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<b>SECURITY OF SUPPLY - PARTICIPANT OUTAGE PLAN</b>		

## 1 PURPOSE OF THIS DOCUMENT

This plan was written to comply with Electricity Commission's Security of Supply Outage Plan (SOSOP).

Under the regulations, participant outage plans (POP) are required to specify the actions that would be taken to reduce the consumption of electricity to:

- reduce electricity consumption when a supply shortage is declared by the Electricity Commission;
- comply with requirements of the Electricity Commission's Security of Supply Outage Plan (SOSOP);
- comply with Electricity Governance (Security of Supply) Regulations 2008 and subsequent amendments; and
- supplement the Electricity Commission's Security of Supply Outage Plan.

Reducing demand by disconnecting supply to consumers would be a last resort after all other forms of savings, including voluntary savings, had been employed. Aurora will always endeavour to keep consumers supplied. Aurora will only disconnect consumers when directed to by the Electricity Commission.

The procedures outlined are in response to major generation shortages including dry year scenarios. How an event is declared and how the Electricity Commission 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 DEFINITIONS

<b>AUFLS</b>	Automatic Under Frequency Load Shedding.
<b>Commission</b>	Electricity Commission.
<b>EDN</b>	Electrical Distribution Network.
<b>Electricity Act</b>	Electricity Act 1992 and subsequent amendments.
<b>Feeder</b>	A high voltage circuit typically supplying up to 2000 consumers.
<b>GXP</b>	Transpower Grid Exit Point.
<b>GEN</b>	Grid Emergency Notice.
<b>POP</b>	Participant Outage Plan (this plan).

<b>Regulations</b>	Electricity Governance (Security of Supply) Regulations 2008 and subsequent amendments.
<b>Retailers</b>	Electricity Retail Companies.
<b>Rolling Outages or Rolling Cuts</b>	Planned electricity disconnections spread over different parts of the network at differing times to avoid prolonged outages at any one location.
<b>Security Coordinator</b>	Person responsible for System Security at the System Operator
<b>SOSOP</b>	Security of Supply Outage Plan (Electricity Commission).
<b>Supply Shortage Declaration</b>	Declaration made by the Electricity Commission under regulation 9.
<b>System Operator</b>	Operator of the national electricity transmission grid.

## 2.1 Associated Quality Procedures

<b>QP1601-18</b>	Notification of Outages.
<b>QP1601-34</b>	Advice to Media re Outages.
<b>QP1602-22</b>	Emergency Load Shedding and Restoration.
<b>QP1602-59</b>	POP Feeder Schedules.

## 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, which owns and operates New Zealand's National Grid - the network of high voltage transmission lines and substations that transports electricity from where it is generated to distribution line companies, such as Aurora.

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 Aurora

Aurora Energy is the electricity network company that owns and maintains the electricity lines, cables and substations that deliver electricity to consumers in the Dunedin and Central Otago regions.

## 4 SUPPLY AND DEMAND

Transpower, as the System Operator, controls the transmission network to match generation with consumer demand. Constraints on the ability to manage this may be caused by:

- low lake levels reducing hydro generation;
- failure of a large generator; and
- a fault on critical transmission circuit.

The first two causes above could lead to an energy shortage, while the third could lead to a shortage of transmission capacity.

### 4.1 Load Reduction by Aurora

Aurora has some ability to reduce load by turning off domestic water heaters via ripple control in the Dunedin and Central Otago regions. Further load reductions would require disconnecting consumers.

### 4.2 Range of Events

Events that could lead the Commission to make a supply shortage declaration can in general terms be categorised as;

**Developing (Category A) Event:** Events that evolve over time, for example low hydro lake levels.

**Immediate (Category B) Event:** Events that occur with little or no warning, usually as a result of a transmission line or major generation failure.

### 4.3 Significant Incident

A Category A or Category B event will be classed by Aurora as a significant incident and the Network Services Manager will assemble a team of senior managers and staff to manage the incident.

Communication with retailers, will be as per normal notification procedures described in "[Advice to Media re Outage](#)" QP1601-34.

Local Authorities, civil defence and other stakeholders will be notified of significant events by the Engineering Services Manager.

