



NC05/01

Participant Rolling Outage Plan

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|------------------------|---------------------------------|
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| Version 2 | Updated | Sept 2013 |
| Version 3 | Complete revision of Plan to update System Operation Control to rolling outages | July 2015 |
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PARTICIPANT ROLLING OUTAGE PLAN

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PARTICIPANT ROLLING OUTAGE PLAN

PURPOSE

This plan was written to comply with System Operator Rolling Outage Plan (SOROP) and Part 9, Security of Supply, of the Electricity Industry Participation Code 2010 (EIPC).

1 SCOPE

Under the Electricity Industry Participant Code 2010 (EIPC), participant rolling outage plans (PROP) are required to specify the actions that would be taken to reduce the consumption of electricity:

- when a supply shortage is declared by the System Operator.
- to comply with requirements of the System Operator Rolling Outage Plan (SOROP).
- to comply with Electricity Industry Participation Code 2010.
- to supplement the System Operator's Rolling Outage Plan.

Reducing demand by disconnecting supply to customers would be a last resort after all other forms of savings, including voluntary savings, had been employed.

Network Waitaki will always endeavour to keep customers supplied but will disconnect customers when directed to by the System Operator.

The procedures outlined are in response to 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.

2 DEFINITIONS

| | |
|--|---|
| AUFLS | Automatic Under Frequency Load Shedding |
| Electricity Act | Electricity Act 1992 and subsequent amendments |
| Feeder | A high voltage circuit typically supplying up to 1200 customers |
| GXP | Transpower Grid Exit Point |
| GEN | Grid Emergency Notice |
| PROP | Participant Rolling Outage Plan (this plan) |
| Regulations | Electricity Industry Participation Code 2010, Part 9, (Security of Supply) |
| Retailers | Electricity Retail Companies |
| Rolling Outages or Rolling Cuts | Planned electricity disconnections spread over different parts of the network at differing times to avoid prolonged outages at any one location |
| SOROP | System Operator Rolling Outage Plan |
| SOSOP | Security of Supply Outage Plan (System Operator) |
| Supply Shortage | Declaration made by the System Operator under regulation 9 |
| System Operator | Operator of the national electricity transmission grid |

2.1 Associated Quality Procedures

- Notification of Outages to Retailers
- Outage Advice to Media
- NWL Emergency Load Shedding and Restoration (NC05/02)
- NWL PROP Feeder Schedules

3 BACKGROUND

3.1 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 connect areas of generation with town and cities across the country.

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.

3.2 Network Waitaki

Network Waitaki is the electricity network company that owns and maintains the electricity lines, cables and substations that deliver electricity to our connected customers in the North Otago and southern South Canterbury 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; or
- 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 Network Waitaki

Network Waitaki has some ability to reduce load by turning off domestic water heaters, and irrigation, via ripple control.

Further load reductions would require rolling outages to our connected customers under NWL priority feeder outage plan.

4.2 Range of Events

Events that could lead the System Operator to make a Supply Shortage Declaration can in general terms be categorized as a:

- **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.

4.3 Significant Incident

A Developing Event or Immediate Event will be classed by Network Waitaki as a significant incident and the Engineering 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 Outage Advice to Media in section 6.8.

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

5 ACTIONS FOR IMMEDIATE EVENT

5.1 System stability

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.

5.2 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 numbers of frequency capable relays installed and the likely revenue stream from the market, less the compliance costs of participating in the reserve market. Network Waitaki does not presently participate in this market.

5.3 Disconnecting Customers

5.3.1 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.

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.

AUFLS scheme on Network Waitaki network is available only at Weston 33kV Switching Station. The pre-selected 33kV feeders are automatically disconnected by Network Waitaki relays.

5.3.2 AUFLS Zone 1

If system frequency fails to recover after Reserve market load shed, AUFLS Zone 1 shedding by Network Waitaki relays will occur. This will disconnect up to approximately 17.7% and 16.2% of Network Waitaki's summer and winter load respectively by disconnecting customers supply.

