COUNTIES POWER PARTICIPANT ROLLING OUTAGE PLAN

1 INTRODUCTION

This plan was written to comply with Part 9 *Security of Supply* of the Electricity Industry Participant Code 2010. The procedures outlined are in response to major generation shortages and/or significant transmission constraints. Typical scenarios include unusually low inflows into hydro-generation facilities, loss of multiple thermal generating stations or multiple transmission failures. The main energy saving measure deployed in response to such a scenario is the use of rolling outages. The structure and implementation of these is discussed.

2 PURPOSE OF DOCUMENT

Participant rolling outage plans ("PROP") are required to specify the actions that would be taken to:

- reduce electricity consumption when a supply shortage is declared by the system operator;
- comply with the requirements of the system operator rolling outage plan (SOROP).

Reducing demand by disconnecting supply to customers is a last resort after all other forms of savings, including voluntary savings, have been exhausted. Counties Power will always endeavour to maintain supply to customers.

3 DEFINITIONS

The terms used in this document are defined in Figure 1.

Figure 1: Definition of Terms

Term	Description
AUFLS	Automatic Under Frequency Load Shedding.
Code	Electricity Industry Participant Code 2010 and subsequent amendments.
Act	Electricity Industry Act 2010 and subsequent amendments.
Feeder	A high voltage circuit typically supplying up to 2,000 customers.
GXP	Transpower Grid Exit Point.
GEN	Transpower Grid Emergency Notice.
PROP	Participant Rolling Outage Plan (this plan).
Retailers	Electricity Retail Companies.
Rolling Outages	Planned electricity disconnections spread over different parts of the network at differing times to avoid prolonged outages at any one location.
SOROP	System Operator Rolling Outage Plan
Supply Shortage Declaration	Declaration made by the system operator under clause 9.14.
System Operator	Operator of the national electricity transmission grid.

4 BACKGROUND

4.1 Electricity Authority

The Electricity Authority (Authority) is an independent Crown entity responsible for regulating the New Zealand electricity market. One of the core functions of the Electricity Authority under the Electricity Industry

Act 2010 (Act) is to make and administer the Electricity Industry Participation Code 2010 (Code) governing the electricity market, including the security of supply.

4.2 Transpower

Transpower is a state-owned enterprise which owns and operates New Zealand's National Grid. The National Grid is the network of high voltage transmission lines and substations that transports electricity from where it is generated to distribution line companies, such as Counties Power.

As System Operator, Transpower manages the real-time operation of New Zealand's electricity transmission system to enable generation to match the demand.

4.3 Counties Power

Counties Power is the electricity network company that owns, manages and operates the distribution network in the Franklin and Southern Papakura area covering an area of approximately 2,250km^2. The number of retailer customers served by the network (active ICPs) is approximately 38,300 with a maximum demand of approximately 100 MW and annual energy delivered is 504 GWh as at March 2013.

5 RANGE OF EVENTS

Events that could lead the System Operator to make a supply shortage declaration are categorised as:

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

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

Both event types are classified by Counties Power as significant incidents and the management team will activate the appropriate contingency and management plan.

Communication with retailers, civil defence, local government authorities and other stakeholders will be carried out in accordance with normal notification procedures.

6 IMMEDIATE EVENTS

6.1 System Stability

Transpower, as the System Operator, is required to keep enough reserve generation to cover the risk of the largest connected generator tripping or of a failure of the HVDC link. They are also required to keep the system frequency at 50Hz. If a large generator trips, it may cause a reduction in frequency. If this is not rectified, consequential tripping of other generators can lead to complete failure of the electricity network.

As reserve generation cannot immediately pick up the load of a disconnected generator, an immediate load reduction is required until additional generation can pick up the load. Automatic load shedding groups reduce load in stages until the frequency stabilises.

6.2 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 failure risks. Counties Power offers part of its interruptible load, predominantly water heating, into the Reserve Market.

Generally water-heaters are only turned off for short periods, during which their inherent thermal capacity ensures limited impacts on customers. Once failed generation or transmission equipment is back in service, water heating and other controlled loads are gradually reinstated.

6.3 Disconnecting Customers

6.3.1 Automatic Under Frequency Load Shedding (AUFLS)

If load shed by the Reserve Market tripping is insufficient to stabilise the network, further automatic load reduction is required.

