Company Standard

NCST-015

Security of Supply – Participant Outage Plan

Contents

1. PURPOSE

This procedure and plan was written to comply with the Electricity Industry Participation Code 2010.

Under the code, the System Operator must prepare a System Operator Rolling Outage Plan (SOROP). The SOROP requires Electricity Distribution Businesses (EDBs) to prepare Participant Rolling Outage Plans (PROP) that specify the actions that would be taken to reduce the consumption of electricity to:

- reduce electricity consumption when a supply shortage declaration is made by the System Operator (after consultation with the Electricity Authority);
- comply with requirements of the System Operator's SOROP;
- comply with the Electricity Industry Participation Code 2010 and subsequent amendments; and
- supplement the System Operator's SOROP[i].

Reducing demand by disconnecting supply to customers would be a last resort after all other forms of savings, including voluntary savings, had been employed. PowerNet will always endeavour to keep customers supplied. PowerNet will only disconnect customers when directed to by the System Operator at Transpower.

2. SCOPE

This document outlines the 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.

3. REFERENCES

System Operator Rolling Outage Plan (SOROP).

4. DEFINITIONS

AUFLS	Automatic Under Frequency Load Shedding
Authority	Electricity Authority
Code	Electricity Industry Participation Code 2010 and subsequent amendments
EDN	Electrical Distribution Network
Electricity Act	Electricity Act 1992 and subsequent amendments
Feeder	A medium voltage circuit typically supplying a number of customers
GEN	Grid Emergency Notice
GXP	Transpower Grid Exit Point
PROP	Participant Rolling Outage Plan (this plan)

PSTN	Public Switched Telephone Network
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 (SOROP)
Security Co-ordinator	Person responsible for system security on the Grid (Transpower)
Supply Shortage	Declaration made by the System Operator under Part 9 of the Code
System Control	System Control manages all faults, repairs, and activity on the PowerNet managed networks (PowerNet)
System Control Manager	The System Control Manager manages System Control (PowerNet)
System Operator	Operator of the national electricity transmission grid (Transpower)
TPSN	Transpower Speech Network

5. PROCEDURE

5.1. BACKGROUND

5.1.1. 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 Electricity Authority under the Electricity Industry Act is to use reasonable endeavours to ensure the security of electricity supply. The Authority'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 customers to manage price risks in the market.

5.1.2. 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 PowerNet Ltd.

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.

5.1.3. PowerNet Limited

PowerNet Limited is the electricity network management company that delivers power to Invercargill City, Southland, North, South and West Otago and Frankton near Queenstown. PowerNet Limited is responsible for maintaining the electricity lines, cables and substations that delivers electricity to customers across Invercargill City and Southland by Electricity Invercargill Limited and The Power Company Limited and North, South and West Otago by OtagoNet Joint Venture and Frankton by Electricity Southland Limited. The following GXPs are under each of these companies.

The Power Company Limited GXPs
Invercargill (INV), Gore (GOR), North Makarewa (NMA) and Edendale (EDN)

Electricity Invercargill Limited GXPs
Invercargill (INV)

OtagoNet Joint Venture GXPs
Balclutha (BAL), Halfway Bush (HWB), and Naseby (NSY)

Electricity Southland Limited GXP
Frankton (FKN)

5.1.4. Communication with the System Operator

The System Operator can contact PowerNet using the following details:

PowerNet Ltd
Phone: +64 3 211 1899 or 0800 808 587, Fax: +64 3 211 1880
251 Racecourse Road, PO Box: 1642, Invercargill 9840

PowerNet will contact the System Operator for administration purposes, including reporting performance against targets, using the following details:

System Operator
TPSN: 7700
Phone: 04 495 7000
system.operator@transpower.co.nz

Security Co-ordinator
TPSN: *12
Phone: 0800 488 500

5.2. SUPPLY AND DEMAND

Transpower, as the System Operator, controls the transmission network to match generation with customer 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.

5.2.1. Load Reduction by PowerNet

PowerNet has some ability to reduce load by turning off domestic water heaters via ripple control in Southland and parts of Otago. Further load reductions would require disconnecting customers.

5.2.2. Range of Events

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

Developing Event: Events that evolve over time, for example low hydro lake levels.

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

5.2.3. Significant Incident

Developing or Immediate events will be classed by PowerNet as a significant incident and the Chief Operating Officer will assemble a team of senior managers and staff to manage the incident.

Communication with retailers, will follow PowerNet's normal notification procedure described in "NPMR-115 Planned Outages". Local Authorities, civil defence and other stakeholders will be notified of significant events by the System Control Manager.

5.3. ACTIONS FOR IMMEDIATE 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.

5.3.1. 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. PowerNet does not presently participate in this market.

5.3.2. Disconnecting Customers

5.3.2.1. 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 PowerNet has installed AUFLS relays on selected 33kV and 11kV breakers to meet its obligations.

5.3.2.2. 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 PowerNet's load by disconnecting customers' supply automatically.