5.3.3 AUFLS Zone 2

If zone 1 tripping fails to restore frequency, the next stage, zone 2 activates. Network Waitaki relays would disconnect approximately another 28.4% of load.

5.3.4 Manual Load Shedding

If AUFLS Zone 1 and Zone 2 tripping fails to stabilise frequency the System Operator will shed more load (either via its own generation or hot water ripple or irrigation channels). Once the frequency has stabilised the System Operator will advise the Network Waitaki System Control when load can be restored.

5.4 Supply Restoration

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

5.5 System Operator Declaration

For some Immediate Events, the System Operator may make a supply shortage declaration and direct rolling outages. In such a situation, the procedures for developing events will need to be implemented as per section 6 to 8.

5.6 Transmission Grid Emergency

The System Operator may request Network Waitaki to reduce load under a grid emergency notice (GEN). Network Waitaki would commence with shedding load via ripple control and then if necessary shed feeders as per NWL Emergency Load Shedding and Restoration (refer to NC05/02).

If an Immediate Event is in place, the grid emergency will take precedence.

6 ACTIONS FOR DEVELOPING EVENTS

If the System Operator requests a load reduction for a planned Developing Event, Network Waitaki would reduce demand to meet the specified targets. The targets are expected to be a weekly energy savings target that is reviewed each week.

To reduce energy usage Network Waitaki would disconnect HV feeders (rolling outages) in a controlled manner to enable targets to be reached.

Network Waitaki has a legal obligation to comply with the targets specified by the System Operator. The shedding of water heating load is generally not a viable option for energy savings as this only defers usage and would not save energy.

6.1 Declaration of Developing Event

The System Operator will endeavour to provide 9 days prior notice of the requirement for weekly energy savings and any increase in the weekly energy savings target.

To declare a Developing Event the System Operator will specify the energy savings target to be enforced for a specific region for a specified time-frame.

The System Operator is responsible for general media advertising of the need to conserve electricity and the impending rolling outages when they are requested if a Public Conservation Campaign has been declared in accordance with the Code.

If Network Waitaki plans to issue a public message related to rolling outages, then this will be sent to the System Operator for review before being released. Any such communication will give a time for response from the System Operator, so as their feedback can be included before Network Waitaki issues the message to the public.

On receipt of a declaration of a Developing Event, Network Waitaki will update Appendix A with current load data.

6.2 Criteria for Rolling Outages

To ensure public health and safety is preserved and costs to economy are minimised the following table shows the desired criteria for selecting feeders to be included in rolling outages.

| Priority | Priority Concern | Maintain Supply to: |
|----------|---------------------------|---|
| 1 | Public health and safety | Major hospitals, emergency operation centres and maritime safety. |
| 2 | Important public services | Communication networks, water & sewage pumping, Fuel delivery systems, airports |
| 3 | Public health and safety | Medical centres, schools, hotels, rest homes |
| 4 | Food production | Dairy farms, milk production facilities and Stock water supplies |
| 5 | Domestic production | Commercial and industrial premises. |
| 6 | Disruption to customers | Strictly Residential premises. |

Table 1 - Priority of Loads

Rolling outage plans will focus on lower priority feeders to the extent possible, and the higher priority feeders being selected only at the higher required savings levels. Rolling outage feeders with the same priority and in the same area (according to our grid exit areas) are grouped together into rolling outage groups. This level of grouping simplifies the planning, management and notification of rolling outages. The areas (GXPs for rolling outages) are:

| Area | GXP | Rolling outages may occur |
|------|--------------|---------------------------|
| A | Oamaru | Y |
| B | Lake Waitaki | Y |
| C | Twizel | Y |
| D | Black Point | Y |

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 customers would also be affected).

It is necessary to maintain the two 16% AUFLS blocks during rolling outages, so this suggests that rolling outages may need to impact on some high priority feeders.

