



Security of Supply Participant Outage Plan

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1 Purpose

This plan has been developed in order to comply with the Electricity Commission's Security of Supply Outage Plan (SOSOP).

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 Electricity Commission 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
Commission	Electricity Commission
POP	Participant Outage Plan (this plan)
Regulations	Electricity Governance (Security of Supply) Regulations 2008 and subsequent amendments
SOSOP	Security of Supply Outage Plan
System Operator	Operator of the national electricity grid
GEN	Grid Emergency Notice

3 Background

3.1 Electricity Commission

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

A function of the Electricity Commission under the Electricity Act is to use reasonable endeavours to ensure the security of electricity supply. The Commission's

activities include forecasting supply and demand, developing and publishing guideline hydro levels for security of supply, contracting for reserve energy, and improving the ability of consumers to manage price risks in the market.

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

4 Range of Events

Events that could lead the Commission 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 now warning, usually as a result 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.

Communication with retailers, civil defence and other stakeholders will be as per notification procedures also described in Electra's Major Network Event Guideline Document (PC Docs # 47664).

5 Electra Staff Responsibilities

Role	Electra Personnel
Receive communication from Commission	CEO or General Manager Commercial
Receive communication from System Operator	Control Centre Operator
Implement this plan	Operations Manager
Weekly savings report	System Analyst Engineer
Revoking rolling outages	General Manager Commercial
Reporting to Electricity Commission	General Manager Commercial
Reporting to media, public agencies	General Manager Commercial
Reporting to Civil Defence and Lifelines	Operations Manager

Table 1: Electra Staff Responsibilities.

6 Communication with the Commission

The Commission can contact Electra using the following details:

Electra Limited
FAX 06 367 0155
PH 06 367 9755
P.O. Box 244
Corner of Bristol and Exeter Streets
Levin 5540

Electra will contact the Commission's Emergency Response Project Manager for administration service purposes (including reporting performance against targets) using the following details:

Electricity Commission
FAX 04 460 8879
PH 04 460 8860
P.O.Box 10041

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 next section).

7.2 Disconnecting Customers

7.2.1.1 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.

Each distribution network company must unless exempted have available at all times two blocks of load each of 16% or more of its total load to be shed by automatic under frequency relays. Electra has two blocks of approximately 20% of its total load available to the System Operator for AUFLS requirements.

7.2.1.2 AUFLS Zone 1

If system frequency fails to recover after Reserve Market load shed, AUFLS Zone 1 shedding will occur by disconnecting customers supply. This will automatically

disconnect approximately 20% of Electra's connected load as detailed in AUFLS Data Updated September 2009 (PC Docs # 50775).

7.2.1.3 AUFLS Zone 2

If a Zone 1 tripping fails to restore frequency, the next stage, Zone 2 activates. This will disconnect a further approximate 20% of Electra's connected load as detailed in AUFLS Data Updated September 2009 (PC Docs # 50775).

7.2.1.4 Manual Shedding

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

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

7.3 Supply 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.

7.4 Transmission Grid Emergency

The System Operator may request Electra to reduce load under a grid emergency notice (GEN). Electra will shed all controllable load (water heating). The System Operator will be advised and, if more load shedding is needed the System Operator will instruct Electra to shed load.

8 Developing Events

If the Commission requests (through the System Operator) a load reduction for a planned Developing Event, Electra would reduce demand to meet the Commission's 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 Commission. 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 Commission, the Commission would make a request through the System Operator for savings. The System Operator will specify the energy savings target to be enforced for a specific region for a specified time-frame.

The Commission 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 Commission 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.

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

Table 2: 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 trippings. 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 Notification

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.

- Electra Website
 - A dedicated website page will be set up which shows the rolling outage timetable and gives 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 Electricity Commission/System Operator.

13 Communication with System Operator

All communications with the System Operator will be between Electra's Control Centre and Transpower's Regional Operating Centre.

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.

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 General Manager Commercial and Operations Manager, together with the Control Centre Operator 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. Rolling outages will wherever possible disconnect feeders using the priorities listed in Table 2.

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 Operations Manager will monitor energy savings against the target and, together with the General Manager Commercial, review future load shedding to increase or decrease the amount of rolling outages to

enable the weekly target to be met. General Manager Commercial 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 Centre Operator will log times of disconnection and reconnection of all feeder interruptions. 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 Centre Operator to reduce demand, rolling outages will be instigated as outlined in this document.

The Control Centre Operator 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 will be necessary.

Outages will be programmed between 0800 and 1800 on all days. Night time 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 in order 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) in order 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 0800 and 1800 in order 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			0.0%	0.0%
2			13.8%	0.0%
3			0.0%	0.0%
4			13.4%	0.0%
5	4	7	18.2%	3.0%
6	4	7	13.7%	2.3%
Total				5.32%

Table 3: 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			0.0%	0.0%
2			13.8%	0.0%
3			0.0%	0.0%
4	2	7	13.4%	1.1%
5	6	7	18.2%	4.5%
6	8	7	13.7%	4.6%
Total				10.24%

Table 4: 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			0.0%	0.0%
2			13.8%	0.0%
3			0.0%	0.0%
4	5	7	13.4%	2.8%
5	9	7	18.2%	6.8%
6	10	7	13.7%	5.7%
Total				15.32%

Table 5: 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			0.0%	0.0%
2	4	7	13.8%	2.3%
3			0.0%	0.0%
4	8	7	13.4%	4.5%
5	10	7	18.2%	7.6%
6	10	7	13.7%	5.7%
Total				20.05%

Table 6: 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			0.0%	0.0%
2	10	7	13.8%	5.7%
3			0.0%	0.0%
4	10	7	13.4%	5.6%
5	10	7	18.2%	7.6%
6	10	7	13.7%	5.7%
Total				24.60%

Table 7: Feeder Outage Requirements for 25% Energy Savings.

Rolling Outage Feeder Selection

This table has been developed for use with the SOSOP

It details the non-AUFUL feeders that will be used when rolling outages are required.

Electra presently has given two blocks of 20-25% of feeders away for AUFULs purposes.

Priority	Feeder											
1												
2	C1	129	652	V106	V107	E150	E153	Z167	L349	L350	L351	
3												
4	C4	C2	119	E148	G308	L352						
5	C3- C59	406	622	662	V101	V103	E154	E156	G306	Z165	Z166	L348
6	405	632	672	V109	Z209	Z210	Z212					

This table originates from document #51922