5.3.2.3. AUFLS Zone 2

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

5.3.2.4. 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 PowerNet's System Control Manager when load can be restored.

5.3.3. Supply Restoration

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

5.3.4. System Operator Direction

The System Operator may direct that rolling outages are required to be implemented either for Immediate or Developing events. In either situation, the procedures for Developing Events will need to be implemented as per Section 5.4.

5.3.5. Transmission Grid Emergency

The System Operator may request PowerNet to reduce load under a Grid Emergency Notice (GEN). PowerNet would commence with shedding water heating load and then, if necessary, shed feeders as per Emergency Load Shedding List.

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

5.4. DEVELOPING EVENTS

If the System Operator (in consultation with the Electricity Authority) requests a load reduction for a Developing event, PowerNet would reduce demand to meet the System Operator's targets. The targets are expected to be a weekly energy savings target that is reviewed each week. To reduce energy usage PowerNet would disconnect HV feeders (rolling outages) in a controlled manner to enable targets to be reached. There may be 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.

5.4.1. Directions during a Developing Event

The System Operator will endeavour to provide nine days prior notice of the requirement for weekly energy savings for a Developing Event. It is PowerNet's plan to use the standard planned outage notification procedure to retailers. Any increase in the weekly energy savings target would also need nine days prior notice.

In the case of a Developing Event, the System Operator will request that a specific weekly energy savings target is to be enforced for a specific region for a specified time-frame. A notification system similar to the GEN procedure would be appropriate. The Authority is expected to manage general media advertising of the need to conserve electricity and the impending rolling outages.

5.4.2. Criteria for Rolling Outages

To ensure public health and safety is preserved and costs to economy are minimised, priorities are assigned to each load type. Table 1 shows a desired criteria for selecting feeders to be included in rolling outages.

Table 1 - 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, major ports, public passenger transport and major supermarkets.
3	Public health and safety	Minor hospitals, medical centres, schools, and street lighting.
4	Food production	Dairy farms and milk production facilities, chicken sheds and cool stores
5	Domestic production	Commercial and industrial premises.
6	Disruption to customers	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 customers on the same feeder presently[1]. For example, a predominantly residential feeder may also have small pockets of commercial or industrial customers. To ensure that this example feeder would not be unfairly favoured due to the small presence of higher priority industrial customers, a feeder only gains an overall priority if the number of priority customers exceeds the weighting seen in Table 2. However, when implementing rolling outages, distributors should generally adopt an approach which leads to fewer and shorter outages for high priority customers.

Table 2 - Feeder prioritisation

Priority	Number of ICPs required on feeder to gain higher feeder priority
1	1
2	4
3	6
4	8
5	10
6	1

Time of day for the outage should also be taken into consideration. A feeder with less than, or equal to, five ICPs on it will inherit the priority of the highest one. This is to ensure that feeders that are dedicated to a single customer gain the correct weighting when taking into consideration feeder prioritisation outlined in Table 2.

[1] Future smart meter implementation may allow for this discrimination

5.4.3. 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.

For system security reasons, AUFLS blocks are excluded from rolling outages, unless it is possible to maintain the requirement for two 16% blocks, while rolling outages through a limited number of AUFLS feeders. 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 an AUFLS exemption unusable, as it would be too late to amend the publicly available outage schedule and so AUFLS exemption will not be considered.

To minimise the effect of AUFLS exclusion during rolling outages, it is proposed to shift the AUFLS to high priority zone substations. When a Developing event is declared, Transpower will be requested to change the AUFLS blocks to alternative feeders as detailed in the Emergency Load Shedding List. It is considered prudent to expose high priority customers to a low probability short term event, such as AUFLS, rather than have them included in rolling outages. Although PowerNet may achieve the 5% - 25% target without including some high priority feeders, it may be necessary to roll outages through some higher priority load to achieve the same savings targets.

5.4.4. Shutdown Notification

When requested to reduce demand with rolling outages, PowerNet plans to use the planned outage procedure NPMR-115, to advise retailers in advance, of pending outages. The time and extent of advertised outages will be approximate.

5.4.5. Vulnerable customers

Retailers maintain lists of customers with health and safety issues. PowerNet will endeavour to give retailers as much advance notice as possible of pending rolling outages to enable them to notify vulnerable customers. During rolling outages general media releases will advise customers with health problems as to their best course of action. For example, a residential customer with health and safety issues is assigned a priority three, a higher weighting than the typical priority six for a residential customer as seen in Table 1.

5.4.6. 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, PowerNet 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.

5.4.7. 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.

5.4.8. Communication

Communication objectives will take account of two security of supply situations:

5.4.8.1. Developing Event

The System Operator will provide up to a 14-day notice of a security of supply situation and up to a 9-day notice of a saving target.

5.4.8.2. Immediate Event

An immediate event has little or no notice. PowerNet will act under the instruction of the System Operator in managing the situation.

