/A

Automatic Under Frequency and Rolling Outage Groups					
GXP	Zone Substation	Feeder	CB	AUFLS Group	Rolling Outage Group
ANIWHENUA	GALATEA	GALATEA	GL21	2	A
		GOLF ROAD	GL27	1	A
		JOLLY ROAD	GL28	1	B
		MINGINUI	GL23	2	A
		MURUPARA	GL22	NA	D
		DUNN ROAD	KA32	1	D
EDGEKUMBE	KAINGARUA	KA31	KA31	2	E
		ANCHOR2	EB02	NA	M
	EAST BANK	AWARUA	EB01	2	E
		THORNTON	EB04	1	B
		WESTBANK	EB03/PL72	2	D
	KOPE	KING ST	KS14	NA	M
		REX MORPETH	KS12	NA	E
		STRAND NORTH	KS11	NA	E
		STRAND SOUTH	KS15	NA	D
		VICTORIA	KS13	2	C
	OHOPE	HARBOUR	OH79	2	D
		POHUTUKAWA	OH78	NA	E
	PLAINS	AWAITI	PL42	1	C
		AWAKERI	PL52	1	A
		MANAWAHE	PL32	1	B
TE TEKO		PL22	1	C	
STATION RD		ANGLE RD	SR31	2	C
	CITY SOUTH	SR37	2	F	
	MOKORUA	SR29	1	G	
	PIRIPAI	SR38	2	D	
	RUATOKI	SR35	1	A	
	TANEATUA	SR33	1	D	

Automatic Under Frequency and Rolling Outage Groups					
GXP	Zone Substation	Feeder	CB	AUFLS Group	Rolling Outage Group
	WBM		2242+2182	NA	G
KAWERAU	KAWERAU	KAWERAU	2742	NA	E
		KEA FEEDER	2752	NA	E
		ONEPU	2792	NA	F
		PLATEAU	2802	NA	D
		SPENCER	2762	NA	F
		TARAWERA	2842	NA	E
WAIOTAHU	WAIOTAHU	WAIMANA	WT14	1	B
		FACTORY	WT11	NA	F
		HOSPITAL	WT13	2	F
		OPOTIKI	WT12	NA	D
	OPOTIKI	COAST	OP22	2	A
		OTARA	OP29	1	B
TE KAHA	TE KAHA	TE KAHA	TK22	2	B
WAIOTAHU		WAIHAU BAY	TK23	1	A

