Participant Rolling Outage Plan

ERS-007

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Revision	Issued	Reason for revision	Change reference	Supersedes
1		Clarifications from the EC		
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Contents

1. Purpose

Wellington Electricity Line Ltd has prepared this plan to comply with the Electricity Authority's System Operator Rolling Outage Plan (SOROP) requirements – (Issued by the Electricity Commission (now the Electricity Authority) on 30 Sept 2010). The SOROP in turn meets the requirements of Part 9 of the Electricity Industry Participation Code 2010 (the Code).

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

- Reduce electricity consumption when a supply shortage is declared by the System Operator;
- Comply with requirements of the Electricity Authority's System Operator Rolling Outage Plan (SOROP); and
- Comply with the Electricity Industry Participation Code 2010 and subsequent amendments.

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

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

AUFLS	Automatic Under Frequency Load Shedding
EA (the Authority)	Electricity Authority
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
TGO	Transpower 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	System Control and Data Acquisition
SOROP	System Operator Rolling Outage Plan
Supply Shortage Declaration	Declaration made by the Electricity Authority under Part 9 of the Code
SO (System Operator)	Operator of the national electricity transmission grid
The Authority (EA)	Electricity Authority
The Code	Electricity Industry Participation Code 2010

3. References

Reference	Title	Page (s)
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	
The Code	Electricity Industry Participation Code 2010	
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).

A function of the Electricity Authority under the Electricity 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 consumers to manage price risks in the market.

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. It ensures that at any one time the energy supplied to the network is matched by the energy demand of all the loads supplied by 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 could lead to an energy shortage developing over time.

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

The third cause 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 constitute a Security of Supply Emergency.

4.4 The Authority's Response to Security of Supply Emergencies

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

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

The SOROP outlines how the Authority intends to deal with security of supply situations of different severities. The most severe is a Security Emergency Phase situation, which would be triggered when hydro storage fell below the 'Emergency Storage Guideline', or when some other contingency increased the probability of shortages within a particular region to at least 10%.

The rolling outages process outlined in the SOROP would be a 'last resort' emergency measure during a Security Emergency Phase situation. Rolling outages would be implemented only after the Authority had assessed that it is more likely than not that a period of forced outages under Grid Emergency provisions would otherwise be required.

The disconnection of demand under grid emergency provisions (due to an immediate event) would necessarily be based on limited information and would focus on achieving a supply-demand balance in the short term. Rolling outages, in response to a developing event, should facilitate demand reductions on a more informed basis and could be implemented in a more managed way.

During a Security of Supply Emergency, both a Developing Event or 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

As of 31 December 2014, there were over 165,000 connected customers. The total system length (excluding streetlight circuits and DC cable) was almost 4,635 km, of which 62.3% was underground.

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.

Peak demands and energy distributed for the last five years are shown in Table 1.

Year to	30 Sep 2009	30 Sep 2010	30 Sep 2011	30 Sep 2012	30 Sep 2013	30 Sep 2014
System Maximum Demand (MW)	565	583	585[1]	552	542	546
System Energy Injection (GWh)	2,595	2,594	2,579	2,543	2480	2459

Table 1 Peak Demand and Energy Delivery

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.

[1] During an unusual snowstorm in August 2011 peak demand was over 615MW for a period of half an hour until the load control system was operated to shed 30MW of controllable load.

4.5.2 Wellington Electricity's Means of Reducing Load

Wellington Electricity has the ability to 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 savings, including voluntary savings, had been employed. Wellington Electricity will always endeavour to keep supply on to customers.

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 through automatic under-frequency load shedding (AUFLS), or through manual load reduction, as would be used to implement a participant rolling outage plan (PROP).

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

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 load. Automatic load shedding groups reduce 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 (such as distribution networks), offer reserve capacity to the Instantaneous Reserves 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.

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.

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 to customers. Once spinning reserve generators take up 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 have available at all times 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.

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 further drops to below 47.5Hz.

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

5.2 Communications

It is expected that the System Operator will make most communications with the Network Control Room via Transpower Security as this is the normal line of communications for urgent operational matters.

5.3 Manual Load Reduction

Under certain circumstances the System Operator may request Wellington Electricity to manually shed load. Under the Electricity Industry Participation 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 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 to shed 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 savings, including voluntary savings, had been employed.

If the Authority uses its authority under the Participation Act to require, through the System Operator, a load reduction for a planned event, Wellington Electricity must reduce demand to meet the Authority's 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 (participant rolling outage plan) to enable targets to be reached. There may be financial penalties on distributors for not meeting targets set by the Authority.

6.1 Authorisation to Receive Direction and Activate the PROP

6.1.1 Declaration of a Developing Event

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

Upon declaring a Shortage of Supply the Authority would need to direct through the System Operator who will specify the Developing Event and the energy savings target to be enforced for a specific region for a specified timeframe.