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

5.4.8.3. Communication with System Operator

All communications with the System Operator will be between PowerNet's System Control Manager and Regional Operating Centre using Transpower's TPSN telephone in Invercargill and via Chorus' PSTN.

5.4.8.4. Coordinating with the System Operator

If PowerNet has to depart from forecast load profile during rolling outages, PowerNet will communicate direct with Security Coordinator at the System Operator rather than with Regional Operating Centre.

5.4.8.5. PowerNet Contact

Michelle Henderson
Chief Operating Officer
Phone: +64 3 211 1899, DDI: +64 3 211 8811, Mobile: +64 27 204 4864
27 Onslow Street, PO Box: 1642, Invercargill 9840
mhenderson@powernet.co.nz

Kana Shanmuganathan
System Control Manager
Phone: +64 3 211 1856, DDI: +64 3 2111856, Mobile: +64 27 433 6757
251 Racecourse Road, PO Box: 1642, Invercargill 9840
kshanmuganathan@powernet.co.nz

5.4.8.6. System Operator

System Operator
TPSN: 7700
Phone: 0800 THE GRID
system.operator@transpower.co.nz

5.4.9. POWERNET Staff Responsibilities

Within one day of declaration of a Developing event, the Chief Operating Officer will notify the System Operator of the updated contact details including telephone numbers and email address for each of the positions named in Table 3.

Table 3 - PowerNet Staff Responsibilities

Role	***PowerNet* Person Responsible**
Receive communication from Authority	Chief Operating Officer
Receive communication from System Operator	System Control Manager
Implement this plan	Chief Operating Officer
Weekly savings reporting	System Control Manager
Retailer notification	System Control Manager
Revoking rolling outages	Chief Operating Officer
Reporting to Electricity Authority	Chief Operating Officer
Reporting to media, public agencies	Chief Executive or SLT nominee

5.4.10. Rolling Outages Strategy and Methodology

The Chief Operating Officer together with the System Control Manager will review weekly targets and prepare plans for weekly rolling outages based on savings required. The plans will be forwarded to the retailers for customer 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.

5.4.11. Target Monitoring

Actual energy savings will be measured by plotting the normal network load graph during period of planned rolling outages and plotting a saving curve for the same period. This way energy savings can be calculated and monitored.

For load shedding to meet a weekly target, the System Control Manager will monitor energy savings against target and, together with the Chief Operating Officer, review future load shedding. They will adjust future feeder selection to compensate for any under or over achieving of targets. The System Control Manager will be responsible for daily and weekly reporting of consumption relative to target levels. During the period of rolling outages, the System Control Manager will report:

- Daily to the Security Coordinator (at the System Operator) with a week-ahead half hourly forecast of demand at each GXP including the impact of the rolling outages;
- Weekly by email to the System Operator and the Authority with the actual energy usage compared with energy used in corresponding week of previous year.

The System Control Manager will report any under or over achieving of targets to the Chief Operating Officer to enable adjustments to be made in the following week's feeder selection on a three-daily basis.

5.4.12. Log of Rolling Outages

PowerNet's 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 PowerNet's System Controllers is shown in Appendix 7.1. These will be used to monitor the rolling outage program.

5.5. ROLLING OUTAGES

When instructed by the System Operator, following a supply shortage declaration, to reduce demand, rolling outages will be instigated by the System Control Manager as per this plan and outage strategy. The System Control 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 (of more than +/- 20%) is noticed, or expected, from the schedules provided to the System Operator then PowerNet shall advise the System Operator (Security Coordinator) of this change.

Where possible, PowerNet will comply with the priorities in Table 1 to select feeders for rolling outages.

Outages will be programmed between 0800 and 1800 on all days. Night time is excluded from the outage 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.

5.5.1. Feeder Selection

Feeders to be disconnected are shown in Appendix 7.2 to 7.5 Rolling Outage Feeder Schedules. Table 4 to Table 8 are based upon priority guidelines shown in Table 1. Generally, feeders will be chosen from the bottom of the table first. The number of feeders chosen for any week will depend upon the level of savings required to meet target.

Table 4 - Duration of Daily outages per Customer Group for 5% Savings

Customer Group Priority	Maximum Duration	Days per week	Expected Energy Savings
1			0.0000%
2			0.0000%
3			0.0000%
4	4	7	5.2258%
5	4	7	0.5741%
6	4	7	0.5067%
Total			6.3067%

Table 5 - Duration of Daily outages per Customer Group for 10% Savings

Customer Group Priority	Maximum Duration	Days per week	Expected Energy Savings
1			0.0000%
2			0.0000%
3			0.0000%
4	8	7	9.9959%
5	8	7	1.0737%
6	8	7	0.9598%
Total			12.0294%

Table 6 - Duration of Daily outages per Customer Group for 15% Savings

Customer Group Priority	Maximum Duration	Days per week	Expected Energy Savings
1			0.0000%
2			0.0000%
3			0.0000%
4	10	7	12.5115%
5	10	7	1.2932%
6	10	7	1.1934%
Total			14.9981%

