

SECURITY OF SUPPLY PARTICIPANT OUTAGE PLAN

Category	Network
Type	Plan
Approved By	General Manager Network & Technology
Last Approved Revision	November 2020
Responsible Officer	Operations Manager
Next Review Date	November 2022

1. PURPOSE

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 the section 9.8 of the regulations, 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 in accordance with 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 a 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 shortage 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 Electricity Authority 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. TERM AND DEFINITIONS

TERM	DEFINITION
AUFLS	Automatic Under Frequency Load Shedding
Feeder	A High voltage supply line typically supplying between 50 and 2000 customers
GEN	Grid emergency notice
GXP	Transpower Grid Exit Point
POP	Participation Outage Plan

TERM	DEFINITION
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
Supply Shortage Declaration	Declaration made by the Electricity commission under regulation 9.

3. BACKGROUND

Part 9 Sub part 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:

- a) All of New Zealand; or
- b) 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:

- a) make and administer the Electricity Industry Participation Code 2010 (Code) governing the New Zealand electricity market;
- b) undertake market-facilitation measures (such as providing education, guidelines, information, and model arrangements) and monitor the operation and effectiveness of market-facilitation measures;
- c) monitor and enforce compliance with the Code, various regulations, and the Act;
- d) proactively monitor the performance of the electricity industry in regard to competition, reliable supply and efficient operation; and
- e) contract service providers to operate the New Zealand electricity system and market in accordance with 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 a number of direct customers and distribution line 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 Authority to declare a supply shortage can be categorized as:

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

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

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

5. HORIZON ENERGY STAFF RESPONSIBILITY

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

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

Transpower 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 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 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 participant in the reserve market. Horizon Networks does not presently participate in this market.

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 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 disconnected load must be in conjunction with the System Operator to prevent overloading the transmission network and further instability. Unless agreed with the System Operator, load shedding and restoration shall be no more than 25 MW per five minutes. Horizon'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 all water heating load from the network and disconnect the load as per the emergency load shedding feeders listed in the Appendix.

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

6.6 Electricity Authority Declarations

For some immediate events, the Electricity Authority 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 6.

7. ACTIONS FOR DEVELOPING EVENTS

If the Authority requests through the System Operator a load reduction for a planned developing event, Horizon Energy would reduce supply to meet the Authority's 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 Authority. In general, water heating load shedding is not a practical choice for these category events.

7.1 Declaration of Developing Event

The Authority will endeavour to provide 9 days prior notice of the requirement for weekly energy savings and any 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 Authority would need to request through the System Operator that 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 Authority 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 the natural disaster. It is possible that a grid emergency will 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 are able to 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 is 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

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 which 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 percent. 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 principals 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 is balanced against less 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 to 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 During Developing Event

If the System Operator declares an emergency during a developing event, the grid emergency will take priority. Horizon Networks would normally have the water heating load available for load reduction when required for the grid emergency. If water heating load is insufficient, further load disconnection will be carried out as per the emergency load shedding feeders listed in Appendix A. Once the grid emergency is over, the rolling outage plan will continue.

In general, a Grid Emergency will prevail in both a developing and an immediate Event.

7.6 Rolling Outage Strategy and Methodology

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 network manager, operations manager and planning engineer will review 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 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 outage will take place during the daytime for health and safety concerns. However, the time 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	Industrial	20.3%	12.0
G	Whakatane Mill(SIG Whakatane)	28.3%	16.7
M	Operational Discretion	Varies	Varies

Load groups to achieve each target saving are below;

% saving	Load Group	Outage duration per day	
5%	A,B,C,D	4 hours	Outage durations 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	

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

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

7.7 Target Monitoring

As part of the monitoring process Horizon Energy is required to report compliance to the Authority, as well as reporting 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 Authority through 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 Authority.

Horizon Networks staff may use remote controlled switches to refine their ability to meet the load control requirements.

7.8 Log of Rolling Outages

The control room 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 Electricity Authority can contact Horizon Networks using the following details:

Network Operations Manager
 Horizon Energy Distribution Ltd.
 Level 4, Commerce Plaza, 52 Commerce Street
 P.O. Box 281, Whakatane 3158
 Phone: 07 306 2965
 Fax: 07 306 2907

8.1 Shutdown Notification

Prior to implementing a rolling outage plan, Horizon Networks will notify the outages via 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

8.2 Communication with System Operator

All communications with the System Operator will be between Horizon’s Control Room and Transpower’s Regional Operating Centre through telephone or normal communication systems.

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 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 Communication with the Authority

Horizon Energy will contact the Authority for administration and reporting purpose using the following details:

Electricity Authority
 Level 7, ASB Bank Tower, 2 Hunter Street
 P.O. Box 10041, Wellington
 Phone: 04 460 8860
 Fax: 04 460 8879

9. RELATED POLICIES, PROCEDURES AND FORMS

List any relevant Policies, Procedures, Guidelines, Codes of Practice, Statutes, Legislation or other documents that users should consider in relation to this Policy.

REFERENCE	TITLE & DESCRIPTION

10. CONTACT FOR FURTHER INFORMATION

If you have any queries regarding the content of this Policy or need further clarification, contact the Operations Manager, 073062943 or email: shane.piaray@horizonnetworks.nz

11. REVISION HISTORY

REVISION	PUBLISH DATE	DESCRIPTION OF CHANGE
1	05/07/2017	Changed to Horizon Networks throughout document - Updated Tables
2	06/11/2020	Section 7.4 and Appendix tables updated

12. APPENDIX A – ROLLING-FEEDER LOADS AND CUSTOMER

Automatic Under Frequency and Rolling Outage Groups					
GXP	Zone Substation	Feeder	CB	AUFLS Group	Rolling Outage Group
ANIWHENUA	GALATEA	GALATEA	GL21	1	A
		GOLF ROAD	GL27	1	A
		JOLLY ROAD	GL28	1	B
		MINGINUI	GL23	2	A
		MURUPARA	GL22	NA	D
KAINGAROA	DUNN ROAD	KA32	KA32	2	D
		KM31	KA31	1	E
		ANCHOR2	EB02	NA	M
EDGEKUMBE	EAST BANK	AWAROA	EB01	2	E
		THORNTON	EB04	1	B
		WESTBANK	EB03/PL72	NA	D
		KOPE	KING ST	KS14	NA
		REX MORPETH	KS12	NA	E
		STRAND NORTH	KS11	NA	E
		STRAND SOUTH	KS15	2	D
		VICTORIA	KS13	2	C
		OHOPE	HARBOUR	OH79	2
		POHUTUKAWA	OH78	NA	E
		PLAINS	AWAITI	PL42	1
		AWAKERI	PL52	1	A
		AWAKERI	PL52	1	A
		MANAWAHE	PL32	2	B
		TE TEKO	PL22	1	C

Automatic Under Frequency and Rolling Outage Groups					
GXP	Zone Substation	Feeder	CB	AUFLS Group	Rolling Outage Group
	STATION RD	ANGLE RD	SR31	2	C
		CITY SOUTH	SR37	2	F
		MOKOROA	SR29	NA	G
		PIRIPAI	SR38	2	D
		RUATOKI	SR35	1	A
		TANEATUA	SR33	1	D
	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	NA	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