## **5 ACTIONS FOR IMMEDIATE (CATEGORY B) EVENTS**

Transpower, as 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 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 complete failure of the electricity network.

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 the load. Automatic load shedding groups reduce load in stages until the frequency stabilises.

### **5.1 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. Aurora does not presently participate in this market.

### **5.2 Disconnecting Customers**

#### **5.2.1 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.

Each distribution network company must have available at all times two blocks of load, each of 16% of its total load to be shed by automatic under frequency relays. In the South Island Transpower has installed these relays on selected 33kV feeders at the GXPs and the total load at the selected Aurora zone substations is disconnected by Transpower.

#### **5.2.2 AUFLS Zone 1**

If system frequency fails to recover after Reserve market load shed, AUFLS Zone 1 shedding by Transpower will occur. This will disconnect up to 16% of Aurora's load by disconnecting customers supply.

#### **5.2.3 AUFLS Zone 2**

If zone 1 tripping fails to restore frequency, the next stage, zone 2 activates. Transpower would disconnect a further 16% of Aurora's load.

#### **5.2.4 Manual Load Shedding**

If AUFLS Zone 1 and Zone 2 tripping fails to stabilise frequency the System Operator will shed more load. Once the frequency has stabilised the System Operator will advise the Aurora System Control when load can be restored.

### 5.3 Supply Restoration

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

### 5.4 Electricity Commission Declaration

For some immediate events, the Electricity Commission may declare 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.

### 5.5 Transmission Grid Emergency

The System Operator may request Aurora to reduce load under a grid emergency notice (GEN). Aurora would commence with shedding water heating load and then if necessary shed feeders as per [Emergency Load Shedding & Restoration procedure QP1602-22](#).

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

## 6 DEVELOPING (CATEGORY A) EVENTS

If the Commission requests through the System Operator a load reduction for a planned Category A event, Aurora 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 Aurora would disconnect HV feeders (rolling outages) in a controlled manner to enable targets to be reached. 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.

### 6.1 Declaration of Category A Event

The Commission will endeavour to provide nine days prior notice of the requirement for weekly energy savings. It is Aurora's plan to use the standard planned outage notification procedure to retailers as detailed in ["Notification of Outages" QP1601-18](#). Any increase in the weekly energy savings target would also need nine days prior notice.

To declare a Category A event, the Commission would need to request through the System Operator that a specific weekly energy savings target was to be enforced for a specific region for a specified time-frame. A notification system similar to the GEN procedure would be appropriate.

The Commission is responsible for general media advertising of the need to conserve electricity and the impending rolling outages when they are requested.

## 6.2 Criteria for Rolling Outages

To ensure public health and safety is preserved and costs to 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 1 - Priority Loads**

These priorities are intended as guidelines, and because rolling outages will be implemented on a feeder by feeder basis, it is not possible to discriminate between individual consumers on the same feeder. For example, a predominantly residential feeder may also have small pockets of commercial or industrial consumers.

## 6.3 AUFLS Criteria

Currently, the same criteria for rolling outages as shown in Table 1 are also used to select 33kV feeders (zone substations) for AUFLS tripping. Thus, AUFLS load blocks are predominantly from lower priority load categories however some higher priority consumers would also be affected.

For system security reasons, AUFLS blocks are excluded from rolling outages. An exemption for AUFLS blocks may be available but notice is only likely to be advised several hours before the commencement of rolling outages. The short notice would make AUFLS exemption unusable, as it would be too late to amend the publicly available outage schedule and so AUFLS exemption will not be considered. Aurora may include some AUFLS feeders in rolling outages as rolling outages will reduce network demand and thus reduce the quantum (MW) of load required to be maintained for AUFLS.

To minimise the effect of AUFLS exclusion during rolling outages, it is proposed to shift the AUFLS to high priority zone substations. When a Category A event is declared, then Transpower will be requested to change the AUFLS blocks to alternative feeders as detailed in [Emergency Load Shedding & Restoration procedure QP1602-22](#). It is considered prudent to expose high priority consumers to a low probability short term event, such as AUFLS, rather than have them included in rolling outages.

