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# SECURITY OF SUPPLY – PARTICIPANT ROLLING OUTAGE PLAN

JANUARY 2022



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# 1 Introduction

## 1.1 Purpose

This standard provides information for,

- Aurora Energy Network Operations to reduce electricity consumption when a supply shortage is declared by the System Operator under the requirements of the Transpower System Operator Rolling Outage Plan (SOROP).
- Aurora Energy as a participant in the Electricity Industry Participation Code 2010 (the Code) to comply with specifically clauses 9.6 to 9.8 of Part 9 of the code.
- Aurora Energy to comply with the Electricity Authority requirements to prepare a Participant Rolling Outage Plan (this Plan). This current plan is published in the disclosures section of the Aurora Energy website.
- the Aurora Energy Participant Rolling Outage Plan as required by the Transpower System Operator to be current and up to date.

## 1.2 Scope

This standard applies to the Aurora Energy Network Operations procedures to reduce electricity demand as directed by the System operator.

The procedures outlined are in response to major transmission equipment outages or major generation shortages including dry year scenarios. How an event is declared and how the System Operator should communicate its requests are detailed.

The main energy saving measure listed is rolling outages and how these are structured and implemented is discussed.

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 Energy will always endeavour to keep consumers supplied. Aurora Energy will only disconnect consumers when directed to by the System Operator.

## 1.3 Definitions

Aspect	Definition
Code	Electricity Industry Participation Code
Feeder	A high voltage circuit typically supplying up to 2000 consumers.
Rolling Outages	Planned electricity disconnections spread over different parts of the network at differing times to avoid prolonged outages at any one location.
Security Coordinator	Person responsible for system security at the System Operator
Supply Shortage Declaration	Declaration made by the System Operator under clause 9.14(2) of the Code.
System Operator	Operator of the National Electricity Transmission grid

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## 1.4 Acronyms

Short Form	Long Form
AUFLS	Automatic under-frequency load shedding.
EDN	Electricity distribution network.
GXP	Grid exit point
GEN	Grid emergency notice
PROP	Participant rolling outage plan (this plan)
SOROP	System Operator Rolling Outage Plan

## 1.5 Accountabilities

### 1.5.1 GM Operations & Network Performance

Accountable for ensuring the Participant Rolling Outage Plan is current, fit for purpose, and operable.

### 1.5.2 Network Operations Manager

Accountable for ensuring the specified communications are in place and the Network Coordination Team can enact the Participant Rolling Outage Plan.

### 1.5.3 Network Coordinator Team Leader

Accountable for ensuring the Network Coordinators understand the Participant Rolling Outage plan and the ADMS can be operated to comply with the plan as stated.

### 1.5.4 GM Regulatory & Commercial

Accountable for ensuring the Participant Rolling outage Plan is communicated to Transpower and to all consumers of Aurora Energy.

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## 2 Background

### 2.1 Electricity Authority

The Electricity Authority is a Crown entity set up under the Electricity Industry Act 2010 and responsible for the efficient operation of the New Zealand electricity market.

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),
- 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 regarding competition, reliable supply and efficient operation,
- and contract service providers to operate the New Zealand electricity system and market in accordance with the Code.

### 2.2 Transpower (System Operator)

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 Aurora Energy.

As System Operator, Transpower manages the real-time operation of New Zealand's electricity transmission system. The real-time operation ensures that at any one point in time the energy supplied by generating companies is matched to the energy demand of all loads supplied by the network. Constraints on the ability to manage this may be caused by,

- Low lake levels reducing hydro generation
- Failure of a large generator
- A fault on a critical transmission circuit.

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

The System Operator has various other security-of-supply responsibilities under the Code, including forecasting supply and demand, calculating, and publishing hydro risk curves, and implementing the SOROP under certain conditions.

### 2.3 Aurora Energy

Aurora Energy is the electricity network company that owns, operates, and maintains the electricity lines, cables and substations that deliver electricity from the Transpower GXP's to over 91,000 consumers in the Dunedin and Central Otago and Queenstown Lakes regions.

Aurora Energy has some ability to control load by turning off domestic water and storage heaters, via ripple control. Further load reductions would require disconnecting consumers.

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## 3 Range of Events

Events that could lead the System Operator to make a supply shortage declaration can in general terms be categorised as:

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

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

### 3.1 Significant Incident

A **Category A** or **Category B** event will be classed by Aurora Energy as a significant incident and Aurora Energy's management team will activate the appropriate contingency plan as provided for in the Emergency Response Plan guide AE-HC03-G01 to manage the event accordingly.

Communication with electricity retailers, civil defence, media, and other stakeholders will be as per section 4.1.3 of the guide AE-HC03-G01.

## 4 Communications

### 4.1 General

Upon receipt of direction from the System Operator to Save Energy and prepare for rolling outages, the Operations Manager will acknowledge this receipt by email.

The Operations Manager will also inform Aurora Energy's management and commence specific rolling outage plan preparations. Final authorisation to commence a programme of rolling outages will be made by Aurora Energy's Chief Executive.