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 NCR Operator 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 Authority 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 or the Authority to reduce demand, rolling outages will be instigated by Wellington Electricity's Network Control Room Manager following authorisation from Wellington Electricity's Group Chief Executive Officer, as per this plan and outage strategy. The Network Control Room 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 to activate the PROP, are:

Communications with:	Communications Type:	Wellington Electricity Position	Contact Number
Electricity Authority	Administrative	General Manager Network & Operations	+4 915 6107
	Reporting Overall Compliance	General Manager Network & Operations	+4 915 6107
System Operator	General PROP Communications	Network Control Room Operator	+4 570 3751
	Reporting Savings Against Targets	Network Control Room Manager	+4 915 6157
Retailers	General Retailer Notifications	NCR Operations Planner	+4 570 3755
	Formal Communications	Retail & Customer Relations Manager	+4 915 6115
Public Agencies	All enquiries	CEO	+4 915 6113
Media	All enquiries	Media Relations Manager	+4 915 6118
	Media Statements	CEO	+4 915 6113

Table 2 Key Personnel Involved with the PROP

The Address for Wellington Electricity is: 75 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 Transpower Grid Operations Centre (TGO) as this is the normal line of communications for operational matters.

6.2 Implementing Rolling Outages

Wellington Electricity has developed a methodology for determining the level of load shedding that is required to obtain the target savings required by the Authority.

It will have available at any one time:

- An up-to-date list of AUFLS (automatic under-frequency load shedding) feeders, and a list of PROP (participant rolling outage plan) 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.

From the above, Wellington Electricity can prepare a schedule of required shed and restore times for individual feeders, to achieve the target level of energy savings.

6.2.1 Rolling Outages Timeline

The Authority will endeavour to provide 9 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.

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 following week	Stakeholders notified of pending outages for following week	Stakeholders notified of pending outages for following week	Stakeholders notified of pending outages for following week	Stakeholders notified of pending outages for following week
			Savings calculated. Adjustments made to schedule if required for week 6	Savings calculated. Adjustments made to schedule if required for week 7	Savings calculated. Adjustments made to schedule if required for week 8

Table 3 Rolling Outages Timeline

6.2.2 Allocating Feeders to AUFLS and PROP Categories

The desired criteria for selecting feeders to be included in rolling outages, or to be used as AUFLS feeders, need to be chosen to ensure public health and safety is preserved and costs to the economy are minimised.

The customer priority criteria suggested by the EA are shown in Table 4 below:

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.

Table 4 Electricity Authority Priorities

These priorities as recommended by the EA 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. 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 aim of the project was 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 type of site within a sector.

Some of the sectors have different priorities so the same sector can have a different priority depending on their needs, these have been considered and where practical these have been factored in to 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

Priority	Sector
1	Fuel (diesel, petrol), Electricity (lines company), Emergency Management, Water Supply, key Community Facilities (Hospitals) , sections of the electricity transmission and distribution, major fuel terminals. Telecommunication exchanges and sites, Airport, Waste Water pumping Stations.
2	Emergency Management, key Community Facilities (Hospitals), sections of the electricity transmission and distribution, 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)

Table 5 Wellington Lifelines Group Priorities

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. All feeders have some residential customers but those with the highest proportion of residential customers and 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 have developed a list of all their 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 that 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.

In order to be able to compare present energy consumption with that a year earlier, it is important to have access to a schedule of half hourly kWhr values for each 11kV feeder a year ago.

The 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.

ENP008 – 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 in order 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 in order 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 EA 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 Table 6.

Feeder off Times - Winter

WE* PROP Feeder Shedding Priority / Weekly Savings Target	1	2	3	Days per Week	Savings from PROP Feeders	Savings from AUFLS Feeders
	Hours off per Day					
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 / Weekly Savings Target	1	2	3	Days per Week	Savings from PROP Feeders	Savings from AUFLS Feeders
	Hours off per Day					
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%

Table 6 Feeder Off Times

The Table above show that:

- For high savings 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 load is shed for rolling outages, proportions of the AUFLS block loads also need to be shed (to maintain each AUFLS block's load at 16% of the then current load).

The Tables above do not :

- Take into account the additional savings that will have been achieved through voluntary savings. As the impact and extent of these savings are an unknown, it becomes imperative to be able to amend a shedding strategy regularly, based on savings actually achieved.

6.2.6 Load Variation

To ensure the national transmission network remains stable during rolling outages, the system operator has requested that Wellington Electricity's system load should not vary by more than 25MW during any 5 minute period. This applies both when shedding and restoring load.

6.2.7 Log of 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 Operators 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.

6.2.8 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.

6.2.9 Other Planned Outages

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

6.2.10 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 advertised program**.**

6.2.11 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 Operators 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 Operator 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 disconnected load must be restored in conjunction with the System Operator. This is to prevent overloading the transmission network and creating further instability.
Note, that to ensure the national transmission network remains stable during rolling outages, the System Operator has requested that Wellington Electricity's system load should not vary by more than 25MW during any 5 minute period. This applies both when shedding and restoring load.

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 in order 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. Possibly 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 take into account 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 actually occur during the week (as recorded on the rolling outage logs), and
- any changes to the savings target required by the Authority.

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 target and, together with the Network Control Room 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 Control Room 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 Transpower Grid Operations Centres (TGO).

The Network & Operations General Manager will report overall compliance to the Authority.

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.

Note, that to ensure the national transmission network remains stable during rolling outages, the System Operator has requested that Wellington Electricity's system load should not vary by more than 25MW during any 5 minute period. This applies both when shedding and restoring load.

It is expected that the System Operator will make most communications with the Network Control Room via Transpower Grid Operations Centre (TGO) 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 up with an email to MMet@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.

Wellington Electricity will endeavour to give retailers as much advance notice as possible of pending rolling outages to enable them to notify vulnerable customers.

Appendix A 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 = $0.5*(L_D+L_R)*(T_2-T_1)$

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