



MainPower Participant Rolling Outage Plan

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1. Purpose

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

Under the regulations, Participant Rolling Outage Plans (PROP) are required to specify the actions that would be taken to reduce the consumption of electricity:

- when a supply shortage is declared by the System Operator;
- to comply with requirements of the System Operator Rolling Outage Plan (SOROP);
- to comply with Electricity Industry (Enforcement) Regulations 2010, the Electricity Industry Participation Code 2010 and subsequent amendments; and
- to supplement the System Operator Rolling Outage Plan.

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

The procedures outlined are in response to major generation shortages, including dry year scenarios. The main energy saving measure listed is rolling outages and how these are structured and implemented is discussed.

2. Definitions

AUFLS	Automatic Under Frequency Load Shedding
Code	Electricity Industry Participation Code
EDN	Electricity Distribution Network
Feeder	A high voltage circuit typically supplying up to 2,000 consumers
GXP	Transpower Grid Exit Point
CAN	Customer Advice Notice
GEN	Grid Emergency Notice
PROP	Participant Rolling Outage Plan (this plan)
Regulations	Electricity Industry (Enforcement) Regulations 2010 and subsequent amendments
Rolling Outages	Reductions in demand or electricity consumption
SOROP	System Operator Rolling Outage Plan
Supply Shortage Declaration	Declaration by the System Operator

3. Energy Shortage - Events

Transpower, acting as the System Operator, ensures there are always enough energy and reserves available to meet demand and to keep the national grid stable and online. Their ability to achieve this can be impacted by:

- generation shortfall (due to low lake levels, calm winds, other fuel shortages)
- failure of a large generator(s)
- transmission circuit fault(s)

The first two causes above could lead to an energy shortage, while the third could lead to a shortage of transmission capacity.

To achieve these outcomes, MainPower will act to support the System Operator.

3.1 Load Reduction by MainPower

MainPower can reduce load by turning off domestic water heaters and irrigation pumps in the Waimakariri, Hurunui, and Kaikoura regions. Further load reductions require MainPower to disconnect electricity consumers.

3.2 Range of Events

Events causing a supply shortage declaration can be categorized as:

Developing Event (Category A):	Events that evolve over time. Ranging from low hydro lake levels to a shortage of generation offers for a trading period within the next 24 hours
Immediate Event (Category B):	Events that occur with little or no warning, usually because of a transmission line or major generation failure

4. Immediate Events (Category B)

The following table summarises the immediate actions to take if some form of rolling outage has occurred or is expected to occur.

Table 1 – Actions

Event	Immediate Action
Automatic Under Frequency Load Shedding (AUFLS) has occurred	Do not increase load or restore supply. Telephone the System Operator for further instructions.
Customer Advice Notice	Submit difference bids into WITS as required (Currently done by Orion on behalf of the USI group)
Grid Emergency Notice – Request	<ol style="list-style-type: none"> Reduce load using hot water control. If required, further reduce load using irrigation control, seek approval if time allows. <i>If time allows</i>, contact large users and ask for voluntary reductions. Refer to Customer Management Guidelines for a list of customers to contact.
Grid Emergency Notice – Instruction	<p>Reduce load to the instructed amount:</p> <ol style="list-style-type: none"> Disconnect controlled hot water load except preferential channels. Disconnect controlled irrigation load, if required. If required to comply with instructions, disconnect customers starting with low priority and moving up the priority list until the load reduction is achieved, see Appendix 2. Always keep AUFLS load connected at 16% per block. Hold network total load as steady as possible using hot water control, maximum rate of change 5 MW/minute unless approved by System Operator. <p>In emergency situations, electricity consumers will be disconnected with limited or no notice to Retailers or customers. <i>If time allows</i>, ask the Customer team to communicate with customers (per this plan).</p>
Supply Shortage – Declared	Refer to Section 6 of this document for detailed procedure
Restoration Post-Event	Take no action unless formally instructed by the System Operator

The following events can occur immediately. MainPower will become aware of these events through SCADA alarms or by near real time communications from Transpower.

4.1 Automatic Under Frequency Load Shedding (AUFLS)

Each distribution network company must maintain two blocks of load, each approximately 16% of its total load, to be shed by automatic under frequency relays. MainPower and Transpower have agreed to arm relays on selected feeders at the GXPs. These relays watch local grid frequency and automatically open the switchgear at pre-set points.

