Warning: Printed copies of this document not in an official Manual MAY NOT BE THE LATEST. The most up-to-date version is located on the Intranet.

Participant Rolling Outage Plan (PROP)

Document Register

Document Author:	Name:	Andrew Twaddle
	Position:	Network Operations Manager

Document Reviewer:	Name:	Andrew Twaddle
	Position:	Network Operations Manager

Document Recommender:	Name:	Nick Merrington
	Position:	Engineering Planning Manager

Document Approver:	Name:	Waqar Qureshi
	Position:	General Manager Asset Management

Revision Register

Revision	Issued	Reason for revision	Change reference	Supersedes
0	28/Mar/2017	Draft for internal review		
1	31/Mar/2017	For Internal Approval		0
2	3/Apr/2017	For SO Approval		1
3	12/Oct/2020	Approved for External Disclosure		2
4	3/Apr/2023	Generally Updated		3
5	20/Aug/2024	Update Contact Details, refer to section 7 of this document for a complete list of the changes in this version.		4
End of Revision Register				

Document Review

A document review shall be conducted no more than 3 years from the date of this revision, or at such a time changes may be required due to a change of policy, scope, or technical content.

CONTENTS

1. Purpose

Electricity distribution quality depends upon many factors including the balance of generation capacity and load consumption. Certain events, including a shortfall in generation capacity, system failure or load increase, could cause widespread disruption. As a result, the Electricity Authority (EA) requires all participants to develop and publish Participant Rolling Outage Plans (PROP), as outlined in the requirements of Electricity Industry Participation Code 2010 (the Code) Parts 9.4 (d through f), 9.6 to 9.13 and the System Operator Rolling Outage Plan (SOROP), sections 5 and 6

Wellington Electricity Lines Ltd (WELL) has prepared this plan to comply with the code and provides for the management and coordination of planned outages as an emergency measure during energy shortages.

Under the Code, PROP is required to specify the actions that would be undertaken to reduce the consumption of electricity to:

- When a supply shortage is declared by the System Operator (SO); and
- Comply with the requirements of the SO's Rolling Outage Plan (SOROP); and
- Comply with the Code and subsequent amendments.

Reducing demand by disconnecting supply to consumers would be the last resort after all other load reduction efforts, including voluntary savings, were employed. Wellington Electricity will always endeavour to keep consumers supplied. Consumer disconnection will only occur when WELL is directed to by the SO or for safety reasons.

While this is Wellington Electricity's planned response, a change in circumstances or network conditions may require Wellington Electricity to adjust this plan to operating conditions at the time.

2. Definitions

Table 1: Definition

Terms	**Definitions**
AUFLS	Automatic Under Frequency Load Shedding
EA (the Authority)	Automatic Under Frequency Load Shedding
Feeder	A high voltage supply line typically supplying between 100 and 2000 customers
GEN	Grid Emergency Notice
NCR	Network Control Room
GXP	Transpower Grid Exit Point
PROP	Participant Rolling Outage Plan
NGOC	National Grid Operations Centres (Auckland and Christchurch)
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

SCADA	Supervisory Control and Data Acquisition
SOROP	System Operator Rolling Outage Plan
Supply Shortage Declaration	Declaration made by the System Operator under Part 9 of the Code
SO (System Operator)	The operator of the national electricity transmission grid, Transpower has been given the SO responsibility
IL	Interruptible Load
The Code	Electricity Industry Participation Code 2010
IR	Instantaneous Reserves

3. References

Table 2: References

Reference Standards	Title	Page
ERS- 001	Major Event Management Plan	10, 13, 17
ERS- 003	Emergency Load Shedding Strategy	As reference only
Wellington Life Lines Group	Priority Utility Sites Project Report	15
SOROP	System Operator Rolling Outage Plan	Version May 2016
The Code	Electricity Industry Participation Code 2010	Part 9
ENP-008	Detailed Methodology for Implementing a Rolling Outage	
End Of References		

4. Background

4.1. Electricity Authority

The Electricity Authority is an independent Crown entity responsible for the efficient operation of the New Zealand electricity market. Although independent, the Authority is required, among its other roles, to pursue the statutory objective set for it in the Electricity Industry Act 2010 (Act).

4.2. Transpower

Transpower is a State-Owned Enterprise, tasked with owning and operating New Zealand's National Grid - the network of high voltage transmission lines and substations that transports bulk electricity from where it is generated to distribution line companies such as Wellington Electricity.