Each distribution network company must have two blocks of load, each of 16% of its total load, available at all times to be shed by automatic under-frequency relays. Transpower has installed relays at the following locations:

- Bombay GXP, on the Ramarama, Mangatawhiri, Pukekawa and Tuakau 33kV feeders
- Glenbrook GXP, on the Karaka 33kV feeder
- Counties Power's Waiuku 33kV incomers.

Also, to supplement these relays and to maintain the 16% load groups at all times, Counties Power has installed under-frequency relays on certain feeders, namely Hunua and Hingaia feeders from Opaheke.

AUFLS Block 1 shedding will occur if the system frequency fails to recover after Reserve Market load shedding. This will remove at least 16% of Counties Power's load by disconnecting customers supply.

6.3.2 AUFLS Block 2

If Block 1 load-shedding fails to restore the system frequency, Block 2 shedding will occur and disconnect a further 16% or more of Counties Power's load.

6.3.3 Manual Load Shedding

If AUFLS Block 1 and Block 2 trippings fail to stabilise the frequency, the System Operator will manually shed more load. Once the frequency has stabilised, the System Operator will advise Counties Power Control when load can be restored.

6.4 Supply Restoration

Restoration of disconnected load must be carried out in conjunction with the System Operator. This is to prevent overload of the transmission network and the creation of any further instability.

6.5 System Operator Declaration

The System Operator may declare a supply shortage and direct that rolling outages are required for some immediate events.

Should this be the case, rolling outages will be implemented in accordance with the procedures as described in Section 7 ("Developing Events") and Section 8 ("Implementation Plan for Rolling outages") of this plan.

6.6 Transmission Grid Emergency during Immediate Events

The System Operator may request Counties Power to reduce load under a grid emergency notice ("GEN"). Counties Power would commence by shedding controlled load. If this is insufficient, the rolling outage feeder classification may be rearranged to comply with the requirements of the specific GEN. After the grid emergency is over, the programmed rolling outages schedule will continue.

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

7 DEVELOPING EVENTS

If the System Operator requests through the System Operator a load reduction for a planned "Developing Event", Counties Power will reduce demand to meet the System Operator's targets. The targets are expected to be a weekly energy savings target that is reviewed each week. To reduce energy usage, Counties Power will disconnect HV feeders in a controlled manner to enable targets to be reached. There may be financial penalties for not meeting the targets specified by the System Operator. The shedding of water heating load is not a viable option for energy savings as this effectively only defers usage.

7.1 Declaration of Developing Events

The System Operator may declare a supply shortage and direct specified participants to implement rolling outages.

The System Operator will endeavour to provide nine days prior notice of the requirement for weekly energy savings. Counties Power will use the standard planned outage notification procedure for retailers. Any increase in the weekly energy savings target will also require nine days prior notice.

The System Operator will request through the System Operator that a specific weekly energy savings target is to be enforced for a specific region for a specified time-frame. A notification system similar to the GEN procedure is envisaged.

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

7.2 Criteria for Rolling Outages

To ensure public health and safety is preserved and economic costs are minimised, the criteria shown in Figure 2 are, as far as practicable, used for rolling outage feeder selection and prioritisation.

Figure 2: Customer Priority Groups

Priority	Priority Concern	Maintain Supply to:
1	Public health and safety	Emergency operation centres (e.g., Civil Defence, Police Stations)
2	Important public services	Communication networks, major water and sewage pumping, selected fuel delivery systems and major supermarkets in commercial districts
3	Public health and safety	Minor hospitals, medical centers and major schools
4	Food production	Dairy farms and milk production facilities, poultry processing, cool stores
5	Domestic production	Commercial and industrial premises
6	Disruption to consumers	Residential premises

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. These criteria are therefore considered as guidelines for prioritisation purposes only.

Rolling outages shall be carried out only between 0800 to 1800 for safety reasons.

7.3 AUFLS Criteria

As the level of AUFLS during rolling outages needs to be maintained, Counties Power will:

- As AUFLS Block 1 and 2 are being over-compensated at about 18% and 11% respectively during 0800 to 1800 hours, some lower priority AUFLS feeders are being included for energy savings.

- The load-shedding will be regularly monitored to ensure that the two AUFLS blocks of 16% are maintained.