Prior to notifying and implementing rolling outages, the Operations manager will consult with the System Operator Security Coordinator to establish a process for load shedding and restoration which may include a MW load cap to operate under during restoration phases. Unless a different agreement is made with the System Operator, load shedding and restoration shall be no more than 25MW per any five-minute period.

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

Aurora Energy will provide the System Operator with daily, rolling week-ahead forecast of half-hourly load at each GXP, considering the impact of the planned rolling outages. Whenever any change in the forecast for a GXP of more than 20% for any half hour is expected Aurora Energy will highlight this to the System Operator.

### 4.2 Aurora Energy Staff Responsibilities

Within one day of declaration of a Category A event, the Operations Manager will notify the System Operator of any updated contact details including telephone numbers and email address for each of the positions named in Table 1.

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**Table 1 - Aurora Energy Staff Responsibilities**

Role	Aurora Energy Person Responsible
Receive communication from System Operator of pending SOROP implementation.	CEO or GM Operations & Network Performance
Receive communication from System Operator	Network Operations Manager
Implement this plan	Incident Controller (normally GM Operations & Network Performance)
Preparation of load shedding schedules	Network Operations Manager
Retailer Notification	Network Access Manager
Communicate with Emergency Services (incl. Civil Defence) & Local authorities	Customer & Engagement Manager
Reporting to media, public agencies	Customer & Engagement Manager
Weekly savings reporting	Operational Performance Manager
Revoking rolling outages	Network Operations Manager
Reporting to System Operator	Incident Controller

If the listed Aurora Energy staff member is unavailable, an appropriate alternate must be appointed.

### 4.3 Communication with the System Operator

The System Operator will contact Aurora Energy for operational purposes using the following details,  
 Aurora Energy Network Control Centre,  
 Duty Network Co-ordinator,  
 Email: [NetworkOpCentre@auroraenergy.nz](mailto:NetworkOpCentre@auroraenergy.nz)

Aurora Energy Network Operations Manager.  
 Jeff Procter  
 Email: [Jeff.procter@auroraenergy.nz](mailto:Jeff.procter@auroraenergy.nz)

Aurora Energy will contact the System Operator for Operational purposes:  
 Transpower National Grid Operations Centre (South).

For administration purposes (including reporting performance against targets) using the following details:

Transpower System Operator,  
 Email: [system.operator@transpower.co.nz](mailto:system.operator@transpower.co.nz)

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## 5 Actions for Developing Events- (Category A)

If the System Operator requests a load reduction for a planned (Category A) event, Aurora Energy must reduce demand to meet the System Operator’s targets. The targets are expected to take the form of an energy savings target, reviewed weekly. To reduce energy usage, Aurora Energy would disconnect HV feeders (rolling outages), in a controlled manner, to enable targets to be reached. The shedding of water heating load is not a viable option for energy savings, as this only defers usage and would not save energy over a Category A event.

### 5.1 Declaration of Category A Event

The System Operator will endeavour to provide nine days prior notice of the requirement for weekly energy savings. Any increase in the weekly energy savings target would also need nine days prior notice.

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

The System Operator will begin an official conservation campaign if either New Zealand or South Island hydro storage reaches the emergency zone.

### 5.2 Criteria for Rolling Outages

To ensure public health and safety is preserved, and costs to economy are minimised, Table 2 shows a desired criteria for selecting feeders to be included in rolling outages. The higher the load priority the less likely the load will be shed as part of rolling outages.

**Table 2 – Priority Loads**

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

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.

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### 5.3 Automatic Under Frequency Load Shedding (AUFLS) Criteria

Currently, the same criteria for rolling outages, as shown in Table 2, 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.

To maintain equity as far as practical Aurora Energy may include AUFLS feeders as part of rolling outage plans however, Aurora Energy will ensure that the 16% capacity requirements of load shed from feeders in each AUFLS block is maintained.

To minimise the effect of potential AUFLS exclusion during extended rolling outages, Aurora Energy will continue to review the allocation of AUFLS feeders and look for opportunities to shift the AUFLS to high priority zone substations. When a Category A event is declared, Aurora Energy may engage with Transpower to change the AUFLS blocks to alternative feeders. 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.

### 5.4 Retailer Agreements

Aurora Energy does not have any agreements with retailers or consumers which would adversely affect Aurora Energy’s ability to comply with System Operator directions.

### 5.5 Interruptible load

Aurora Energy does not have any demand on the network for the provision of interruptible load on the instantaneous reserve market.

### 5.6 Shutdown Notification

With the wide scale impact of rolling outages, it is not feasible to use our standard planned outage notification process. When implementing a rolling outage plan, Aurora Energy will notify the outages in several ways:

- Aurora Energy website – we will publish, with as much accuracy as we can, the approximate rolling outage timetable.
- Online social media and radio – will be utilised as appropriate
- Customer Engagement Team - will communicate with customers directly as appropriate.
- Retailer notification – Aurora Energy will provide the published rolling outage timetable to all electricity retailers together with a schedule showing the rolling outage group for all ICPs.