As the System Operator Transpower manages the real-time operation of New Zealand's electricity transmission system. The System Operator ensures that at any time the energy supplied to the network is matched by the energy demand of all the loads connected to the network.

4.3. 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:

- Insufficient generation
- Insufficient transmission capacity

Which, for example, can be caused by:

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

The first cause above (i) could lead to an energy shortage developing over time.

The second cause (ii) would occur with little or no warning and could lead to a shortage of transmission capacity.

The third cause (iii) could occur with little or no warning, as well as possibly leading to an energy shortage developing over time.

Any of these could be significant enough to warrant a Supply Shortage Declaration.

4.4. The Authority's Response to Security of Supply Emergencies

In general, events that could lead the System Operator to declare a supply shortage can be categorized as:

- **Developing Event –** Events that evolve over a period. For example, low hydro lake or fuel levels over an extended period.
- **Immediate Event –** Events that occur with little or no warning, usually as a result of a transmission line or major generation failure.

During a Security of Supply Emergency, both a Developing Event and an Immediate Event will be treated by Wellington Electricity as a major incident as per Wellington Electricity's Major Event Management Plan ERS-001. The Major Event Team comprises senior Wellington Electricity operational managers and asset specialists as required.

4.5. Wellington Electricity

4.5.1. The Network

Wellington Electricity's distribution network supplies the cities of Wellington, Porirua, Lower Hutt and Upper Hutt. Wellington City is one of the major metropolitan centres in the country with high-density commercial developments. It is also the seat of government and includes Parliament Buildings and the head offices of most government departments. A map of the supply area is shown in Figure 1.