7.4 Shutdown Notification

When requested to reduce demand with rolling outages, Counties Power will use the planned outage procedure to advise retailers of pending outages in advance. It will not be possible to use our standard mail planned outage notification process for all customers because of the large volume of outage notifications required. Counties Power will therefore endeavour to advise customers in advance through media channels. The time and extent of advertised outages will be approximate because of normal demand variations.

7.5 Vulnerable Consumers and Priority Sites

Counties Power will endeavour to give retailers as much advance notice as possible of pending rolling outages to enable them to notify vulnerable consumers.

7.6 Transmission Grid Emergency during Developing Events

If the System Operator declares a grid emergency during a "Developing Event" event, the grid emergency will take priority. As water heating control will not generally be used to reduce load in a "Developing Event", Counties Power will have that capacity available for load reduction for the grid emergency.

If this is insufficient, the rolling outage feeder classification may be rearranged to comply with the requirements of the specific GEN. After the grid emergency is over, the programmed rolling outages schedule will continue.

7.7 Supply Restoration

Restoration of disconnected load must be carried out in conjunction with the System Operator. This is to prevent overload of the transmission network and the creation of any further 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. Given total Counties Power network demand, it is unlikely that this limit will be approached other than in exceptional circumstances.

7.8 Communication

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

All communications with the System Operator will be between Counties Power's Control Room and Transpower's Regional Operating Centre using Transpower's telephone or as a back-up, the direct operator's line (via Telecom's exchange).

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

7.9 Staff Responsibilities

Within one day of declaration of a "Developing Event", the Duty Operator will notify the System Operator of the updated contact details including telephone numbers and email address for each of the positions named in Figure 3.

Figure 3: Staff Roles and Responsibilities

Role	Person Responsible
Receive communication from System Operator	General Manager (Network)
Receive communication from System Operator	Duty Operator
Implement this plan	Operations Manager
Weekly savings reporting	Business Analyst
Retailer notification	Customer Relations Manager
Revoking rolling outages	Operations Manager
Reporting to System Operator	Operations Manager
Reporting to media, public agencies	General Manager (Network)

7.10 Rolling Outages Strategy

The General Manager (Network), Operations Manager and Operating Team will review weekly targets and prepare plans for weekly rolling outages based on required savings. The plans will be forwarded to the retailers for consumer and media notification.

The following method will be used:

- Rolling outage feeders will be assigned a priority according to the criteria specified in Figure 2 wherever possible.
- Switching instructions will be issued according to the level of savings required.
- Planned energy savings will be based upon network energy usage for the same period in the previous year.
- A plan will be prepared to target the required savings level, taking account of any under or over savings carried forward from earlier SOROP periods. As far as possible, groups will be selected depending on the saving level required in Figure 4.
- As AUFLS Block 1 and 2 are being over-compensated at 18% and 22% respectively during 0800 to 1800 hours, AUFLS feeders are being included as shown in Figure 5, for energy savings of 20% and above.
- The priority group percentages depends on the following:
  - level of generation at Hampton Downs (Envirowaste) and it is assumed to be on 3MW for the period of 0800 to 1800 hours;
  - BHP New Zealand Steel's Mine Site, Pump Stations 1 and 2 feeders are in operation.

Figure 4: Priorities and Saving Levels

Savings required	Priority groups used
Up to 5%	5, 6
10% to 20%	4, 5, 6
25% and above	3, 4, 5, 6

7.11 Target Monitoring

The Business Analyst will monitor energy savings against weekly targets and, together with the Operations Manager, review future load shedding to increase or decrease the rolling outage programme as necessary.

The Business Analyst will be responsible for daily and weekly reporting of consumption relative to target levels. The Business Analyst in conjunction with the Operations Manager will also be responsible for providing the predicted load for the next week on a seven-day rolling basis. This prediction will be prepared by GXP for each half-hour period.

The Business Analyst will supply the following information to the Security Coordinator at the System Operator:

- A daily rolling week-ahead load forecast (beginning at a time specified by the System Operator) that forecasts the reasonable expectation of the half-hourly load at each GXP. This forecast should take into account the impact of any rolling outages
- Any variation in the weekly load forecast of ±20% at each GXP
- The level of consumption relative to the target levels
- The nature and extent of rolling outages.

The Operations Manager will also monitor the rolling outages and assess the degree of compliance with the PROP daily, reporting on the level of compliance at a frequency directed by the System Operator.

