



SECURITY OF SUPPLY

PARTICIPANT ROLLING

OUTAGE PLAN

June 2017

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1. INTRODUCTION

The distribution of electricity depends upon the availability of electricity supply to meet demand. Certain events could lead to a lack of electricity supply, and while such events are infrequent, they could cause widespread disruption.

The procedures outlined in this document will be implemented by Buller Electricity in response to major generation shortages and/or significant transmission constraints which result in the inability of the New Zealand electricity system to meet demand. Typical scenarios include unusually low inflows into hydro generation facilities, loss of multiple thermal generation stations, and multiple transmission failures.

How an event is declared and how the System Operator should communicate its requests are detailed. The management of such events would occur through the implementation of rolling outages to reduce demand and balance against the reduced supply of electricity. How these rolling outages would be structured and implemented by Buller Electricity are discussed.

2. PURPOSE

This plan was written to comply with System Operator Rolling Outage Plan (SOROP).

The Electricity Industry Participation Code (the Code) requires that Buller Electricity publishes a Participant Rolling Outage Plans (PROP) to specify the actions that would be taken to:

- Reduce electricity consumption when a supply shortage is declared by the System Operator
- Comply with requirements of the Part 9 of the Code (Security of Supply)
- Comply with requirements of the System Operator Rolling Outage Plan

Reducing demand by disconnecting supply to consumers would be used as a last resort by Buller Electricity after all other forms of savings, including voluntary savings, had been employed. Buller Electricity will always endeavour to keep consumers supplied, and will only disconnect consumers when directed to by the System Operator.

3. DEFINITIONS

Act	Electricity Industry Act 2010
AUFLS	Automatic Under-Frequency Load Shedding
The Authority	Electricity Authority
BEL	Buller Electricity Limited
Code	Electricity Industry Participation Code
Feeder	A high voltage supply line typically supplying between 100 and 2000 customers
GXP	Transpower Grid Exit Point
GEN	Grid Emergency Notice
PROP	Participant Rolling Outage Plan (this plan)
Rolling Outages	Planned electricity disconnections spread over different parts of the network at differing times to avoid prolonged outages at any one location
Security Coordinator	The person responsible for system security at the System Operator
SOROP	Security of Supply Rolling Outage Plan
Supply Shortage Declaration	Declaration made by the System Operator under Code clause 9.14
System Operator	Operator of the national electricity transmission grid

4. BACKGROUND

4.1 Electricity Authority

The Electricity Authority (the Authority) is a Crown entity set up under the Electricity Industry Act 2010 to oversee the and facilitate the efficient operation of the New Zealand electricity markets. Core functions of the Authority are to:

- Meet its statutory objective – “promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers”
- Develop and administer the Electricity Industry Participation Code (2010) governing the New Zealand electricity market
- Monitor and enforce compliance with the Code, relevant regulations, and the Act

4.2 Transpower

Transpower is a State Owned Enterprise, which owns and operates New Zealand’s national transmission 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 Buller Electricity.

As the 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.

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

4.3 Buller Electricity Limited

Buller Electricity Limited (BEL) is the electricity network company that owns and maintains the electricity lines and cables that deliver electricity to Westport, and the area of the West Coast of the South Island between Meybille Bay (immediately north of Punakaiki) in the south, and Karamea in the north.

5. RANGE OF EVENTS

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

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

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

BEL has some ability to reduce load by turning off domestic water heaters via ripple control, however further load reductions require voluntary consumer savings, or consumers to be disconnected.

6. BEL STAFF RESPONSIBILITIES

A Category A or Category B event will be classed by BEL as a significant incident and the Operations Manager will activate the appropriate contingency plan to manage the incident accordingly. Communication with electricity retailers will be as per the normal notification procedures. Local Authorities, Civil Defence and other stakeholders will be notified directly of significant incidents by the Operations Manager.

The BEL staff responsible for specific tasks are listed in Table 1.