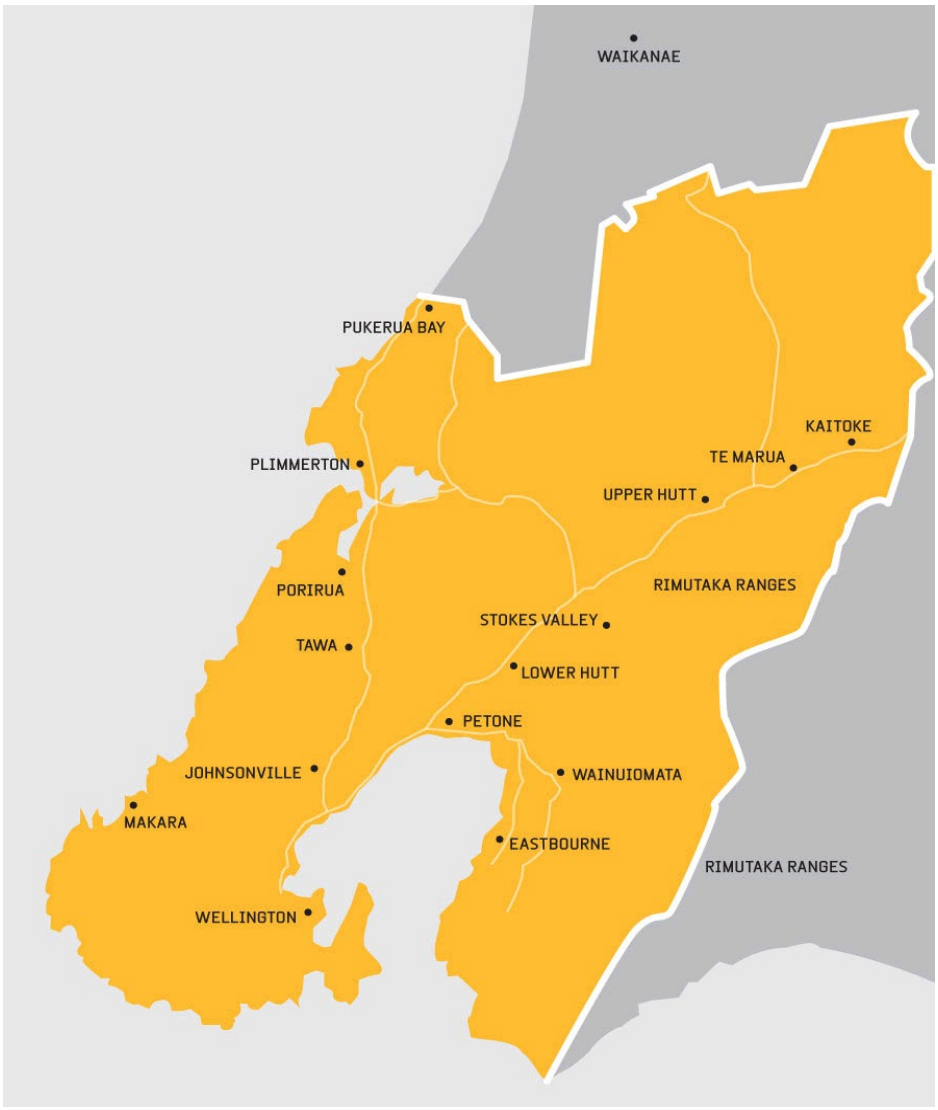

Figure 1 The Wellington Electricity Network Area

The Wellington CBD is the largest business and retail centre for the region, although there are also significant retail centres in Lower Hutt, Porirua and Upper Hutt. Apart from within the CBD there is widespread residential load throughout the network area. This is interspersed with pockets of commercial and light industrial load.

Wellington Electricity's network is supplied from the Transpower-owned national transmission grid through nine grid exit points (GXPs). Central Park, Haywards and Melling supply the network at both 33 kV and 11 kV. Kaiwharawhara supplies it at 11 kV only. The remaining GXPs (Gracefield, Pauatahanui, Takapu Rd, Upper Hutt and Wilton) all supply the network at 33 kV only.

4.5.2. Wellington Electricity's Means of Reducing Load

Wellington Electricity can reduce load directly by turning off domestic water heaters, or by disconnecting customers. It can also influence the load indirectly through advertising campaigns, etc., asking customers to reduce or modify their electricity usage.

Reducing demand by disconnecting supply to consumers would be the last resort after all other forms of energy savings, including voluntary savings, had been employed. Wellington Electricity will always endeavour to keep supply to customers in a safe manner.

Water heating load reduction is only useful to reduce peak demand. It is of almost no value for energy saving because users simply transfer their energy usage to later in the day.

Additional load reductions for response to immediate events, or effective load reductions for energy savings, would require disconnecting customers.

This can be achieved through automatic reduction, such as Automatic Under Frequency Load Shedding (AUFLS), or through manual load reduction, as would be used to implement a PROP.

In the following two Sections the actions required to deal with an Immediate Event and a Developing Event respectively, are detailed.

4.5.3. GXP with PROP Feeders

Table 3 sets out Wellington's GXP at which rolling outages may occur or will not occur.

Table 3: GXP with PROP

GXP	Rolling Outage May Occur (Yes/No)	The reason why rolling outages will not occur
CPK	Yes	
KAI	Yes	
TKR	Yes	
PNI	No	Reserved for AUFLS
HAY	Yes	
GFD	Yes	
MLG	Yes	
UHT	Yes	

5. Actions for an Immediate Event

5.1. Automatic Reduction

Transpower, as the System Operator, is required to keep enough reserve generation to cover the risk of the largest generator tripping. They are also required to keep the system frequency at 50 Hz. 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 generators can pick up the load. Automatic load-shedding groups reduce the load in stages until the frequency stabilises.

To recover from Immediate Events electricity consumption can be reduced by:

5.1.1. Reserve Market

Generators with reserve capacity and users with Interruptible Load (IL) (such as distribution networks), offer reserve capacity to the Instantaneous Reserves (IR) Market to cover the risk

of the largest generating unit, or a critical transmission line, tripping. Wellington Electricity offers its water heating load into the Reserve Market. The percentage of average annual demand available for interruptible load is shown in Table 4.

Table 4: GXP with PROP

GXP	Percentage of average annual demand available for interruptible load (%)[1]
CPK11	6%
CPK33	6%
KAI	5%
TKR	3%
PNI	2%
HAY11	5%
HAY33	6%
GFD	4%
MLG11	4%
MLG33	4%
UHT	4%
WIL	5%

Tripping of water heaters in this case is automatic in response to grid events and in the event the system frequency drops below 49.2Hz. This is part of SO's Contingency Event (CE) recovery scheme, designed to avoid further frequency drops to below 48 Hz, which is categorised as an Extended Contingency Event (ECE).

Generally, the water heaters are only turned off for a short duration and because of the inherent storage capacity of water heaters, there is little or no effect on customers. Once spinning reserve generators take up the load lost by the disconnected generator, the water heaters are gradually switched back on.