7.12 Log of Rolling Outages

Duty operators will log the times of disconnection and reconnection of all feeder interruptions and enter in the rolling outage log (Appendix A).

8 IMPLEMENTATION PLAN FOR ROLLING OUTAGES

When instructed by the System Operator following a supply shortage declaration to reduce demand, rolling outages will be implemented as per this plan. The Operations Manager will ensure load shedding schedules are prepared, system control rosters are adjusted as required, and load is controlled and monitored daily to meet desired targets.

The Business Analyst will provide daily rolling week-ahead load forecast, schedules of estimated load shedding, restoration times and quantities to the System Operator seven days before the planned outage. If significant variation of ±20% in the weekly load forecast is noticed, or expected, from the schedules provided, then Counties Power shall advise the System Operator of this change.

The Operations Manager will also report compliance to the System Operator as detailed in Section 7.11.

Where possible, Counties Power will try to comply with priorities in Figure 2 to select feeders for rolling outages. Counties Power will endeavour to keep rolling outages to any consumer within 6 hours per day for a 5% savings target. For savings more than 5%, longer and more frequent outages is necessary.

Outages will be programmed between 0800 and 1800 hours on all days. Night time is excluded from the cut period for safety reasons. Initially outages will be scheduled for mid-afternoon to limit economic effects.

The timing of outages will be approximate and will vary daily due to network or System Operator constraints.

8.1 Feeder Selection

The feeders to be disconnected are shown in Appendix B. This feeder schedule is based upon the priority guidelines shown in Figure 2**.**

The number of feeders chosen for any week will depend upon the required level of savings. The tables in Figure 5 show the consumer priority groups, outage duration and number of days to achieve the required savings level. Because of AUFLS obligations and changes in network configuration, the outage durations are indicative only and will be reviewed where required to achieve the specified targets.

The available system winter energy associated with consumer priority groups has been identified. Analysis has been conducted on these groups to achieve savings in winter system energy in order to achieve savings of 5, 10, 15, 20 and 25% of the total load.

It is to be noted that for energy saving of 25%, AUFLS of the lowest priority is included in order to exempt the highest priority feeders (emergency operation centres); priority 2 feeders which include vital communication centres are also limited to an outage time of 5 hours. In the event that AUFLS occurs, non-AUFLS feeders will be tripped including those in Consumer Priority 1.

Figure 5: Energy Saving Levels per Consumer Priority Group

5% Energy Savings Level

Consumer Priority Group	Average Feeder Load %	Hours	Days	Energy Savings %
Priority 6	13.7%	5	7	2.7%
Priority 5	22.8%	3	7	2.7%
	Total savings:			**5.4%**

10% Energy Savings Level

Consumer Priority Group	Average Feeder Load %	Hours	Days	Energy Savings %
Priority 6	13.7%	7	7	3.8%
Priority 5	22.8%	7	7	6.4%
	Total savings:			**10.2%**

15% Energy Savings Level

Consumer Priority Group	Average Feeder Load %	Hours	Days	Energy Savings %
Priority 6	13.7%	10	7	5.5%
Priority 5	22.8%	10	7	9.2%
Priority 4	3.0%	4	7	0.5%
	Total savings:			**15.2%**

20% Energy Savings Level

Consumer Priority Group	Average Feeder Load %	Hours	Days	Energy Savings %
Priority 6	13.7%	10	7	5.5%
Priority 5	22.8%	10	7	9.2%
Priority 4	3.0%	10	7	1.2%
Priority 3	7.3%	10	7	2.9%
Priority 2	7.7%	4	7	1.2%
	Total savings:			**20.0%**

25% Energy Savings Level

Consumer Priority Group	Average Feeder Load %	Hours	Days	Energy Savings %
Priority 6	13.7%	10	7	5.5%
Priority 5	22.8%	10	7	9.2%
Priority 4	3.0%	10	7	1.2%
Priority 3	7.3%	10	7	2.9%
Priority 2	7.7%	5	7	1.5%
AUFLS Priority 6 - Block 2	8.7%	7	7	2.4%
AUFLS Priority 6 - Block 1	8.5%	7	7	2.4%
	Total savings:			**25.2%**

Certain critical installations are able to be supplied from more than one feeder as shown in Figure 6. These feeders will be shed at different times to enable the supply to these areas to be maintained.