BEL Person Responsible	Role
Operations Manager	Receive notification of pending SOROP implementation from the System Operator Receive communication from the System Operator Implement this plan Revoking rolling outages Communicate with Emergency Services and Local Authorities Reporting to media and public agencies
Development Engineer	Preparation of load shedding schedules Weekly savings reporting Retailer notification

Table 1 – BEL Staff Responsibilities

If the listed BEL staff member is unavailable, an appropriate alternate will be appointed. Final authorisation to commence a program of rolling outages will be made by BEL's Chief Executive.

7. COMMUNICATION WITH THE SYSTEM OPERATOR

The System Operator can contact BEL using the following details:

Buller Electricity Limited
 PO Box 243
 Westport 7825
 Ph: 03 788 8171 Fax: 03 788 8191

BEL will contact the System Operator for administration purposes using the following details:

System Operator	National Grid Operating Centre (South)
Transpower	Islington
PO Box 1021	Christchurch
Wellington	TPSN: 7905
Ph: 04 495 7000 Fax: 04 498 2671	Ph: 03 349 7043 Fax: 03 349 8506

8. IMMEDIATE (CATEGORY B) EVENTS

A Category B (Immediate) event is likely to occur due to a major transmission equipment or generation outage. The Electricity Industry has put a number of systems in place which will automatically respond to Immediate events to ensure that the transmission grid remains in service. Longer term Immediate events may initially be handled as a Transmission Grid Emergency using a Grid Emergency Notice (GEN). If the Transmission Grid Emergency is expected to persist for a sustained period, the System Operator may make a Category B supply shortage declaration and cease the GEN.

A Category B event may only limit peak loads rather than requiring long term energy savings. If this is the case, BEL will use its ripple control system to reduce load as a first preference and only use rolling outages if this is insufficient. Otherwise BEL will handle a Category B event in an identical manner to a Category A event, as described in Section 9.

8.1 System Stability

Transpower, as the System Operator, is required to keep enough reserve generation to cover the risk of connected generators tripping. 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, potentially leading to a cascade failure of the transmission system.

As reserve generation cannot immediately pick up the load supplied by a disconnected generator, an immediate load reduction is required until additional generation can pick up the load. Automatic load shedding occurs in stages as dictated by the Reserve and Extended Reserve Markets.

8.2 Reserve Market

Generators and load users with interruptible load, such as distribution networks, may offer in reserve capacity to cover the risk of the generating units 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.

8.3 Extended Reserve Market

If the available Reserve Market reserve capacity is insufficient to stabilise the transmission grid, further load reduction by way of the Extended Reserve Market will occur. Automatic Under-Frequency Load Shedding (AUFLS) is currently the only type of extended reserve product which is available. AUFLS is organised into two blocks which will disconnect load (typically distribution network feeders) when the transmission grid frequency drops below prescribed thresholds.

8.4 Manual Load Shedding & Restoration

If AUFLS tripping fails to stabilise the transmission grid the System Operator will shed more load manually. Once the frequency has stabilised the System Operator will advise the BEL Switching Coordinator when load can be restored. Restoration of disconnected load must be restored in conjunction with the System Operator. This is to prevent overloading the transmission grid and/or creating further instability.

8.4 Transmission Grid Emergency

The System Operator may request BEL to reduce load using a Grid Emergency Notice (GEN). BEL will shed all water heating load and the System Operator will be advised. If more shedding is required the System Operator will disconnect further load.

If an Immediate event is in place, the Grid Emergency will take precedence. If the System Operator declares a supply shortage following a Grid Emergency, then BEL will respond by implementing rolling outages as described in the following “Developing Events” section.

9. DEVELOPING (CATEGORY A) EVENTS

If the System Operator requests a load reduction for a planned (Category A) event, BEL must reduce demand to meet the System Operator’s targets. The targets are expected to take the form of an energy savings target to be reviewed weekly. Depending on the level of energy savings requested, BEL will meet the required targets by using one or more of the following measures:

- Request consumers make voluntary energy savings
- Restrict water heating services hours to night only (this will result in many consumers running out of hot water on a daily basis unless normal hot water usage is reduced)
- Disconnecting feeders (rolling outages) in a controlled manner, to enable targets to be reached

BEL has legal obligation to comply with the savings targets requested by the System Operator.