5.1.2. Disconnecting Customers

If the load shed by the Reserve Market tripping is insufficient to stabilise the network or if the frequency falls below the reserve market threshold, further automatic load reduction is required.

Each distribution company including Wellington Electricity is required, unless exempted, to always have available two blocks of load (each comprising 16% of its total instantaneous load) to be shed by automatic under-frequency relays should an AUFLS event occur.

[1] The information is extracted from WELL's Ripple Test Analysis carried out in 2015. These values are aimed to be revised by a new load drop test before the next PROP submission.

- **AUFLS Block 1**

This will automatically disconnect a minimum of 16% of Wellington Electricity's load by disconnecting customers' supply. Block 1 load is shed if the system frequency drops below 47.8Hz.

- **AUFLS Block 2**

This will automatically disconnect a further 16% of Wellington Electricity's load if the system frequency is not recovered within 15s after the Block 1 operation or the system frequency further drops to below 47.5Hz.

Note: a large drop in frequency may cause an AUFLS trip before the sustained reserve market operates.

5.2. Communications

It is expected that the System Operator will make most communications with the Network Control Room via the Transpower National Grid Operations Centres (NGOC) as this is the normal line of communications for operational matters.

5.3. Manual Load Reduction

Under certain circumstances, the System Operator may request Wellington Electricity to manually shed load. Under the Code, Wellington Electricity must comply with this request. The manual load reduction involving rolling outages shall follow the procedure for a Developing Event as detailed in Section 6.

5.4. Supply Restoration

Restoration of the 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. Transmission Grid Emergency

If the System Operator requests Wellington Electricity to reduce load under a Grid Emergency Notice (GEN), Wellington Electricity will commence shedding all water heating load, and then if necessary shed feeders as per Wellington Electricity's Emergency Load Shedding Strategy ERS-003.

If a transmission grid emergency was declared during an Immediate Event, the grid emergency would take priority.

6. Actions for a Developing Event- Implementing the PROP

Rolling outages will be a mechanism for managing Developing Events, although reducing demand by disconnecting supply to consumers would be the last resort after all other forms of energy savings, including voluntary savings, had been employed.

If the System Operator instructs a load reduction after declaring a supply shortage then Wellington Electricity must reduce demand to meet the System Operators targets. The targets may be a weekly energy savings target that is reviewed each week. To reduce energy usage, Wellington Electricity would disconnect feeders (rolling outages) in a controlled manner as per the PROP to enable targets to be reached.

6.1. Authorisation to Receive Direction and Activate the PROP

6.1.1. Declaration of a Developing Event

During a developing event, the System Operator will endeavour to provide at least 14 days prior notice of the requirement for weekly energy savings and any increase in the weekly energy savings target.

Upon declaring a supply shortage, the System Operator will specify the energy savings target to be enforced for a specific region for a specified timeframe.

Wellington Electricity will acknowledge receipt of a direction to save energy, as required under Section 6.13 of the System Operator's PROP. The Network Operations Manager will acknowledge that they have received the direction to save energy by returning an email to the System Operator with the email address system.operator@transpower.co.nz.

Upon receipt of direction from the System Operator to prepare for rolling outages, Wellington Electricity's NCR Duty Operator, will inform Wellington Electricity's management, who will activate the Major Event Management Plan ERS-001. The Network Control Room (NCR) Controller will then commence specific rolling outage plan preparations to meet the requirements of the instructions issued by the System Operator. Final authorisation to commence a programme of rolling outages will be made by Wellington Electricity's Chief Executive Officer.

The System Operator is expected to manage general media advertising of the need to conserve electricity and impending rolling outages when they are requested.

6.1.2. Rolling Outages

When instructed by the System Operator to reduce demand, rolling outages will be instigated by Wellington Electricity's Network Operations Manager following authorisation from Wellington Electricity's Chief Executive Officer, as per this plan and outage strategy. The Network Operations Manager will ensure that a load-shedding schedule is prepared in advance, and load is controlled and monitored to meet desired targets.