Figure 6: Alternative Feeders for Critical Installations

Installation	Normal Feeder	Alternative Feeder	Comment
Waikato Water Treatment Plant	WWTP1	River Road	Inform Watercare Operator before switching
Pukekohe Sewage Treatment Plant	Church Corner	Railway	Remote manual Switching
Bombay Motorway Service Area	Pukekohe East	Bombay	Automatic Changeover
Mercer Motorway Service Area	Mercer	Pukekawa	Automatic Changeover

8.2 Contingent Events

If an unplanned event occurs, such as a Civil Defence emergency that could alter the planned rolling outage schedule, the Customer Relations Manager or Duty Operator will be responsible for communication of any changes to retailers.

8.3 Consumer Liaison

For major consumers, with dedicated HV feeder supplies, short-term rolling outages may not be appropriate. As an alternative, longer single outages may be considered and be easier for them to plan for.

Other consumers will be advised to contact their retailer for information on the priority of the feeder they are supplied from and outage times.

8.4 Vulnerable Customers

Retailers maintain lists of consumers with health and safety issues. It is not feasible for Counties Power to prevent rolling outages affecting individual vulnerable consumers. During rolling outages, general media releases will advise consumers with health problems as to their best course of action.

9 COMMUNICATIONS WITH THE SYSTEM OPERATOR

The following contact details will be used for communications between Counties Power and the System Operator, including that for the purposes of performance reporting against targets to the System Operator's Emergency Response Project Manager:

Counties Power Ltd

Fax: +64 9 237 0919
Phone: +64 9 238 1764
Address: 14 Glasgow Road
Private bag 4
Pukekohe 2340

Transpower

System Operator

Fax: +64 4 495 7100
Phone: +64 4 495 7000
Address: Transpower House
96 The Terrace
Wellington

Appendix A: Rolling Outage Log Sheet

COUNTIESPOWER

Rolling Outage Log Sheet

Form CP-R01

Date:		Event:			Planning Engineer:			Duty Operator:	
No.	Zone Substation	Feeder ID	Feeder	Load (amps)	Time Off	Time On	Duration (min)	Estimated Savings	Notes

Appendix B: Rolling Outage Feeders Schedule

Note:

1. The winter loads are based on metered and SCADA demands during June 2013.
2. Because of AUFLS obligations and changes in network configuration and loads, this schedule may be reviewed to achieve the targets required.

Sequence	Feeder	Priority Level	Consumer Priority Group	AUFLS Block	Average Feeder Winter Load %
1	RACECOURSE	6	Priority 6	Nil	1.3%
2	PAPAKURA SOUTH	6			1.9%
3	RAILWAY	6			2.2%
4	TITI MAUKU	6			3.1%
5	CAPE HILL	6			5.2%
6	RED HILL	5	Priority 5		2.4%
7	KERI DOWNS	5			2.7%
8	BUCKLAND	5			2.9%
9	HUNUA	5			3.0%
10	NZSP	5			3.4%
11	MINESITE	5			4.2%
12	PUKEKOHE WEST	5			4.2%
13	Otaua	4	Priority 4		0.8%
14	DRURY HILLS	4			2.2%
15	ANCHOR FACTORY	3			2.6%
16	PUKEKOHE HILL	3	Priority 3		4.7%
17	PUKEKOHE EAST	2	Priority 2		1.3%
18	BEACH ROAD	2			3.2%
19	DRURY	2			3.3%
20	PUKEKOHE TOWN	1	Priority 1		4.7%
21	GLEN MURRAY	6	AUFLS Priority 6 - Block 2	Bombay Block 2	0.6%
22	PORT WAIKATO	6			0.9%
23	TE TORO	6		Glenbrook Block 2	1.2%
24	WAIUKU SOUTH	6			1.3%
25	MANUKAU HEADS	6			1.4%
26	GLENBROOK	6			1.5%
27	WHANGARATA	6		Bombay Block 2	1.6%
28	BLACKBRIDGE	6	AUFLS Priority 6 - Block 1	Glenbrook Block 1	0.9%
29	GREAT SOUTH ROAD	6		Bombay Block 1	1.1%
30	ARARIMU	6			1.3%
31	PAKINGTON	6		Glenbrook Block 1	1.5%
32	TEHIHI	6			1.7%
33	WAIAU PA	6			1.9%