Status – Final
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Version 9.0

Security of Supply Participant Rolling Outage Plan

1 PURPOSE

This plan has been developed to comply with the System Operator Rolling Outage Plan (SOROP).

Only in the event of major generation shortages and/or significant transmission constraints will this plan be implemented.

This plan outlines how:

- the event is declared
- the System Operator communicates its requests
- rolling outages will be used to implement energy saving measures:
  - how these are structured
  - how these are implemented

2 DEFINITIONS

AUFLS	Automatic Under Frequency Load Shedding
EA	Electricity Authority
PROP	Participant Rolling Outage Plan (this plan)
Regulations	Electricity Industry Participation Code
SOROP	System Operator Rolling Outage Plan
System Operator	Operator of the national electricity grid
GEN	GRID EMERGENCY NOTICE

3 BACKGROUND

3.1 Electricity Authority

The Electricity Authority is a Crown entity set up under the Electricity Act to oversee New Zealand's electricity industry and markets.

A function of the System Operator under the Electricity Act is to use reasonable endeavours to ensure the security of electricity supply.

The System Operator's activities include forecasting supply and demand, developing and publishing guideline hydro levels for security of supply, contracting for reserve energy.

3.2 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 transports bulk electricity from where it is generated to distribution line companies such as Electra.

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.

3.3 Electra

Electra is the electricity network company that owns and maintains the electricity lines and cables that deliver power from Paekakariki in the Kapiti Coast through to Tokomaru in the Horowhenua region.

Electra's network interfaces with Transpower at Mangahao (MHO), and Paraparaumu (PRM).

GXP	Rolling outages may occur (Yes/No)	Reason for there being no rolling outages
MHO	Yes	N/A
PRM	Yes	N/A

Table 1: Electra interface with Transpower GXP sites

4 RANGE OF EVENTS

Events that could lead the System Operator to make a supply shortage declaration, and therefore lead Electra to implement rolling outages, can in general terms be categorised as:

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

4.1 Major incident

A Supply Shortage Declaration will be classed by Electra as a major incident and Electra's network management team will activate the Major Network Event Guideline Document (PC Docs # 47664) to manage the incident accordingly.

5 ELECTRA STAFF RESPONSIBILITIES

Role	Electra Personnel
Receive notification of declaration of supply shortage from the system operator.	Network Operations Manager
Receive notification of declaration of supply shortage from the System Operator.	Control Room Operator
Implement this plan	Control Room Supervisor
Weekly savings report	Network Planning Manager
Revoking rolling outage	Network Operations Manager
Reporting to System Operator	Network Operations Manager
Reporting to media, public agencies	General Manager Customer and Sustainability
Reporting to Civil Defence and Lifelines	General Manager Customer and Sustainability

Table 2: Electra staff responsibilities

6 COMMUNICATION WITH THE SYSTEM OPERATOR

The System Operator can contact Electra using the following:

Control Room (24/7)

Phone: +64 6 367 9755

Email: controlcentre@electra.co.nz (email distribution list)

Control Room Supervisor: Matt Jack

Phone: +64 27 444 6767

Email: matt.jack@electra.co.nz

Network Operations Manager: Ross Fitzgibbon

Phone: +64 27 379 6101

Email: ross.fitzgibbon@electra.co.nz

Postal: Electra Limited
25 Bristol Street
PO Box 244
Levin 5540

System Operator: +64 4 590 7000

7 ACTIONS FOR IMMEDIATE EVENTS

7.1 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 an immediate event electricity consumption can be reduced by disconnecting customers (see Section 7.2).

7.2 Disconnecting Customers

7.2.1 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.

The System Operator requires a four-block AUFLS scheme with the following configuration:

- Block 1: 10% of total load
- Block 2: 10% of total load
- Block 3: 6% of total load
- Block 4 & Rate of Change of Frequency function (ROCOF): 6% of total load (combined)

7.2.2 Electra's 4 Block AUFLS Scheme

Electra has a scheme allocation exceeding the System Operator's minimum requirements, documented in the following resources:

- Main Analysis - AUFLS Feeder Configuration Electra LTD stored in the Secondary Systems Management Platform.
- PC Docs # 50775

Electra's scheme is configured as follows:

- Block 1: 13.28% of total load
- Block 2: 12.75% of total load
- Block 3: 7.51% of total load
- Block 4 & ROCOF: 8.73% of total load (combined)

7.2.3 Manual Shedding

Under certain situations the System Operator may request Electra to manually shed load. Under the Electricity Industry Participation Code, Electra must comply with this request.