6.1.3. Key Communication Roles

Key personnel, who will be expected to receive the instructions, and activate the PROP, are:

Table 5: Key Personnel Involved with the PROP

Communications with:	Communications Type:	Wellington Electricity Position:	Contact Number:
System Operator	Operational matters	Network Control Room Controller	04 570 3751
	Managerial and administrative matters	Network Operations Manager	021 199 3133
	Escalation	GM Asset Management	027 285 0637
Retailers	General Retailer Notifications	Team Leader Outage Planning, Network	04 915 6156 021 653 608
	Formal Communications	Customer Services Manager	04 915 6162 021 114 5155
Public Agencies	All enquiries	CEO	04 915 6113 021 422 364
Media	All enquiries	Media Enquires Service Desk	04 915 6118
	Media Statements	CEO	04 915 6113 021 422 364

The Address for Wellington Electricity is: 85 The Esplanade, Petone
PO Box 31049
Lower Hutt 5040

It is expected that the System Operator will make most communications with the Network Control Room via the Transpower National Grid Operations Centres (NGOC) as this is the normal line of communications for operational matters.

6.1.4. Retailer Agreements

Currently, Wellington Electricity do not have any agreements with retailers or consumers which would adversely affect Wellington Electricity's ability to comply with System Operator directions.

6.2. Implementing Rolling Outages

Wellington Electricity has developed a methodology for determining the level of load shedding required to meet the target savings instructed by the System Operator.

By assessing the following documents, Wellington Electricity will prepare a rolling outage plan which outlines the participating feeder's shed and restore times that are required to achieve the energy-saving targets:

- An up-to-date list of AUFLS feeders, and a list of PROP feeders.
- A schedule of half-hourly kWhr values for each 11kV feeder for the present period but in the previous year.
- A spreadsheet to calculate potential 'savings' for any given feeder shedding strategy.

6.2.1. Rolling Outages Timeline

The System Operator will endeavour to provide at least 14 days prior notice of the requirement for weekly energy savings and any change in the weekly energy savings target. This would allow the following timeline to be followed for pre-outage planning, actual load shedding, and continuing adjustment each week of the shedding schedule based on observed savings in the previous week.

Table 6: Rolling Outages Timeline

WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6
Savings target received		Rolling outages commence →			
Feeders selected for rolling outages	Stakeholders notified of pending outages for the following week	Stakeholders notified of pending outages for the following week	Stakeholders notified of pending outages for the following week	Stakeholders notified of pending outages for the following week	Stakeholders notified of pending outages for the following week
			Savings calculated. Adjustments made to schedule if required for week 5	Savings calculated. Adjustments made to schedule if required for week 6	Savings calculated. Adjustments made to schedule if required for week 7

6.2.2. Allocating Feeders to PROP Categories

The desired criteria for selecting feeders suggested by the System Operator (shown in Table 7) are to be included in rolling outages to ensure public health and safety is preserved and costs to the economy are minimised. This document has been drafted assuming that AUFLS feeder allocation and the rolling outage plan feeder allocation will need to be managed separately. (refer 6.2.6).

Table 7: Priority Load

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, and public passenger transport.
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 as recommended by the System Operator are intended as guidelines and, because rolling outages will be implemented on a feeder-by-feeder basis, it is not always possible to discriminate between individual customers on the same feeder. For example, a predominantly residential feeder may also have small pockets of commercial or industrial customers.

In addition, the Wellington Lifelines Group undertook the Priority Utility Site Response and Recovery project in 2007, and this was reviewed in 2013. The project aimed to identify key community facilities and utility sites that are essential to support the recovery of the community following a major emergency and to identify their service restoration requirements.

For the Lifelines project, the key service providers across health and safety and public services selected the priority depending on their circumstances. The service providers have been grouped into various sectors and types of sites within a sector.

Some of the sectors have multiple priority levels, these have been considered and where practical these have been factored into feeder selections.

Lifelines Priorities:

Priority 1 No functionality or service delivery can be maintained without this supply
Priority 2 Some functionality or service delivery can be maintained without this supply
Priority 3 Functionality or service delivery can generally be maintained without this supply

Table 8: Wellington Lifelines Group Priorities

Priority	Sector
1	Fuel (diesel, petrol), Electricity (lines company), Emergency Management, Water Supply, key Community Facilities (Hospitals), sections of the electricity transmission and distribution, and major fuel terminals. Telecommunication exchanges and sites, airports, and Wastewater pumping Stations.
2	Emergency Management, key Community Facilities (Hospitals), sections of the electricity transmission and distribution, and major fuel terminals. Telecommunication (TV and radio transmission) exchanges and sites, Transport (harbour, rail and airports), Waste Water (pumping Stations and treatment plants), Water Supply (pumping stations and treatment plants)
3	Emergency Management, key Community Facilities (Hospitals), Waste Water (pumping Stations)

Feeders for shedding will be targeted based on the load types in accordance with the priorities. Residential consumption varies from about 35% to 51% of the total energy over Wellington's

network. Most feeders have some residential customers but those with the highest proportion of residential customers and the least number of Priority 1 and 2 customers will be targeted for rolling outages.