#### 6.4 Shutdown Notification

When requested to reduce demand with rolling outages, Aurora plans to use the planned outage procedure as per [“Notification of Outages” QP1601-18](#), to advise retailers in advance, of pending outages. The time and extent of advertised outages will be approximate.

#### 6.5 Vulnerable consumers and Priority Sites

Aurora will endeavour to give retailers as much advance notice as possible of pending rolling outages to enable them to notify vulnerable consumers.

#### 6.6 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, Aurora would have the water heating load available for load reduction when required 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.

#### 6.7 Supply Restoration

Disconnected load must be restored in conjunction with the System Operator. This is to prevent overloading the transmission network and creating instability. The System Operator has advised that load changes of less than 25 MW in any five minutes may be implemented by a network without their prior approval.

#### 6.8 Communication

Aurora will keep media and consumers informed of planned interruptions to supply before and during the outages. Media will be informed as per Aurora’s standard communications procedure, and the retailers will be responsible for consumer notification.

##### 6.8.1 Communication with System Operator

All communications with the System Operator will be using Transpower’s TPSN telephone in Dunedin and via Telecom’s PSTN in Central. The main point of communication with the System Operator will be via the Regional Operating Centre (South).

Prior to notifying and implementing rolling outages, Aurora will consult with the Security Coordinator to establish a process for load shedding and restoration.

#### 6.9 DELTA Staff Responsibilities

<b>Role</b>	<b>DELTA Person Responsible</b>
Receive communication from Commission	Network Services Manager
Receive communication from System Operator	System Control Managers
Implement this plan	Network Services Manager
Weekly savings reporting	Network Analyst

<b>Role</b>	<b>DELTA Person Responsible</b>
Retailer notification	System Control Managers
Revoking rolling outages	Network Services Manager
Reporting to Electricity Commission	Network Services Manager
Reporting to media, public agencies	Engineering Services Manager

**Table 2- DELTA Staff Responsibilities**

Within one day of declaration of a Category A event, the Network Services Manager will notify the Commission of the updated contact details including telephone numbers and email address for each of the positions named in Table 2. Contact details for the Network Services Manager are, address - DELTA, P O Box 1404, Dunedin, phone (03) 479 6669, or fax (03) 477 5771.

#### 6.10 Rolling Outages Strategy and Methodology

The Network Services Manager and the Engineering Services Manager together with the System Control Managers 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 priority listed in Table 1.

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

#### 6.11 Target Monitoring

For load shedding to a weekly target, the Network Analyst will monitor energy savings against target and, together with the Network Services Manager, review future load shedding to increase or decrease the amount of rolling outages to enable the weekly target to be met. The Network Analyst will be responsible for daily and weekly reporting of consumption relative to target levels. The Network Analyst will also be responsible for providing the predicted load for the next week on a seven day rolling basis. This prediction is to be by GXP for each half-hour.

#### 6.12 Log of Rolling Outages

System Controllers will log times of disconnection and reconnection of all feeder interruptions and enter in the log. The log sheet to be used by System Controllers is shown in Appendix 1. These will be used to monitor the rolling outage program.

## 7 ROLLING OUTAGES

When instructed by the System Operator, following a supply shortage declaration, to reduce demand, rolling outages will be instigated by System Control Managers as per this plan and outage strategy. The System Control Managers will ensure 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 System Operator seven days before the planned outage. If significant variation is noticed, or expected, from the schedules provided to the System Operator then Aurora shall advise the Security Coordinator of this change.

Where possible, Aurora will try to comply with priorities in Table 1 to select feeders for rolling outages. Aurora will endeavour to keep rolling outages to any consumer no longer than 4 hours per day for a 5% savings target. For savings more than 5% longer and more frequent outages may be necessary.

Outages will be programmed between 0800 and 1800 on all days. Night time is excluded from the cut period for safety reasons. Initially outages will be scheduled for mid-afternoon to limit the economic effects.

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

The table below shows the planned cut duration for each specified savings level. Cuts are based on five to seven days per week and the listed priorities are the highest priority loads expected to be cut as per Table 1.