Table 7 - Duration of Daily outages per Customer Group for 20% Savings

Customer Group Priority	Maximum Duration	Days per week	Expected Energy Savings
1			0.0000%
2			0.0000%
3	6	7	5.3716%
4	10	7	12.5115%
5	10	7	1.2932%
6	10	7	1.1934%
Total			20.3697%

Table 8 - Duration of Daily outages per Customer Group for 25% Savings

Customer Group Priority	Maximum Duration	Days per week	Expected Energy Savings
1			0.0000%
2	6	7	1.4933%
3	10	7	8.5984%
4	10	7	12.5115%
5	10	7	1.2932%
6	10	7	1.1934%
Total			25.0898%

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

5.5.2. Contingent Events

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

5.5.3. Customer 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 PowerNet for information on the priority of the feeder they are supplied from and outage times.

5.6 Promapp Process

Refer to the following process in Promapp, System Control, Other System Control Processes

Implement a Participant Rolling Outage Plan

6. RECORDS

7. APPENDICES

Appendix 1 – Outage Log
Appendix 2 – Electricity Invercargill Limited Rolling Outage Feeder Names
Appendix 3 – The Power Company Limited Rolling Outage Feeder Names
Appendix 4 – OtagoNet Joint Venture Rolling Outage Feeder Names
Appendix 5 – Electricity Southland Limited Rolling Outage Feeder Names

7.1. Appendix 1 – Outage Log

Date:			Controller:			
Feeder No	Load (amps)	No. of Customers	Time Off	Time On	Duration	Notes

7.2. Appendix 2 – Electricity Invercargill Limited Rolling Outage Feeder Names

Table 9 - Electricity Invercargill Limited Rolling Outage Feeder Names

Feeder	Priority	AUFLS Group	Count of ICP	4 hr Window	6 hr Window	8 hr Window	10 hr Window
LEV 7	6		18	0.0503%	0.0751%	0.0987%	0.1188%
SPY12	5		166	0.0895%	0.1310%	0.1704%	0.2076%
LEV 8	4		99	0.0707%	0.1042%	0.1352%	0.1618%
LEV11	4		97	0.1504%	0.2234%	0.2918%	0.3525%
LEV 6	3		170	0.1094%	0.1600%	0.2088%	0.2527%
LEV10	3		254	0.2417%	0.3553%	0.4610%	0.5527%
SPY 5	3		975	0.0200%	0.0293%	0.0370%	0.0458%
SPY 6	3		794	0.1554%	0.2231%	0.2840%	0.3508%
SPY 7	3		348	0.1910%	0.2753%	0.3489%	0.4314%
SPY 8	3		527	0.0885%	0.1240%	0.1539%	0.1898%
SPY 9	3		453	0.2023%	0.2985%	0.3883%	0.4721%
SPY10	3		686	0.1307%	0.1843%	0.2288%	0.2814%
SPY11	3		1482	0.0535%	0.0779%	0.0991%	0.1230%
SPY13	3		1	0.0176%	0.0258%	0.0331%	0.0399%
SPY14	3		123	0.0265%	0.0395%	0.0522%	0.0647%
LEV12	2		632	0.1370%	0.2029%	0.2643%	0.3285%
LEV13	2		737	0.2669%	0.3895%	0.5066%	0.6160%
LEV 9	1		54	0.0818%	0.1194%	0.1558%	0.1891%
RRD11[2]	6	1	96	0.0505%	0.0739%	0.0946%	0.1161%
RRD 6	3	1	709	0.1940%	0.2878%	0.3728%	0.4530%
RRD 8	3	1	1093	0.1519%	0.2231%	0.2879%	0.3609%
RRD10	3	1	313	0.0515%	0.0727%	0.0901%	0.1126%
RRD12	3	1	781	0.0921%	0.1283%	0.1574%	0.1968%
SOU 6	3	2	1352	0.2318%	0.3400%	0.4362%	0.5463%
SOU 9	3	2	1211	0.1935%	0.2864%	0.3728%	0.4659%
SOU10	3	2	2358	0.2730%	0.4030%	0.5210%	0.6559%
SOU 7[2]	2	2	1	0.0215%	0.0313%	0.0402%	0.0490%
SOU 8	2	2	740	0.1456%	0.2097%	0.2664%	0.3245%

[2] Calculated from total substation load. Will be updated when information becomes available