Wellington Electricity shedding categories:

Taking the above information into account, Wellington Electricity has developed a list of all feeders, with each allocated to a **Category - 1, 2 or 3**. Category 1 feeders (typically residential, commercial outside CBD) are the ones most readily shed; Category 2 feeders (typically commercial in CBD, industrial) are to be shed less; and Category 3 feeders (which are all critical load feeders) should never be shed, but if required, individual non-critical loads can be individually isolated at the distribution substation level to reduce load.

These same criteria were also used to select feeders for AUFLS tripping. AUFLS load blocks are predominantly taken from Category 1, thus leaving a considerably reduced number of feeders for possible rolling outages use in Category 1, unless an AUFLS exemption is granted by the System Operator. Without such an exemption, Category 2 (and possibly Category 3) feeders must be included in rolling outages. However as total load decreases during rolling outages, the amount of load required for AUFLS will also decrease and some feeders reserved for AUFLS blocks will need to be included in the rolling outages.

Note: Transpower supplies Wellington Electricity from nine grid exit points. Feeders from each of these are included in the shedding schedules.

6.2.3. Schedule of the Previous Year's Half-Hourly kWhr Values

Savings targets under rolling outages will be specified as an energy savings percentage compared to the same period in the previous year. The shutdown duration and the number of feeders selected for rolling outages will depend upon the savings required.

To compare present energy consumption with the level from a year before, it is important to have access to a schedule of half-hourly kWhr data from the previous year.

The Wellington Electricity Asset & Planning team will ensure that it has this data from the previous year readily available at all times.

6.2.4. Feeder Shedding Schedules

A Shedding Spreadsheet to calculate potential 'savings' for any given feeder shedding strategy has been developed. In preparing for a period of rolling outages this will be the tool used by the Asset and Planning team to produce a schedule of feeders to be shed and restored at various times throughout the day.

ENP-008 – Detailed Methodology for Implementing Rolling Outages describes the process used to develop feeder shedding schedules for a savings scenario using the Shedding Spreadsheet.

The Asset and Planning team will provide this feeder switching schedule to the Network Control Room controllers who will confirm that the feeders are available for switching and will then send a copy to the System Operator.

Except during periods when savings of 25% are required, outages would be scheduled between 0800 and 1800 Monday to Friday. Saturday and Sunday shedding would need to be included for savings targets greater than 10%.

The Shedding Spreadsheet also calculates how much of the AUFLS load needs to be shed to maintain the AUFLS loads at 16% per block, as the load is decreased through rolling outage shedding. In addition to this requirement, the shedding of the AUFLS load also contributes to achieving the savings target.

Given that the actual selection of feeders during any outage will most likely diverge from this plan due to operational considerations the schedule of feeders is not made publicly available to avoid any confusion regarding which feeders are to be disconnected. In the event of pending

rolling outages Wellington Electricity will advise retailers at the time who can then in turn advise their customers.

6.2.5. Shed Times Required to Meet Savings Targets

Participant Rolling Outage Plans must be capable of achieving a level of energy savings of up to 25% relative to the same period in the previous year. The target savings specified by the System Operator will allow for savings that may already be occurring as a result of other measures, including a national conservation campaign.

However, as a starting point, the Shedding Spreadsheet was used to find shedding strategies that would have achieved energy savings of 5%, 10%, 15%, 20% and 25% respectively, if nothing else had changed from the previous year. The required shedding times calculated for a typical winter week and a typical summer week are shown in Figure 2.