7.2.4 Interruptible load for instantaneous reserves

Electra no longer provide interruptible load for instantaneous reserves market. Historically load provided was based on average Summertime hot water heating load (Controlled)

GXP	Percentage of average annual demand available for interruptible Load
MHO	5% [1]
PRM	5%

Table 3: Historic interruptible load

Once the frequency has stabilised, the System Operator will advise EDBs when load can be restored.

[1] *IL is scheduled to be available except for between 07:30-10:00 and 17:30-21:00 daily*

7.3 Supply Disconnection and Restoration

Restoration of disconnected load must be restored in conjunction with the System Operator. This is to prevent overloading the transmission grid and/or creating further instability. Unless agreed with the System Operator, load shedding and restoration shall be no more than 25MW per 5 minutes.

Electra will use best endeavours to minimise impact on frequency and voltage stability and, where possible, minimise the disconnection and restoration of demand during times where demand is typically ramping up or down in the region affected by the supply shortage.

The Electra DDA and previous UoSA agreement with Retailers, states that Electra may disconnect/shed load in order to maintain security and/or stability of the Electra network or as directed by the System Operator.

7.4 Transmission Grid Emergency

The System Operator may request Electra to reduce load under a grid emergency notice (GEN). If load shedding is needed the System Operator will instruct Electra to shed load.

8 DEVELOPING EVENTS

If the System Operator requests a load reduction for a Developing Event, Electra would reduce demand to meet the System Operator targets. The targets are expected to be a weekly energy savings target that is reviewed each week. To reduce energy usage, Electra would disconnect HV feeders (rolling outages) in a controlled manner to enable targets to be met. There are financial penalties for not meeting the targets specified by the System Operator. The shedding of water heating load is not a viable option for energy savings as this only defers usage and would not save energy.

9 DECLARATION OF A DEVELOPING EVENT

Following on from a supply shortage declaration from the System Operator, the System Operator would make a request for savings. The System Operator will specify the energy savings target to be enforced for a specific region for a specified timeframe.

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

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

10 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 feeders to be included in rolling outages, as indicated by the System Operator.

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, and major port.

Priority	Priority Concern	Maintain Supply to:
3	Public health and safety	Minor hospitals, medical centres, schools and street lighting.
4	Food production	Dairy farms and milk production facilities. Key Supermarkets
5	Domestic production	Commercial and industrial premises.
6	Disruption to consumers	Residential premises.

Table 4: Priority Ranking for Feeders

These priorities are intended as guidelines. As rolling outages will be implemented on a feeder-by-feeder basis, it is not possible to discriminate between individual consumers on the same feeder. This is the case for many of Electra's feeders and as an example, a largely residential feeder may also have sewerage and water pumping stations.

11 AUFLS UNDER ROLLING OUTAGES

Predominantly the same criteria for rolling outages as shown in Table 2, are also used to select the feeders for AUFLS tripping. Consequently, AUFLS load blocks are predominantly from lower priority load categories, however, some higher priority consumers will also be affected.

The level of AUFLS during rolling outages needs to be maintained. Electra intends to use AUFLS feeders to the extent possible to reduce load, while meeting AUFLS requirements.

12 SHUTDOWN NOTIFICATIONS

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

- Public Notices - Electra will place public notice advertisements providing a rolling outage timetable showing the times and approximate geographical areas affected by rolling outages. Depending on notice period provided by the System Operator this will include notices within local newspapers, Beach FM Radio station, Facebook and Electra's mobile app.
- Electra Website - A dedicated website page will be set up to show the rolling outage timetable and giving approximate geographical locations for where the outages will affect.
- Retailer Notification - Electra will provide the rolling outage timetable to all electricity retailers and approximate geographical locations for where the outages will affect.