7.3. Appendix 3 – The Power Company Limited Rolling Outage Feeder Names

Table 10 - The Power Company Limited Rolling Outage Feeder Names

				Percent Energy Saved			
Feeder	***Priority***	***AUFLS Group***	***Count of ICP***	***4 hr Window***	***6 hr Window***	***8 hr Window***	***10 hr Window***
AHL 3	6		26	0.0103%	0.0150%	0.0197%	0.0249%
AWA 1	5		1	0.0213%	0.0314%	0.0371%	0.0371%
AWA 3	5		1	0.0438%	0.0647%	0.0856%	0.1065%
BLF 3	5		141	0.0078%	0.0112%	0.0145%	0.0173%
COL 9[i]	5		36	0.0003%	0.0005%	0.0006%	0.0007%
HIL 3	5		58	0.0028%	0.0037%	0.0044%	0.0052%
IBK 4	5		120	0.0348%	0.0474%	0.0614%	0.0796%
IBK 5	5		98	0.0405%	0.0507%	0.0637%	0.0840%
MAK 3	5		76	0.0696%	0.1035%	0.1365%	0.1674%
MOS 2	5		109	0.0343%	0.0502%	0.0649%	0.0794%
OHA 3	5		61	0.0140%	0.0199%	0.0261%	0.0334%
OHA 5	5		1	0.0271%	0.0404%	0.0529%	0.0619%
SEA 5	5		166	0.0371%	0.0518%	0.0648%	0.0820%
WTN13	5		113	0.0317%	0.0436%	0.0565%	0.0730%
CEN 2	4		1	0.1077%	0.1447%	0.1877%	0.2435%
CHL 1	4		93	0.0250%	0.0358%	0.0466%	0.0596%
CHL 2	4		71	0.0207%	0.0297%	0.0383%	0.0481%
CHL 5	4		1	0.0054%	0.0081%	0.0106%	0.0125%
CHL 6	4		129	0.0324%	0.0459%	0.0604%	0.0778%
COL10	4		1	0.1453%	0.2178%	0.2903%	0.3629%
DIP 1	4		137	0.0506%	0.0721%	0.0950%	0.1217%
DIP 2	4		208	0.0703%	0.0987%	0.1302%	0.1673%
FONT	4		1	1.0238%	1.5304%	2.0395%	2.5541%
GLM 1	4		180	0.0447%	0.0629%	0.0821%	0.1059%
HGH 3	4		155	0.0276%	0.0411%	0.0547%	0.0685%
HGH 4	4		95	0.0395%	0.0589%	0.0784%	0.0982%
HGH 5	4		57	0.0180%	0.0268%	0.0357%	0.0448%
HIL 1	4		135	0.0121%	0.0178%	0.0231%	0.0288%
HIL 2	4		164	0.0283%	0.0409%	0.0531%	0.0662%
IBK 3	4		130	0.0337%	0.0458%	0.0583%	0.0738%
LUM 1	4		205	0.0543%	0.0742%	0.0957%	0.1246%
LUM 2	4		175	0.0587%	0.0850%	0.1128%	0.1428%
LUM 6	4		76	0.0310%	0.0462%	0.0615%	0.0770%
MAK 4	4		2	0.0831%	0.1243%	0.1647%	0.2049%
MAK 7	4		231	0.0479%	0.0659%	0.0851%	0.1097%

Table 10 - The Power Company Limited Rolling Outage Feeder Names

				Percent Energy Saved			
Feeder	**Priority**	**AUFLS Group**	**Count of ICP**	**4 hr Window**	**6 hr Window**	**8 hr Window**	**10 hr Window**
MAT 3	4		169	0.0401%	0.0569%	0.0735%	0.0935%
MAT 4	4		2	0.1177%	0.1755%	0.2328%	0.2880%
MON 2	4		94	0.0085%	0.0126%	0.0167%	0.0208%
MOS 3	4		61	0.0105%	0.0152%	0.0202%	0.0257%
MOS 4	4		178	0.0509%	0.0723%	0.0954%	0.1220%
MOS 5	4		168	0.0461%	0.0653%	0.0863%	0.1110%
NGR 3	4		355	0.0812%	0.1163%	0.1505%	0.1887%
NGR 5	4		261	0.0789%	0.1126%	0.1448%	0.1802%
OHA 6	4		173	0.0623%	0.0852%	0.1112%	0.1429%
ORA 1	4		192	0.0473%	0.0645%	0.0835%	0.1082%
ORA 2	4		114	0.0287%	0.0405%	0.0529%	0.0677%
ORA 3	4		163	0.0398%	0.0541%	0.0702%	0.0907%
OTU 1	4		81	0.0508%	0.0671%	0.0852%	0.1106%
OTU 2	4		124	0.0500%	0.0667%	0.0863%	0.1124%
OTU 4	4		158	0.0704%	0.0923%	0.1182%	0.1548%
OTU 5	4		4	0.0264%	0.0385%	0.0508%	0.0579%
RTN 3	4		101	0.0066%	0.0090%	0.0116%	0.0150%
RTN 4	4		100	0.0092%	0.0125%	0.0158%	0.0206%
RTN 5	4		124	0.0484%	0.0666%	0.0868%	0.1123%
RTN 6	4		138	0.0706%	0.0992%	0.1284%	0.1666%
SEA 4	4		227	0.0668%	0.0914%	0.1197%	0.1576%
SGR 6	4		194	0.0366%	0.0526%	0.0683%	0.0867%
TEA 3	4		355	0.1065%	0.1527%	0.1959%	0.2399%
UND 6	4		1	0.2452%	0.3676%	0.4883%	0.6068%
WAK 2	4		248	0.0548%	0.0771%	0.0998%	0.1279%
WTN10	4		177	0.0542%	0.0734%	0.0948%	0.1236%
WTN11	4		226	0.0916%	0.1328%	0.1766%	0.2230%
LUM 5	3		290	0.0423%	0.0618%	0.0795%	0.0983%
MAK 5	3		385	0.1210%	0.1703%	0.2233%	0.2886%
MAK 6	3		388	0.0620%	0.0880%	0.1135%	0.1447%
MAT 5	3		855	0.0881%	0.1287%	0.1696%	0.2150%
MAT 6	3		214	0.1397%	0.2075%	0.2735%	0.3358%
OHA 4	3		517	0.0805%	0.1169%	0.1544%	0.1965%
OTU 3	3		495	0.0974%	0.1400%	0.1832%	0.2343%
RRD13	3		104	0.0525%	0.0747%	0.0955%	0.1165%
RTN 7	3		665	0.1584%	0.2271%	0.2918%	0.3659%
SEA 6	3		382	0.1443%	0.2142%	0.2841%	0.3478%