Feeder off Times - Winter

WE* PROP Feeder Shedding Priority	1	2	3			
Weekly Savings Target	Hours off per Day			Days per Week	Savings from PROP Feeders	Savings from AUFLS Feeders
5%	3	1	0	5	1.9%	3.1%
10%	6	2.5	0	6	4.6%	5.4%
15%	6.5	5	0	7	7.5%	7.5%
20%	9	8.5	0	7	11.4%	8.6%
25%	10.5	10	0	7	14.0%	11.0%

Feeder off Times - Summer

WE* PROP Feeder Shedding Priority	1	2	3			
Weekly Savings Target	Hours off per Day			Days per Week	Savings from PROP Feeders	Savings from AUFLS Feeders
5%	4	2	0	5	2.5%	2.5%
10%	7	3.5	0	6	5.4%	4.6%
15%	7.5	6	0	7	8.3%	6.7%
20%	9.5	9	0	7	11.9%	8.1%
25%	11.5	11	0	7	14.5%	10.5%

Figure 2: Feeder Off Times

The Table above shows that:

- For high saving targets the necessary shed times would be very long.
- Category 3 PROP feeders have not been included for shedding (due to these feeders supplying some emergency services).
- Note, that whenever the load is shed for rolling outages, proportions of the AUFLS block loads may also need to be shed to maintain each AUFLS block's load at 16% of the then-current load. This will be decided as part of the saving target calculation during event planning, as well as reviewed as part of the new Extended Reserve scheme.

The Tables above do not:

- Consider the additional savings that will have been achieved through v voluntary savings. As the impact and extent of these savings are unknown, it

becomes imperative to be able to amend a shedding strategy regularly, based on savings achieved.

6.2.6. AUFLS Under Rolling Outages

The level of AUFLS during a rolling outage scenario needs to be maintained, Wellington Electricity will either:

- Exclude the current AUFLS feeders from its rolling outage plans, which means that supply to lower value loads may be maintained (but armed for AUFLS) while higher value loads are cut, or;
- Include AUFLS feeder shedding but limit the shedding to ensure that two AUFLS blocks of 16% are maintained, which is, if 20% of the total load is shed, a similar percentage of AUFLS allocated load is to be shed at the same time, or;
- Arm additional higher-value load feeders to supplement the AUFLS load, and exclude these from the rolling outage plan.

This document is drafted assuming that AUFLS feeders are excluded from shedding.

6.2.7. Load Variation

To ensure the national transmission network remains stable during rolling outages, Wellington Electricity will use the 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 the morning and evening peaks).

6.2.8. Logging Rolling Outages

The NCR Operators will record times of disconnection and reconnection of all feeder interruptions. The log sheet to be used by the NCR Controllers would record the same information required by the Rolling Outage Log sheet shown in Appendix A.

The Asset and Planning team will use this log and daily recalculate the achieved savings and alter the feeder switching schedule as appropriate to maintain the target level required.

6.2.9. Supply Restoration

Load disconnected during rolling outages must be restored in conjunction with the System Operator. This is to prevent overloading the transmission network and creating further instability. Wellington Electricity will ensure that all feeders are returned to service in a controlled manner to maintain system stability

6.2.10. Other Planned Outages

During periods of rolling outages, Wellington Electricity will consider postponing planned outages for maintenance and project work.

6.2.11. Contingent Events

If an unplanned event occurs that can alter the planned rolling outages, Wellington Electricity's Major Event Team will, (as per ERS-001 Major Event Management Plan) be responsible for all decisions and communication with stakeholders of any changes to the advertised program.

6.2.12. AUFLS Exemption

The System Operator may decide in certain conditions that one or both AUFLS blocks are not required for grid security and release distributors from the AUFLS requirement. This would enable Wellington Electricity to select feeders normally reserved for AUFLS to be used in rolling outages. However, if network conditions change, the System Operator may revoke the exemption at any time. Due to the commitment to customer notification prior to rolling outages,

exempted AUFLS groups (if any) are unlikely to be included in planned outages because of the uncertainty of their availability.

6.3. Coordination with Grid Emergencies

Arrangements to manage grid emergencies (as defined in Part 1 of the Code) will take immediate priority over the implementation of rolling outages. On receipt of a GEN (Grid Emergency Notice) from the System Operator, Wellington Electricity's NCR Controllers are authorised to take all necessary operational steps including the shedding of high voltage feeders where necessary to comply with the requirements of the GEN. The duty NCR Controller will initiate a priority notification.

If a Developing Event is in place, the Grid Emergency will take precedence.