Where possible, Aurora Energy will provide up to 7 days' notice of all rolling outage plans.

### 5.7 Vulnerable consumers and Priority Sites

It is not possible for Aurora Energy to prevent rolling outages affecting individual vulnerable customers and priority sites. In addition to the prioritisation of rolling outage feeders Aurora Energy will:

- Provide information in its public notices and on its website alerting vulnerable customers to the risks, and
- Request that retailers consider individually notifying their vulnerable customers.

### 5.8 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 Energy 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

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may have to be rearranged to comply with the GEN. After the grid emergency is over, the rolling outages pattern would continue.

## 6 Actions for Immediate Events-(Category B)

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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 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 stabilizes.

This event is termed a Category B event and may be initially handled as a Transmission Grid Emergency by the issue of a grid emergency notice (GEN).

Aurora Energy's procedures for handling a GEN are covered under AE-OO08-S 'Grid Emergency-Load Shedding and Restoration'.

## 7 Rolling Outages Strategy and Methodology

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### 7.1 Rolling Outages

When instructed by the System Operator, following a supply shortage declaration, to reduce demand, rolling outages will be instigated by the Operations Manager in accordance with this plan and outage strategy. The Operations Manager will ensure load shedding schedules are prepared, Network Co-ordinator 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 as early as possible prior to the start of the weekly cycle. If significant variation is noticed, or expected, from the schedules provided to the System Operator, then Aurora Energy shall advise the Security Coordinator of this change.

Aurora Energy will endeavour to comply with the criteria stated in Table 1 to select feeders for rolling outages. Aurora Energy will attempt to keep rolling outages to any consumer no longer than 5 hours per day, for a 5% savings target. For savings more than 5%, longer outages may be necessary.

Aurora Energy will, to the extent possible endeavour to program rolling outages between 0800 and 1700 on all days to achieve the required savings. The specific timing of outages will be approximate and could vary daily due to network or System Operator constraints.

Table 3 and 4 below show 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 2. The savings levels in this table are in addition to any savings made through voluntary, or other, means.

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**Table 3 – GXP Details**

GXP	Rolling Outages May Occur
Halfway Bush-HWB	Yes
South Dunedin-SDN	Yes
Frankton-FKN	Yes
Cromwell-CML	Yes
Clyde-CYD	Yes

**Table 4 – Rolling Outage Priority**

Savings Level	Highest Priority load schedule	Maximum Duration	Days per week
5%	5	5 hrs	5
10%	5	8 hrs	6
15%	4	8 hrs	7
20%	3	10 hrs	7
25%	3	10 hrs	7

## 7.2 Feeder Selection

Feeders to be disconnected will be on a planned basis to ensure all feeders are rotated to avoid repeated outages.

Calculation of the expected saving is complicated by two factors:

- The daytime load of feeders is significantly higher than the night-time load, therefore the saving from a feeder outage of, say, 6hrs per day will be greater than 25%.
- On restoration of a feeder, there will be some additional load due to “cold load pickup” (e.g., home heating, water heating, and refrigeration load returning to their temperature settings). This will reduce the expected savings.

To a certain extent, these two factors will cancel each other out.

The tables below are an estimate of expected savings. The actual outages will have to be modified from this plan, based on measured results to meet weekly savings targets.

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**Table 5 - 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
1			12%	0.0%
2			14%	0.0%
3			16%	0.0%
4			18%	0.0%
5	4 Hr	5	18%	2.1%
6	5 Hr	5	22%	3.3%
			100%	5.4%

**Table 6 - 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
1			12%	0.0%
2			14%	0.0%
3			16%	0.0%
4			18%	0.0%
5	6 Hr	6	18%	3.9%
6	8 Hr	6	22%	6.3%
			100%	10.2%

**Table 7 – 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
1			12%	0.0%
2			14%	0.0%
3			16%	0.0%
4	3 Hr	7	18%	2.2%
5	8 Hr	7	18%	6.0%
6	8 Hr	7	22%	7.3%
			100%	15.5%

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**Table 8 - 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
1			12%	0.0%
2			14%	0.0%
3	2 Hr	7	16%	1.3%
4	4 Hr	7	18%	3.0%
5	10 Hr	7	18%	7.5%
6	10 Hr	7	22%	9.2%
			100%	21.0%

**Table 9 - Duration of Daily Outages per Consumer Group for 25% Savings**

Consumer Group Priority	Maximum Duration	Days per week	Percentage System Winter Energy	Expected Energy Savings
1			12%	0.0%
2			14%	0.0%
3	4 Hr	7	16%	2.7%
4	8 Hr	7	18%	6.0%
5	10 Hr	7	18%	7.5%
6	10 Hr	7	22%	9.2%
			100%	25.4%

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

### 7.3 Contingent Events

If an unplanned event occurs, such as a Civil Defence emergency, that could alter the planned rolling outages, the Operations Manager will be responsible for communicating any changes to the advertised program to electricity retailers, and also to the SO Security Coordinator.

### 7.4 Supply Restoration

Disconnected load must be restored in conjunction with the guidance from 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.

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