Where possible, Electra will provide seven days' notice of all rolling outage plans dependent upon notice from the System Operator. Consumers that are noted by the Retailer as being medically dependent will receive a communication from Electra advising them of the outage and to invoke their individual medical response plan. If notice is provided by the System Operator more than seven days in advance, Electra will advise Capital and Costal DHB and Mid Central DHB of the planned rolling outages.

13 COMMUNICATION WITH SYSTEM OPERATOR

Formal operational verbal/phone communications with the System Operator should be directed to the Transpower National Co-ordination Centre using normal communications methods.

Prior to notifying and implementing a rolling outage plan, Electra 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.

Electra will acknowledge receipt of any direction to save energy via return email to the system operator.

14 GRID EMERGENCY DURING AN IMMEDIATE OR DEVELOPING EVENT

If the System Operator declares a grid emergency during either an Immediate or a Developing Event, the grid emergency will take priority. As water heating load generally would not be used to reduce load in a Developing Event, Electra would have water heating load available for load reduction for the grid emergency. If water heating load is insufficient, the rolling outage feeders may have to be rearranged to comply with the grid emergency. After the grid emergency is over, the rolling outages pattern would continue.

15 ROLLING OUTAGES STRATEGY AND METHODOLOGY

The Network Operations Manager and Network Planning and Development Manager, together with the Control Centre Supervisor will review weekly targets and prepare plans for weekly rolling outages based on savings required. The plans will be forwarded to the retailers for consumer and media notification by the General Manager Customer and Sustainability. Rolling outages will wherever possible disconnect feeders using the priorities listed in Table 10

Planned energy savings will be based upon network usage for the same period last year.

15.1 Target Monitoring

For load shedding to a weekly target, the Control Room Supervisor will monitor energy savings against the target and, together with the General Manager Network Service Delivery, review future load shedding to increase or decrease the number of rolling outages to enable the weekly target to be met. Control Room Supervisor will be responsible for daily and weekly reporting of consumption relative to target levels. Electra is required to report compliance to the Commission, as well as daily reporting to the System Operator.

15.2 Log of Rolling Outages

The Control Room Supervisor will record times of disconnection and reconnection of all feeder interruptions in the Control Room log book. This will be used to monitor the rolling outage program.

15.3 Rolling Outages

When the System Operator declares a supply shortage and instructs the Electra Control Room Supervisor to reduce demand, rolling outages will be instigated as outlined in this document.

The Control Room Supervisor will ensure that load shedding schedules are prepared, system control rosters are adjusted as required, and load is controlled and monitored to meet desired targets. Schedules of estimated load shedding, restoration times and quantities are to be forwarded to the Security Coordinator seven days before the planned outage. If +/- 20% variation is noticed or expected from the schedules provided to the Security Coordinator, then Electra shall advise the Security Coordinator of this change.

Electra will make all endeavours to comply with the priorities set in Table 2 as a means of selecting feeders for rolling outages. Electra will endeavour to keep rolling outages to any

consumer no longer than four hours continuous per day for a 5% savings target. For savings more than 5%, longer and more frequent outages might be necessary.

Outages will be programmed between 0700 and 1900 on all days. Nighttime is excluded from the cut period for safety reasons. Electra will attempt to minimise the economic affects by scheduling outages for the mid-afternoon in the first instance.

Timing of the outages will be approximate and could vary daily due to network or System Operator constraints.

15.3.1 Feeder Selection

Feeders to be disconnected are set out in Electra's schedule of feeders for rolling outages. Because of AUFLS obligations and changes in network configuration, this schedule will change from time to time. The number of feeders chosen for any one day and week will depend upon the savings required to meet the target. Given that the actual section of feeders during any outage will most likely diverge from this plan due to operational considerations, the schedule of feeders is not made publicly available to avoid any confusion regarding which feeders are to be disconnected.

The available system winter energy associated with consumer priority groups has been identified. Analysis has been conducted on these groups to achieve savings in winter system energy (AUFLS feeders excluded) to achieve savings of 5, 10, 15, 20 and 25% of the total load. The outages required are shown in the respective tables that follow. It is to be noted that for a saving of 25%, Electra would need to turn off power to all non-AUFLS feeders between the hours of 0700 and 1900 to achieve the required savings. In such an instance it is likely that Electra would make enquiries to the System Operator to request the use of some of the AUFLS feeders in this instance.