The impact of such a Grid Emergency on energy consumption (reduction) will need to be taken into account when assessing the savings achieved for the Developing Event. The shedding schedule for the week may be adjusted once the Grid Emergency is over. Or else, at the very least, it needs to be accounted for in preparing the shedding schedule for the next shedding period.

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

6.4. Maintaining Performance over Time

At the end of a week of rolling outages, the 'success' of the employed shedding strategy can be assessed. This assessment is also required to be able to fine tune the shedding strategy for the next week, as per the process outlined in the Rolling Outages Timeline of Table 3. Adjustments can even be made to the shedding strategy for the week in which the assessment is being carried out.

From the Rolling Outages Log it is possible to calculate how long individual feeders were disconnected.

From the load data for the previous week, and that of the same period a year earlier, it is also possible to compute the amount of energy actually 'saved'. Ideally, this would equate to the energy savings target being aimed for. If the target has been met, then the same shedding strategy can be used in the subsequent week.

In reality, the 'savings' achieved may be different from the target value, and the shedding strategy needs to be amended for the following week, taking into account:

- The extent by which the two differ (this would consider both the effect of customers' voluntary savings, as well as the changes in customers' electricity usage patterns under these changed conditions),
- Differences between the proposed shedding schedule for the previous week, and the shedding that did occur during the week (as recorded on the rolling outage logs), and
- Any changes to the savings target required by the System Operator.
- Amount of load that has a storage capacity, e.g. hot water cylinders and battery banks, the total energy consumption is still the same but just gets deferred during the outage process.

The Shedding Spreadsheet would be used to determine a shedding schedule with a 'savings' outcome modified as necessary to achieve the required target value.

6.5. Monitoring and Reporting Performance Against Targets

The processes described in Section 6.2 would be used to monitor and to enable reporting of, the savings achieved.

For load shedding to a weekly target, the Network Control Room team will monitor energy savings against the target and, together with the Network Operations Manager and Asset & Planning team, review the future load shedding to increase or decrease the amount of rolling outages to enable the weekly target to be met.

The Network Operations Manager will be responsible for preparing daily reporting of consumption relative to the target levels and will also be responsible for providing the predicted load for the next week on a seven-day rolling basis. This will be supplied to the System Operator via the Network Control Room and National Grid Operations Centres (NGOC)).

The General Manager Asset Management will report overall compliance to the System Operator.

6.6. Load Restoration

Load disconnected during rolling outages will be restored in conjunction with the System Operator. This is to prevent overloading the transmission network and creating further instability.

It is expected that the System Operator will make most communications with the Network Control Room via National Grid Operations Centres (NGOC)) as this is the normal line of communications for operational matters.

A direction from the System Operator to revoke the supply shortage declaration is to be directed in the first instance to the Network Control Room and follow this by an email to WENetworkControlRoom@Welectricity.co.nz. This will advise the Network Control Room, and Wellington Electricity personnel responsible for advising customers, the media, essential services, etc. Any load still disconnected will need to be restored in a controlled manner in conjunction with the System Operator.

6.7. Communication Strategy

Communication with retailers, civil defence and other stakeholders will be as per normal notification procedures described in Wellington Electricity's Major Event Management Plan ERS-001.

When requested to reduce demand with rolling outages, Wellington Electricity will endeavour to advise customers in advance through media channels, of pending outages. Because demand varies from day to day the time and extent of advertised outages will be approximate.

It is not possible for Wellington Electricity to prevent rolling outages affecting individual vulnerable customers and priority sites. In addition to the prioritisation of rolling outage feeder, Wellington Electricity 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

7. Summary of Changes

This section outlines the major changes made from the previous version of this document.

Section 6.1.3 – Key Communication Roles

- Table 5: Key Personnel Involved with the PROP - Update contact phone numbers.

8. Appendix-A

8.1. Rolling Outage Log

LOAD SHEDDING PERIOD: from _____ to _____ page _____ of _____

SUBSTATION NAME	CIRCUIT BREAKER NUMBER	FEEDER CATEGORY	TIME OPENED	TIME CLOSED	SHED DURATION (hrs)	LOAD DROPPED (kW)	LOAD RESTORED (kW)	APPROX kWhr SHED	COMMENTS
			T_1	T_2	(T_2-T_1)	L_D	L_R	***	
							TOTAL		

*** Approx kWhr Shed calculated as = $0.5*(L_D+L_R)*(T_2-T_1)$

Figure 3: Rolling Outage Log

End of Document