To minimise this problem, it is proposed to shift the AUFLS to high priority zone substations during rolling outages. Transpower will be requested to change the AUFLS blocks to alternative feeders as detailed in NWL Emergency Load Shedding and Restoration. If this is not possible in the timeframe available, it may be necessary to roll outages through some high priority load, particularly for high savings targets.

Shutdown Notification

When requested to reduce demand with rolling outages, Network Waitaki will use the planned outage procedure as per Notification of Outages to Retailers, to advise retailers in advance, of pending outages. The time and extent of advertised outages will be approximate. Social media (Facebook) will also be used to notify the public.

6.4 Vulnerable customers and Priority Sites

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

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

(Note: there are no agreements between Network Waitaki and retailers or customers on the network that may adversely affect Network Waitaki's ability to comply with the System Operator directions.)

6.5 Grid Emergency during Developing Event

If the System Operator declares a grid emergency during 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, Network Waitaki 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.

The Grid Emergency will take priority in both Immediate Events and Developing Events.

6.6 Supply Disconnection and Restoration

Disconnected load must be restored in conjunction with the System Operator. This is to prevent overloading the transmission network and creating instability. Network Waitaki will use best endeavours to:

- (a) not increase or decrease its demand by more than 25 MW in any five minute period without the system operator's prior approval
- (b) minimise the impact on frequency and voltage stability
- (c) minimise the disconnection and restoration of its demand during times when demand is typically ramping up or down in the region affected by the supply shortage (for example, either side of morning and evening peaks).

7 COMMUNICATION

Network Waitaki will keep media and customers informed of planned interruptions to supply before and during the outages. Media will be informed as per Network Waitaki's standard communications procedure, and the retailers will be responsible for customer notification.

8 COMMUNICATION WITH SYSTEM OPERATOR

The System Operator can contact Network Waitaki using the following details:

Network Waitaki Ltd

Email: operations@networkwaitaki.co.nz

1st Point of Contact - Phone: 03 433 0514 (Network Controller and/or after-hours Duty Engineer)

2nd Point of Contact - Engineering Manager - 027 648 5547

Formal operational verbal/phone communications with the System Operator should be directed to the Transpower National Grid Operations Centre using normal communications methods. Operational queries can also be directed to the System Operator's National Coordination Centre as an alternative.

Administrative communication (relating to supply shortage declarations, directions to save energy, acknowledgment of receipt of a direction to save energy, rolling outage monitoring, distributor

load/load shedding forecasts, media/public communications) with the System Operator will be directed to:

Email: system.operator@transpower.co.nz

PH: 04 590 7000

Network Waitaki will acknowledge receipt, via email, of the direction to save energy.

Prior to notifying and implementing rolling outages, Network Waitaki will consult with the System Operator to establish a process for load shedding and restoration.

9 NETWORK WAITAKI STAFF RESPONSIBILITIES

| Role | Network Waitaki Person Responsible |
|--|---|
| Operational contact | NWL Network Controller |
| Managerial contact for administration and escalation | Engineering Manager Network General Manager |
| Receive initial communication from System Operator | Network General Manager or Engineering Manager |
| Receive ongoing communication from System Operator | NWL Network Controllers |
| Implement this plan | Engineering Manager |
| Weekly savings reporting | NWL Network Controller |
| Retailer notification | Customer Services Team |
| Revoking rolling outages | Engineering Manager |
| Reporting to System Operator | Engineering Manager |
| Reporting to media, public agencies | Engineering Manager and/or Network Customer Services Co-ordinator |

Table 2- Staff Responsibilities

Within one day of declaration of a Developing Event, the Engineering Manager will notify the System Operator of the updated contact details including telephone numbers and email address for each of the positions named in Table 2.

10 ROLLING OUTAGES STRATEGY AND METHODOLOGY

The Engineering Manager and the Network Controllers together 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.