9.1 Declaration of Category A Event

The System Operator will endeavour to provide nine days prior notice of the requirement for weekly energy savings. To declare a Category A event, the System Operator would need to indicate that a specific weekly energy savings target was to be enforced for a specific region over a specified time-period. A notification system similar to the GEN procedure would be appropriate. Any increase in the weekly energy savings target would also need nine days prior notice.

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

9.2 Rolling Outages Strategy and Methodology

When instructed by the System Operator to reduce demand, rolling outages will be instigated by Operation Manager in accordance with this plan and outage strategy. The Operation Manager will ensure load shedding schedules are prepared, Switching Coordinator rosters are adjusted as required, and load is controlled and monitored to meet desired targets. Schedules of estimated load shedding, restoration times and quantities are to be forwarded to the System Operator seven days before the planned outage. If significant variation is noticed, or expected, from the schedules provided to the System Operator, then BEL shall advise the Security Coordinator of this change.

Rolling outages will normally be scheduled to only occur during daylight hours between 0800 and 1800 hours. Initially, outages will be scheduled for mid-afternoon to limit adverse economic effects. It may be necessary to extent outages into evening hours to achieve the actual required savings levels. The scheduled timing of outages will be approximate, and could vary daily due to network or System Operator constraints.

9.3 Section of Feeders for Rolling Outages

To ensure public health and safety is preserved, and costs to the economy are minimised, Table 2 shows the criteria for selecting feeders to be included in rolling outages.

Priority	Priority Concern	Maintain Supply To
1	Public health and safety	Major hospitals, air traffic control centres, and emergency operation centres.
2	Important public services	Energy control centres, communication networks, water and sewage pumping, fuel delivery systems, and major ports.
3		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	Domestic premises

Table 2 – Priority Loads

These priorities are intended as guidelines, and because rolling outages will be implemented on a feeder by feeder basis, it is not possible to discriminate between individual consumers on the same feeder. For example, a predominantly residential feeder may also have small pockets of

commercial or industrial consumers. The categorisation of the BEL Feeders into their predominant Consumer Group and Priority is detailed in Table 3.

Feeder	Consumer Group	Priority
Solid Energy	Industrial	1
Pakington	Commercial/Industrial	2
Russell	Commercial	2
Whareatea	Rural – Diary	3
Carters	Rural – Diary	3
Waimangaroa	Rural – Diary	3
Karamea	Rural – Diary	3
Cape	Rural – Diary	4
Seddonville	Rural – Diary	4
Little Wanganui	Rural – Diary	4
Adderley	Rural – Diary	4
Meybille Bay	Rural	6
Derby	Residential	6
Domett	Residential	6

Table 3 – BEL Feeders, Consumer Group and Priority Categorisation

9.4 Expected Duration of Rolling Outages

BEL will endeavour to comply with the criteria stated in Table 2 and 3 to select feeders for rolling outages. BEL will attempt to keep rolling outages to any consumer to no longer than 5 hours per day, for a 5% savings target. For savings more than 5%, longer outages may be necessary.

Using the proposed methodology indicative plans for 5-25% energy savings targets are provided in Tables 4-8. Calculation of the expected savings is complicated by the following factors:

1. The daytime load of feeders is significantly higher than the nighttime load, and therefore the savings from a feeder outage of, say 6 hours will be greater than 25% (6/24 hours).
2. On restoration of a feeder, there will be some additional load due to 'cold load pickup' e.g. home heating, water heating, and refrigeration load returning to their temperature settings. This will reduce the expected savings.
3. Consumers will invariably shift their load to times when they are not experiencing rolling outages. This will reduce the expected savings.