Consumer Group Priority	Maximum Duration (hours)	Days per Week (based on 7-day week)	% System Winter Energy	Expected Energy Savings
1	1	7	5.92%	0.25%
2	2	7	12.47%	1.04%
3	2	7	14.39%	1.20%
4	3	7	10.38%	1.30%
5	3	7	2.59%	0.32%
6	3	7	7.11%	0.89%
Total				**5.00%**

Table 5: Feeder Outage Requirements for 5% Energy Savings.

Consumer Group Priority	Maximum Duration (hours)	Days per Week (based on 7-day week)	% System Winter Energy	Expected Energy Savings
1	3	7	5.92%	0.74%
2	4	7	12.47%	2.08%
3	5	7	14.39%	3.00%
4	5	7	10.38%	2.16%
5	5	7	2.59%	0.54%
6	5	7	7.11%	1.48%
Total				**10.00%**

Table 6: Feeder Outage Requirements for 10% Energy Savings.

Consumer Group Priority	Maximum Duration (hours)	Days per Week (based on 7 day week)	% System Winter Energy	Expected Energy Savings
1	6	7	5.92%	1.48%
2	6	7	12.47%	3.12%
3	7	7	14.39%	4.20%
4	7	7	10.38%	3.03%
5	8	7	2.59%	0.86%
6	8	7	7.11%	2.37%
Total				**15.06%**

Table 7: Feeder Outage Requirements for 15% Energy Savings.

Consumer Group Priority	Maximum Duration (hours)	Days per Week (based on 7 day week)	% System Winter Energy	Expected Energy Savings
1	9	7	5.92%	2.22%
2	9	7	12.47%	4.68%
3	9	7	14.39%	5.40%
4	9	7	10.38%	3.89%
5	9	7	2.59%	0.97%
6	10	7	7.11%	2.96%
Total				**20.12%**

Table 8:Feeder Outage Requirements for 20% Energy Savings

Consumer Group Priority	Maximum Duration (hours)	Days per Week (based on 7 day week)	% System Winter Energy	Expected Energy Savings
1	11	7	5.92%	2.72%
2	11	7	12.47%	5.72%
3	11	7	14.39%	6.60%
4	12	7	10.38%	5.19%
5	12	7	2.59%	1.29%
6	12	7	7.11%	3.56%
Total				**25.07%**

Table 9: Feeder Outage Requirements for 25% Energy Savings.

15.3.2 Rolling Outage Feeder Selection

This table has been developed for use with the SOROP, both MHO and PRM GXPs are contained within the table. It details the non-AUFLS feeders that will be used when rolling outages are required.

Electra presently has made four blocks of 32% of feeders available for AUFULs purposes.

Electra is served by two GXPs MHO and PRM. Feeders fed by the MHO GXP are shaded in green and feeders fed from PRM are shaded in blue.

Priority	Feeder Name							
1	E154	L352						
2	652	E153	L349	V313	V319	Z166	612	
3	622	E148	E150	G308	V311	662	L348	
4	G310	Z165	Z209	Z211	C2	129	149	
5	E156							
6	Z167	405	682	L350				

Table 10: GXP Feeders

This table originates from document #51922.

16 DOCUMENT REVIEW HISTORY

Version Number	Reviewed By.	Review Date	Reason
1	Ruthe	16/6/2010	Two year resubmit
2	Baden B	08/12/2014	
3	Phil C	22/5/2015	Changes for two year resubmit
4	Baden B	08/06/2017	Added email address, updated Paraparaumu feeder names, edited CE title
5	Mike Myhill	24/8/2021	Content revised, including contact details
6	Matt Jack	22/05/2023	Content revised
7	Matt Jack	04/10/2023	Transpower Amendments
8	Thomas de Klerk Matt Jack	19/4/2024	Updated AUFLS Block scheme Changed Network Planning and Development Manager to GM – Lines Business Content revised
9	SOPROP Steering Committee	15/01/2026	Updated feeder Selection. Updated Contact details and Responsibilities Updated IR market participation Content revised