The rolling outages will be applicable to both Immediate Events and Developing Events.

11 TARGET MONITORING

For load shedding to a weekly target, the Engineering Manager will monitor energy savings against target and, together with the Network General Manager, review future load shedding to increase or decrease the number of rolling outages to enable the weekly target to be met.

The Network Controller will be responsible for daily and weekly reporting of consumption relative to target levels. The Network Controller and Engineering Manager will together, be responsible for providing the predicted load for the next week on a seven-day rolling basis to the Security Co-ordinator (at the System Operator). This prediction is to be by GXP for each half-hour. Any variations in the forecast of +/- 20% will be advised to the Security Co-ordinator (at the System Operator). As part of the monitoring process, NWL will provide regular information to the System Operator regarding Network Waitaki's performance. Including the actual energy usage for the previous week compared with the energy used in the corresponding work of the previous year.

12 LOG OF ROLLING OUTAGES

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

13 ROLLING OUTAGES

When instructed by the System Operator, following a supply shortage declaration, to reduce demand, rolling outages will be instigated by the Engineering Manager as per this plan and outage strategy. The Engineering Manager 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 Network Waitaki shall advise the System Operator of this change.

Where possible, Network Waitaki will try to comply with priorities in Table 1 to select feeders for rolling outages. Network Waitaki 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%, more frequent outages per week 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. 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.

Details of the planned cut duration and weekly frequency for the highest priority relating to each saving level are outlined in Table 3. The cuts are the highest priority loads expected to be affected as per Table 1.

| Savings Level | Priority | Maximum Duration (hr) | Days per week |
|---------------|----------|-----------------------|---------------|
| 5% | 3 - 6 | 3 | 4 |
| 10% | 2 - 6 | 6 | 5 |
| 15% | 2 - 6 | 6 | 5 |
| 20% | 1 - 6 | 2 | 3 |
| 25% | 1 - 6 | 7 | 7 |

Table 3 - Rolling Cut Customers Priority

13.1 GXP and Feeder Selection

Network Waitaki has four GXPs, in which all may be involved should a rolling outage be implemented.

The four GXPs are:

1. Oamaru GXP,
2. Waitaki GXP,
3. Twizel GXP, and
4. Blackpoint GXP

All Feeders to be disconnected, at the four GXPs, are shown in NWL Outage Plan Feeder Schedule Priorities document NC0502. These tables are based upon priority guidelines shown in Table 1. Generally, feeders will be chosen from the bottom of table first.

An example of how savings targets would be achieved for a typical winter and summer week for different savings targets is included in Tables 4 – 8. The number of feeders chosen for any week will depend upon the level of savings required to meet target.

Winter period: April 1 to August 31

Summer period: September 1 to March 31

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

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

| Consumer Group Priority | Maximum Duration (hr) | Days per week | Percentage System Winter Energy | Percentage System Summer Energy | Winter Expected Weekly Energy Savings | Summer Expected Weekly Energy Savings |
|--------------------------------|------------------------------|----------------------|--|--|--|--|
| Priority 1 | | | 24.0% | 14.3% | 0.0% | 0.0% |
| Priority 2 | | | 14.4% | 9.6% | 0.0% | 0.0% |
| Priority 3 | 5 | 4 | 22.8% | 19.2% | 2.7% | 0.0% |
| Priority 4 | 5 | 5 | 16.6% | 33.7% | 2.5% | 5.0% |
| Priority 5 | 6 | 5 | 3.5% | 1.1% | 0.6% | 0.2% |
| Priority 6 | N/A | N/A | 0.0% | 0.0% | 0.0% | 0.0% |
| Total | | | | | 5.8% | 5.2% |