4.2 Supply Shortage Declaration

For some Immediate (Cat B) Events, the System Operator may declare a supply shortage and instruct rolling outages. In such a situation, the procedures for Developing (Cat A) Events will need to be implemented as per section 6.

4.3 Grid Emergency

The System Operator may request or instruct MainPower to reduce load under a Grid Emergency Notice (GEN). MainPower will shed water heating and then irrigation load if required, in the event of a Transpower Grid Emergency requesting voluntary load reductions. If this is unable to meet the target, further reductions may be instructed by the System Operator. MainPower will disconnect customers to meet load targets, only when instructed to.

4.4 Post-event 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. Developing Events (Category A)

If the System Operator requests a load reduction for a planned Developing (Cat A) Event, MainPower will reduce demand to meet the System Operator's targets. Voluntary energy savings from the consumers are the best solution wherever possible, this may not always occur. To reduce energy usage MainPower may need to disconnect load 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.

5.1 Energy Savings and Load Control

Water heating load is not a viable option for energy savings as this only defers usage and would not save energy. Leaving water heating channels off for extended periods risks public health. Shedding irrigation load is not desirable, the irrigation load should be managed as part of wider rolling outages.

5.2 Declaration of a Developing (Cat A) Event

To declare a Developing (Cat A) Event, the System Operator will issue a specific weekly energy savings target, with as much notice as possible. MainPower will use the standard planned outage notification procedure to energy retailers. Any increase in the weekly energy savings target would also need nine days prior notice.

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

5.3 Criteria for Rolling Outages

To ensure we act in the public interest, the following table shows regulatory criteria for selecting feeders to be included in rolling outages. Feeders should be disconnected in this order.

Table 2 - Priority Loads

Priority	Priority Concern	Maintain Supply to:
1	Public health and safety	Major hospitals, air traffic control centres, and emergency operation centres.
2	Maintaining important public services	Lifelines infrastructure, e.g., energy control centres, communication networks, water and sewage pumping, fuel delivery systems, major ports, public passenger transport, major supermarkets.
3	Public health and safety	Vulnerable sectors e.g., rest homes, prisons, medical centres, schools, street lighting.
4	Animal health, food production / storage	Dairy farms, milk production facilities, chicken sheds, cool stores.
5	Maintaining production	Central business districts, commercial and industrial premises.
6	Disruption to households	Residential premises.

These priorities are intended as guidelines, and do not prevent MainPower from making pragmatic decisions.

5.4 AUFLS Under Rolling Outages

The level of AUFLS during rolling outages needs to be maintained at 16% of total load for each AUFLS block.

MainPower will include AUFLS feeders in shedding but limit the shedding to ensure the AUFLS blocks remain at 16% i.e., if MainPower sheds 20% of total load, then approximately 20% of the AUFLS feeder load would also be shed.

AUFLS feeders are low priority loads. If rolling outages are certain to continue for an extended period, then MainPower will ask Transpower to switch AUFLS to different feeders, while maintaining two 16% AUFLS blocks. This will allow rolling outages to be distributed more evenly (and on lower priority feeders).

Switching AUFLS to different feeders is complex and time-consuming. Protection changes are required. Changes to AUFLS feeders will require considerable notice to Transpower and will be subject to workload.

5.5 Grid Emergency During a Developing (Cat A) Event

If the System Operator declares a grid emergency during a Developing (Cat A) Event, the grid emergency will take priority. As water heating and irrigation load would not be used to reduce load in a Developing (Cat A) Event, MainPower would have the water heating and irrigation load available for load reduction when required for the grid emergency. If water heating and irrigation load is insufficient, the rolling outage feeders may need to be rearranged to comply with the grid emergency. After the grid emergency is over, the rolling outage pattern would continue.

5.6 Supply Restoration

Disconnected load from Immediate (Cat B) or Developing (Cat A) Events 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 25MW in any five minutes may be implemented by a network without their prior approval.