Table 10 - The Power Company Limited Rolling Outage Feeder Names

				Percent Energy Saved			
Feeder	**Priority**	**AUFLS Group**	**Count of ICP**	**4 hr Window**	**6 hr Window**	**8 hr Window**	**10 hr Window**
SGR 4	3		1261	0.3436%	0.5066%	0.6583%	0.8060%
SGR 5	3		749	0.1507%	0.2202%	0.2828%	0.3510%
TEA 2	3		168	0.0308%	0.0451%	0.0593%	0.0735%
TEA 4	3		721	0.1243%	0.1826%	0.2376%	0.2951%
TEA 6	3		760	0.0894%	0.1282%	0.1632%	0.1996%
UND 5	3		251	0.0579%	0.0836%	0.1083%	0.1343%
WTN 7	3		522	0.0900%	0.1255%	0.1652%	0.2139%
WTN 8	3		694	0.0696%	0.0942%	0.1221%	0.1578%
WTN 9	3		562	0.2157%	0.3176%	0.4142%	0.5099%
WTN12	3		754	0.1498%	0.2163%	0.2755%	0.3354%
BLF 5	2		195	0.1833%	0.2739%	0.3615%	0.4462%
COL 8	2		3	0.1571%	0.2357%	0.3142%	0.3926%
NGR 4	2		737	0.0882%	0.1300%	0.1686%	0.2096%
ORA 4	2		475	0.1017%	0.1465%	0.1914%	0.2343%
RTN 2	2		904	0.0163%	0.0240%	0.0308%	0.0378%
UND 4	2		336	0.0636%	0.0907%	0.1170%	0.1494%
AHL 5	1		429	0.0114%	0.0163%	0.0207%	0.0256%
NGR 6	1		1341	0.3324%	0.4871%	0.6299%	0.7737%
SEA 3	1		611	0.1615%	0.2396%	0.3146%	0.3929%
SEA 7	1		1052	0.1469%	0.2183%	0.2844%	0.3558%
SGR 3	1		251	0.0557%	0.0796%	0.1022%	0.1303%
TEA 5	1		389	0.0399%	0.0574%	0.0737%	0.0910%
GRD 1	5	1	52	0.0128%	0.0175%	0.0226%	0.0294%
OTA 1	5	1	221	0.0444%	0.0627%	0.0801%	0.1016%
OTA 3	5	1	376	0.0663%	0.0960%	0.1230%	0.1521%
WAI 5	5	1	349	0.0495%	0.0688%	0.0854%	0.1058%
EDN 3	4	1	221	0.0908%	0.1259%	0.1620%	0.2080%
EDN 5	4	1	223	0.1712%	0.2510%	0.3315%	0.4158%
GRD 2	4	1	166	0.0584%	0.0788%	0.0998%	0.1291%
GRD 3	4	1	168	0.0655%	0.0891%	0.1145%	0.1489%
RSD 1	4	1	348	0.0990%	0.1392%	0.1823%	0.2357%
RSD 2	4	1	169	0.0599%	0.0834%	0.1088%	0.1409%
RSD 3	4	1	332	0.0748%	0.1076%	0.1388%	0.1739%
TOK 2	4	1	242	0.0365%	0.0519%	0.0680%	0.0879%
EDN 2	3	1	567	0.1006%	0.1450%	0.1895%	0.2417%
EDN 6	3	1	219	0.0455%	0.0650%	0.0855%	0.1094%
EDN 7	3	1	140	0.0469%	0.0646%	0.0847%	0.1110%