Consumer Group Priority	Maximum Duration	Days per Week	Percentage Winter Energy	Percentage Savings
1			21%	
2			25%	
3			23%	
4			10%	
5			0%	
6	5 hours	7	21%	4.9%
Total			100%	4.9%

Table 4 – Duration of Daily Outages for Consumer Groups for 5% Savings

Consumer Group Priority	Maximum Duration	Days per Week	Percentage Winter Energy	Percentage Savings
1			21%	
2			25%	
3			23%	
4	5 hours	7	10%	2.3%
5			0%	
6	8 hours	7	21%	7.8%
Total			100%	10.1%

Table 5 – Duration of Daily Outages for Consumer Groups for 10% Savings

Consumer Group Priority	Maximum Duration	Days per Week	Percentage Winter Energy	Percentage Savings
1			21%	
2			25%	
3	5 hours	7	23%	3.4%
4	5 hours	7	10%	2.3%
5			0%	
6	5 hours	7	21%	9.7%
Total			100%	15.4%

Table 6 – Duration of Daily Outages for Consumer Groups for 15% Savings

Consumer Group Priority	Maximum Duration	Days per Week	Percentage Winter Energy	Percentage Savings
1			21%	
2	2 hours	7	25%	2.3%
3	5 hours	7	23%	5.2%
4	7 hours	7	10%	3.2%
5			0%	
6	10 hours	7	21%	9.7%
Total			100%	20.4%

Table 7 – Duration of Daily Outages for Consumer Groups for 20% Savings

Consumer Group Priority	Maximum Duration	Days per Week	Percentage Winter Energy	Percentage Savings
1			21%	
2	5 hours	7	25%	5.8%
3	7 hours	7	23%	6.1%
4	7 hours	7	10%	3.2%
5			0%	
6	10 hours	7	21%	9.7%
Total			100%	24.8%

Table 8 – Duration of Daily Outages for Consumer Groups for 25% Savings

9.5 Rolling Outage Notification

If the requested savings targets require BEL to implement rolling outages, BEL will use the standard planned outage procedure to advise electricity retailers (and consumers) in advance of pending outages. The time and extent of advertised outages will be approximate.

If BEL plans to issue a public notice message related to rolling outages, then this will be sent to the System Operator for review before being released.

9.6 Grid Emergency During Category A Event

If the System Operator declares a Grid Emergency during a category A event, the Grid Emergency will take priority. As water heating load generally would not be used to reduce load in a Category A event, BEL 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 GEN. After the grid emergency is over, the rolling outages pattern would continue.

9.7 Supply Disconnection & Restoration

The System Operator will provide general criteria on acceptable disconnection rates. Schedules of outages will be prepared and sent to the System Operator.

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.

9.8 Communications

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

All communications with the System Operator will be using Transpower's TPSN telephone.

9.9 Target Monitoring

For load shedding to a weekly target, the Development Engineer will monitor energy savings against target and, together with the Operations Manager, review future load shedding to increase or decrease the amount of rolling outages required to meet the weekly target. The Development Engineer will be responsible for daily and weekly reporting of consumption relative to target levels. The Development Engineer will also be responsible for providing the predicted load for the next week on a seven day rolling basis. This prediction is to be by GXP, for each half-hour.

Planned energy savings will be based upon the network energy volumes of the same period in the preceding year.

9.10 Contingent Events

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

9.11 Consumer Liaison

For major consumers, 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 those consumers to manage.

9.12 Vulnerable Consumers

Electricity retailers maintain lists of consumers with health and safety issues. It is not feasible for BEL to prevent rolling outages affecting individual vulnerable consumers. BEL will endeavour to give electricity retailers as much advance notice of pending rolling outages as possible, to enable them to notify vulnerable consumers. During rolling outages, general media releases will advise consumers with health problems as to their best course of action.

9.13 Log of Rolling Outages

BEL Switching Coordinators will log times of disconnection and reconnection for all feeder interruptions and enter this information into a log sheet as shown in Appendix 1. These will be used to monitor the rolling outage program.