Savings Level	Current AUFLS		Alternative AUFLS		Days per week
	Highest Priority	Maximum Duration	Highest Priority	Maximum Duration	
5%	4	4 hrs	5	4 hrs	5
10%	4	8 hrs	4	8 hrs	6
15%	4	10 hrs	4	10 hrs	7
20%	3	10 hrs	3	10 hrs	7
25%	2	10 hrs	2	10 hrs	7

**Table 3 - Rolling Cut Consumers Priority**

## 7.1 Feeder Selection

Feeders to be disconnected are shown in QP1602-59 POP Feeder Schedules. These tables are based upon priority guidelines shown in Table 1. Generally, feeders will be chosen from the bottom of table first. A table for each of the two options listed in Table 4 has been included in QP1602-59. The number of feeders chosen for any week will depend upon the level of savings required to meet target.

Consumer Group Priority	Maximum Duration	Days per week	Percentage System Winter Energy	Expected Energy Savings	System Cut Level
1			4.1%	0.0%	64.6%
2			11.2%	0.0%	60.5%
3			12.5%	0.0%	49.3%
4			4.2%	0.0%	36.8%
5	4 hr	5	13.8%	2.3%	32.6%
6	4 hr	5	18.8%	3.1%	18.8%
Total				5.3%	

**Table 4 - Duration of Daily Outages per Consumer Group for 5% Savings**

Consumer Group Priority	Maximum Duration	Days per week	Percentage System Winter Energy	Expected Energy Savings	System Cut Level
1			4.1%	0.0%	64.6%
2			11.2%	0.0%	60.5%
3			12.5%	0.0%	49.3%
4	2 hr	6	4.2%	0.3%	36.8%
5	6 hr	6	13.8%	3.5%	32.6%
6	8 hr	6	18.8%	6.6%	18.8%
Total				10.5%	

**Table 5 - Duration of Daily Outages per Consumer Group for 10% Savings**

Consumer Group Priority	Maximum Duration	Days per week	Percentage System Winter Energy	Expected Energy Savings	System Cut Level
1			4.1%	0.0%	64.6%
2			11.2%	0.0%	60.5%
3			12.5%	0.0%	49.3%
4	4 hr	7	4.2%	0.8%	36.8%
5	8 hr	7	13.8%	5.4%	32.6%
6	10 hr	7	18.8%	9.2%	18.8%
Total				15.3%	

**Table 6 - Duration of Daily Outages per Consumer Group for 15% Savings**

Consumer Group Priority	Maximum Duration	Days per week	Percentage System Winter Energy	Expected Energy Savings	System Cut Level
1			4.1%	0.0%	64.6%
2			11.2%	0.0%	60.5%
3	6 hr	7	12.5%	3.5%	49.3%
4	8 hr	7	4.2%	1.6%	36.8%
5	10 hr	7	13.8%	6.7%	32.6%
6	10 hr	7	18.8%	9.2%	18.8%
Total				21.1%	

**Table 7 - Duration of Daily Outages per Consumer Group for 20% Savings**

Consumer Group Priority	Maximum Duration	Days per week	Percentage System Winter Energy	Expected Energy Savings	System Cut Level
1			4.1%	0.0%	64.6%
2	4 hr	7	11.2%	2.1%	60.5%
3	8 hr	7	12.5%	4.9%	49.3%
4	10 hr	7	4.2%	2.1%	36.8%
5	10 hr	7	13.8%	6.7%	32.6%
6	10 hr	7	18.8%	9.2%	18.8%
Total				25.0%	

**Table 8 - Duration of Daily Outages per Consumer Group for 25% Savings**

The outage durations are indicative only and will be reviewed daily to achieve the specified targets.

## 7.2 Contingent Events

If an unplanned event occurs, such as a Civil Defence emergency that could alter the planned rolling outages, System Control Managers will be responsible for communication with retailers of any changes to the advertised program.

## 7.3 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.

## 7.4 Vulnerable Consumers

Retailers maintain lists of consumers with health and safety issues. It is not feasible for Aurora to prevent rolling outages affecting individual vulnerable consumers. During rolling outages general media releases will advise consumers with health problems as to their best course of action.