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

| Consumer Group Priority | Maximum Duration (hr) | Days per week | Percentage System Winter Energy | Percentage System Summer Energy | Winter Expected Weekly Energy Savings | Summer Expected Weekly Energy Savings |
|--------------------------------|------------------------------|----------------------|--|--|--|--|
| Priority 1 | | | 24.0% | 14.3% | 0.0% | 0.0% |
| Priority 2 | 6 | 5 | 14.4% | 9.6% | 2.6% | 1.71% |
| Priority 3 | 6 | 5 | 22.8% | 19.2% | 2.7% | 3.43% |
| Priority 4 | 6 | 5 | 16.6% | 33.7% | 2.5% | 5.0% |
| Priority 5 | 6 | 5 | 3.5% | 1.1% | 0.7% | 0.2% |
| Priority 6 | N/A | N/A | 0.0% | 0.0% | 0.0% | 0.0% |
| Total | | | | | 10.2% | 5.2% |

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

| Consumer Group Priority | Maximum Duration (hr) | Days per week | Percentage System Winter Energy | Percentage System Summer Energy | Winter Expected Weekly Energy Savings | Summer Expected Weekly Energy Savings |
|--------------------------------|------------------------------|----------------------|--|--|--|--|
| Priority 1 | | | 24.0% | 14.3% | 0.0% | 0.0% |
| Priority 2 | 6 | 5 | 14.4% | 9.6% | 2.6% | 1.70% |
| Priority 3 | 7 | 6 | 22.8% | 19.2% | 5.7% | 4.8% |
| Priority 4 | 8 | 7 | 16.6% | 33.7% | 5.5% | 11.2% |
| Priority 5 | 8 | 7 | 3.5% | 1.1% | 1.2% | 0.4% |
| Priority 6 | N/A | N/A | 0.0% | 0.0% | 0.0% | 0.0% |
| Total | | | | | 15.0% | 16.4% |

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

| Consumer Group Priority | Maximum Duration (hr) | Days per week | Percentage System Winter Energy | Percentage System Summer Energy | Winter Expected Weekly Energy Savings | Summer Expected Weekly Energy Savings |
|--------------------------------|------------------------------|----------------------|--|--|--|--|
| Priority 1 | 2 | 3 | 24.0% | 14.3% | 0.9% | 0.5% |
| Priority 2 | 8 | 7 | 14.4% | 9.6% | 4.8% | 3.2% |
| Priority 3 | 8 | 7 | 22.8% | 19.2% | 7.6% | 6.4% |
| Priority 4 | 8 | 7 | 16.6% | 33.7% | 5.5% | 11.2% |
| Priority 5 | 8 | 7 | 3.5% | 1.1% | 1.2% | 0.37% |
| Priority 6 | N/A | N/A | 0.0% | 0.0% | 0.0% | 0.0% |
| Total | | | | | 20.0% | 21.2% |

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

| Consumer Group Priority | Maximum Duration (hr) | Days per week | Percentage System Winter Energy | Percentage System Summer Energy | Winter Expected Weekly Energy Savings | Summer Expected Weekly Energy Savings |
|--------------------------------|------------------------------|----------------------|--|--|--|--|
| Priority 1 | 7 | 7 | 24.0% | 14.3% | 7.0% | 4.2% |
| Priority 2 | 8 | 7 | 14.4% | 9.6% | 4.8% | 3.2% |
| Priority 3 | 8 | 7 | 22.8% | 19.2% | 7.6% | 6.4% |
| Priority 4 | 8 | 7 | 16.6% | 33.7% | 5.5% | 11.2% |
| Priority 5 | 8 | 7 | 3.5% | 1.1% | 1.2% | 0.4% |
| Priority 6 | N/A | N/A | 0.0% | 0.0% | 0.0% | 0.0% |
| Total | | | | | 26.1% | 25.4% |

13.2 Contingent Events

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

13.3 Consumer Liaison

For major customers, 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 customers are advised to contact their retailer for information on the priority of the feeder they are supplied from and outage times.

APPENDIX 1 - OUTAGE LOG

[illegible]