Table 10 - The Power Company Limited Rolling Outage Feeder Names

				Percent Energy Saved			
Feeder	**Priority**	**AUFLS Group**	**Count of ICP**	**4 hr Window**	**6 hr Window**	**8 hr Window**	**10 hr Window**
OTA 2	3	1	686	0.1046%	0.1448%	0.1789%	0.2260%
RRD 5	3	1	347	0.0381%	0.0533%	0.0657%	0.0822%
WAI 3	3	1	1286	0.2493%	0.3597%	0.4555%	0.5645%
WAI 4	3	1	609	0.1762%	0.2565%	0.3320%	0.4056%
RSD 4	2	1	469	0.0883%	0.1266%	0.1642%	0.2084%
TOK 1	2	1	316	0.0432%	0.0630%	0.0813%	0.1016%
WAI 6	2	1	1157	0.2338%	0.3403%	0.4370%	0.5349%
KEN 3	5	2	41	0.2149%	0.3167%	0.4181%	0.5103%
GLM 2	4	2	159	0.0272%	0.0391%	0.0515%	0.0660%
KEL 1	4	2	372	0.0892%	0.1272%	0.1675%	0.2144%
KEL 3	4	2	116	0.0334%	0.0452%	0.0588%	0.0778%
KEL 4	4	2	118	0.0309%	0.0426%	0.0556%	0.0726%
KEN 4	4	2	190	0.0619%	0.0863%	0.1129%	0.1464%
KEL 2	3	2	677	0.1464%	0.2093%	0.2733%	0.3418%
KEN 5	3	2	503	0.1650%	0.2325%	0.3057%	0.3949%

7.4. Appendix 4 – OtagoNet Joint Venture Rolling Outage Feeder Names

Table 11 - OtagoNet Joint Venture Rolling Outage Feeder Names

				Percent Energy Saved			
Feeder	**Priority**	**AUFLS Group**	**Count of ICP**	**4 hr Window**	**6 hr Window**	**8 hr Window**	**10 hr Window**
FIN 2	6		160	0.0488%	0.0714%	0.0936%	0.1181%
MID 2	6		74	0.0197%	0.0291%	0.0378%	0.0479%
WPT 2	6		61	0.0680%	0.0938%	0.1206%	0.1535%
CLK 1	6		56	0.0121%	0.0174%	0.0225%	0.0280%
MLN 1	6		54	0.0476%	0.0699%	0.0932%	0.1174%
CLY 3	6		53	0.0114%	0.0146%	0.0184%	0.0235%
PML 2	6		52	0.0365%	0.0469%	0.0582%	0.0760%
MLN 3	6		46	0.0510%	0.0760%	0.1000%	0.1185%
WPT 3	6		40	0.0201%	0.0294%	0.0389%	0.0489%
HIN 3	6		34	0.0045%	0.0066%	0.0084%	0.0104%
CLK 3	6		33	0.0078%	0.0117%	0.0154%	0.0194%
HYD 2	6		32	0.0070%	0.0101%	0.0134%	0.0166%
HIN 2	6		26	0.0033%	0.0050%	0.0066%	0.0082%
HYD 1	6		25	0.0840%	0.1258%	0.1675%	0.2090%
FIN 3	6		18	0.0243%	0.0360%	0.0470%	0.0543%
MLN 2	5		1	0.0846%	0.1241%	0.1654%	0.1733%
CLY 1	4		225	0.1032%	0.1494%	0.1981%	0.2513%
FIN 1	4		105	0.0636%	0.0871%	0.1127%	0.1451%
MID 4	4		85	0.0199%	0.0295%	0.0386%	0.0487%
DPD 1	4		77	0.0123%	0.0182%	0.0240%	0.0295%
WPT 1	4		71	0.0312%	0.0461%	0.0607%	0.0754%
HIN 4	4		61	0.0126%	0.0186%	0.0245%	0.0306%
LNB CB1	4		44	0.0613%	0.0895%	0.1169%	0.1457%
GFD	4		1	0.2259%	0.3372%	0.4485%	0.5611%
PPCS[3]	4		1	0.8309%	1.2349%	1.6257%	1.9716%
STL 5	4		1	0.0631%	0.0869%	0.1117%	0.1439%
PML 3	3		322	0.0391%	0.0558%	0.0729%	0.0924%
MID 3	3		159	0.0353%	0.0527%	0.0693%	0.0868%
CLK 2	3		67	0.0100%	0.0144%	0.0186%	0.0232%
WAT 3	6	1	285	0.0429%	0.0606%	0.0778%	0.0982%
WAT 2	6	1	262	0.0376%	0.0511%	0.0641%	0.0804%
OWA 2	6	1	252	0.0512%	0.0729%	0.0937%	0.1171%
OWA 3	6	1	207	0.0510%	0.0753%	0.0980%	0.1212%

[3] Fed from FIN-52

Table 11 - OtagoNet Joint Venture Rolling Outage Feeder Names

				Percent Energy Saved			
Feeder	**Priority**	**AUFLS Group**	**Count of ICP**	**4 hr Window**	**6 hr Window**	**8 hr Window**	**10 hr Window**
OWA 4	6	1	136	0.0449%	0.0630%	0.0818%	0.1046%
KAI 4	6	1	85	0.0615%	0.0843%	0.1064%	0.1327%
MER 3	6	1	82	0.0235%	0.0348%	0.0457%	0.0574%
OWA 5	6	1	74	0.0171%	0.0250%	0.0322%	0.0404%
KAI 1	6	1	40	0.0279%	0.0373%	0.0480%	0.0622%
RAN 4	4	1	112	0.0548%	0.0821%	0.1093%	0.1368%
PAT 1	4	1	91	0.0533%	0.0790%	0.1056%	0.1317%
RAN 5	4	1	75	0.0245%	0.0360%	0.0471%	0.0594%
PAT 2	4	1	54	0.0581%	0.0863%	0.1150%	0.1441%
MER 5	3	1	805	0.2665%	0.3950%	0.5233%	0.6469%
RAN 1	3	1	510	0.0799%	0.1168%	0.1515%	0.1903%
MER 2	3	1	473	0.0575%	0.0824%	0.1076%	0.1358%
KAI 3	3	1	453	0.0980%	0.1378%	0.1787%	0.2214%
WAT 1	3	1	425	0.0762%	0.1073%	0.1386%	0.1756%
RAN 3	3	1	412	0.1151%	0.1681%	0.2169%	0.2660%
OWA 1	3	1	193	0.0309%	0.0455%	0.0594%	0.0744%
NBL 2	6	2	237	0.0404%	0.0577%	0.0756%	0.0938%
LAW 1	6	2	163	0.0273%	0.0402%	0.0519%	0.0648%
WHL 2	5	2	228	0.0505%	0.0729%	0.0936%	0.1178%
WHL 4	4	2	271	0.0389%	0.0566%	0.0728%	0.0915%
LAW 3	4	2	254	0.0760%	0.1131%	0.1505%	0.1890%
CLI 1	4	2	204	0.0946%	0.1352%	0.1764%	0.2229%
GLN 1	4	2	184	0.0729%	0.1020%	0.1339%	0.1738%
CLY 2	4	2	182	0.1311%	0.1736%	0.2191%	0.2763%
CLY 4	4	2	130	0.1101%	0.1427%	0.1778%	0.2253%
NBL 3	4	2	120	0.0142%	0.0197%	0.0253%	0.0318%
CLI 3	4	2	109	0.0651%	0.0860%	0.1081%	0.1379%
WHL 1	4	2	80	0.0220%	0.0303%	0.0386%	0.0504%
ELD 3	3	2	602	0.2197%	0.3264%	0.4299%	0.5351%
NBL 1	3	2	525	0.1580%	0.2337%	0.3059%	0.3792%
ELD 1	3	2	502	0.2604%	0.3800%	0.4980%	0.6117%
CHS 3	3	2	448	0.1502%	0.2201%	0.2852%	0.3520%
CHS 4	3	2	417	0.1263%	0.1827%	0.2437%	0.3071%
CLI 2	3	2	382	0.1031%	0.1503%	0.1977%	0.2491%
PAL 2	3	2	377	0.0979%	0.1427%	0.1871%	0.2313%
CHS 1	3	2	337	0.2034%	0.2967%	0.3875%	0.4755%
ELD 2	3	2	330	0.1418%	0.2077%	0.2700%	0.3290%

Table 11 - OtagoNet Joint Venture Rolling Outage Feeder Names

				Percent Energy Saved			
Feeder	***Priority***	***AUFLS Group***	***Count of ICP***	***4 hr Window***	***6 hr Window***	***8 hr Window***	***10 hr Window***
CHS 2	3	2	324	0.1488%	0.2190%	0.2849%	0.3458%
PAL 3	3	2	311	0.0863%	0.1271%	0.1672%	0.2093%
NBL 4	3	2	309	0.1021%	0.1385%	0.1777%	0.2259%
PAL 1	3	2	273	0.1350%	0.2021%	0.2683%	0.3329%
LAW 2	3	2	243	0.0562%	0.0828%	0.1075%	0.1329%

7.5. Appendix 5 – Electricity Southland Limited Rolling Outage Feeder Names

Table 12 - Electricity Southland Limited Rolling Outage Feeder Names

				Percent Energy Saved			
Feeder	***Priority***	***AUFLS Group***	***Count of ICP***	***4 hr Window***	***6 hr Window***	***8 hr Window***	***10 hr Window***
RMK 7	5		123	0.0319%	0.0476%	0.0631%	0.0774%
RMK 12	5		25	0.0030%	0.0046%	0.0061%	0.0073%
RMK 8	4		128	0.0208%	0.0305%	0.0394%	0.0468%
RMK 11	3		599	0.0741%	0.1066%	0.1380%	0.1719%