5.7 Communication and Retailer Notifications

MainPower will keep media and consumers informed of planned interruptions to supply before and during the outages. Media will be informed as per MainPower's communications procedure, led by the General Manager Customer and Corporate Relations. Energy Retailers will be responsible for consumer notification, via the normal notification process. MainPower will notify the electricity retailers whenever possible.

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

All communications with the System Operator will be using Transpower's TPSN telephone in MainPower's Control Room in Rangiora or via standard telecommunication systems.

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

MainPower key contacts are available in the Electricity Industry Emergency Contacts List (EIECL), which should be contacted by phone whenever urgent. The following is the escalation structure for MainPower Network Operations.

1. MainPower Control Room
2. Network Operations Manager
3. General Manager Network Operations

6. Rolling Outage Procedure

6.1 Responsibilities

The Control Room will:

1. Receive instructions to reduce demand from the System Operator, advise the NOCC Manager
2. Plan rolling outages by creating outage schedules, following the feeder priority list to the greatest extent possible (Schedule 1)
3. Send schedules of estimated load shedding, restoration times and quantities to the System Operator seven days before the planned outage, unless the outages are short notice (Cat B).
4. Advise the System Operator if significant variation to the schedules is expected.
5. Advise Retailers of the outages, using the normal process, if time allows. Or alternatively, advise the General Manager Customer and Corporate Relations, who will ensure the outages are publicized.

The NOCC Manager will ensure:

1. Load shedding schedules are prepared
2. Network Controller rosters are adjusted as required
3. Load is controlled and monitored to meet desired targets
4. The business is kept informed, as agreed with the General Managers

6.2 Feeder Selection

The composition of different loads on each MainPower feeder means that load shedding will not align perfectly with the priorities, because most feeders have a mix of load types. We will align to the greatest possible extent practical, without switching subcircuits unless a special case arises.

The feeder priorities of Table 2 result in the load breakdown shown in Table 3. In this analysis, we use the highest priority load within the feeder to define the priority of the entire feeder. The proliferation of water and sewerage pumping throughout the network results in a large fraction of load in Priority 2.

Table 3 - Load breakdown from feeder priority

Priority	MW Load (shoulder season)	Percentage of Total Load
1	23.26	34.69%
2	32.57	45.59%
3	5.77	8.61%
4	0.49	0.74%
5	4.94	7.37%
6	0	0%
Total	67.03 (Average loadings)	100%

6.3 Contingent Events

If an unplanned event occurs, such as a Civil Defence emergency that could alter the planned rolling outages, Network Controllers are responsible for communication with retailers of any changes to the advertised program.

6.4 Rolling Outage GXPs

The following GXPs will experience rolling outages:

- Southbrook
- Kaiapoi
- Waipara
- Culverden
- Ashley

APPENDIX 1 – FEEDER TABLE

Feeder	Short Name	AUFLS Block	Winter	% Total Load	Summer	% Total Load	Shoulder	% Total Load	Priority
Southbrook – Marsh Road	SB1042		0.00	0.00%	0.00	0.00%	0.00	0.00%	6
Southbrook – Townsend	SB1072		0.00	0.00%	0.00	0.00%	0.00	0.00%	6
Kaiapoi North - Williams Street	K38		0.00	0.00%	0.00	0.00%	0.00	0.00%	6
Southbrook - Todds Road	SB1132		0.00	0.00%	0.00	0.00%	0.03	0.04%	5
Kaiapoi – Load Control	KAI CB5		0.38	0.49%	0.38	0.55%	0.38	0.57%	5
Ashley - Diaken	ASY CB2672	2	6.51	8.45%	4.50	6.49%	4.53	6.76%	5
Burnt Hill – South on Burnt Hill	X53		0.28	0.36%	0.99	1.43%	0.49	0.74%	4
Kaiapoi North - Moorcroft	K34		0.00	0.01%	0.36	0.51%	0.32	0.47%	3
Rangiora West - Fernside	S33		0.09	0.12%	0.08	0.11%	0.09	0.14%	3
Kaiapoi North - Pineacres	K33		0.24	0.31%	0.14	0.21%	0.19	0.28%	3
Burnt Hill – North on Domain	X57		0.31	0.41%	0.92	1.33%	0.50	0.74%	3
Burnt Hill – South on Domain	X55		0.33	0.43%	1.35	1.95%	0.76	1.13%	3
Rangiora West - Rangiora West	S35		0.87	1.13%	0.71	1.02%	0.82	1.23%	3
Swannanoa – North	SW62		1.38	1.79%	1.24	1.79%	1.11	1.66%	3
Southbrook – Central	SB1052		2.36	3.07%	1.72	2.48%	1.98	2.96%	3
Kaiapoi - Silverstream	KAI CB24		0.00	0.00%	0.00	0.00%	0.01	0.02%	2
Leader - Leader Road	L52	1	0.05	0.06%	0.04	0.05%	0.04	0.06%	2
Leader - Parnassus	L53	1	0.11	0.14%	0.50	0.72%	0.21	0.31%	2
Leader - Claverley	L51	1	0.15	0.19%	0.12	0.18%	0.14	0.20%	2
MacKenzies Road - Weka Pass	W22	1	0.17	0.21%	0.21	0.31%	0.17	0.25%	2
Greta - Motunau	G32	1	0.20	0.26%	0.19	0.28%	0.20	0.29%	2
Greta - Scargill	G33	1	0.24	0.32%	0.24	0.35%	0.26	0.38%	2
MacKenzies Road - Omihi	W21	1	0.31	0.40%	0.31	0.44%	0.29	0.43%	2
Greta - Ethelton	G31	1	0.32	0.42%	0.42	0.61%	0.33	0.49%	2
Hawarden - Medbury	H41	1	0.35	0.46%	1.07	1.54%	0.45	0.68%	2
Cheviot - North	T41	1	0.36	0.47%	0.64	0.93%	0.40	0.59%	2
Cheviot - South	T43	1	0.37	0.48%	0.67	0.96%	0.40	0.60%	2
Kaiapoi North - Woodend East	K36		0.51	0.66%	0.31	0.45%	0.40	0.60%	2
Mouse Point - Leslie Hills	P55		0.55	0.71%	0.87	1.26%	0.49	0.74%	2
Mouse Point - Balmoral	P25		0.59	0.76%	1.67	2.41%	0.94	1.40%	2
Hawarden - Hawarden	H31	1	0.63	0.82%	0.63	0.91%	0.49	0.73%	2
Swannanoa – West	SW65		0.75	0.98%	0.98	1.41%	0.93	1.39%	2
Burnt Hill – East on South Eyre	X52		0.76	0.99%	1.52	2.18%	0.96	1.43%	2
Ashley - Sefton	ASY CB2712	2	0.79	1.03%	0.57	0.82%	0.65	0.98%	2
Mouse Point - Culverden	P35		0.82	1.07%	2.00	2.88%	1.46	2.18%	2
Ashley - Beatties Road North West	ASY CB2692	2	0.85	1.10%	0.56	0.81%	0.70	1.05%	2
Swannanoa – South	SW63		0.98	1.27%	2.28	3.29%	1.34	1.99%	2
Rangiora West - West Belt	S34		0.98	1.27%	0.92	1.32%	1.02	1.52%	2
Amberley - Broomfield	Y43	1	0.98	1.28%	0.67	0.97%	0.48	0.72%	2
Hanmer - Argelins	N34	2	1.01	1.31%	0.59	0.85%	0.78	1.16%	2
Kaiapoi – Tuahiwi	KAI CB1		1.10	1.42%	0.62	0.89%	0.85	1.27%	2
S1 - S1	K18		1.13	1.47%	0.71	1.02%	0.89	1.33%	2
Ludstone - Town	U82	1	1.27	1.65%	1.09	1.58%	1.19	1.77%	2
Ashley - Waikuku	ASY CB2762	2	1.27	1.65%	1.00	1.43%	1.03	1.54%	2
Southbrook - Fernside	SB1162		1.45	1.89%	1.12	1.61%	1.31	1.96%	2
Amberley - Amberley	Y33	1	1.46	1.89%	1.06	1.53%	0.81	1.20%	2
MacKenzies Road - Mt Cass	W23	1	1.50	1.95%	1.50	2.16%	1.50	2.24%	2
S1 - Site 10HA and 4755	K16		1.94	2.51%	0.84	1.21%	1.16	1.73%	2
Kaiapoi – Clarkesville	KAI CB6		1.94	2.52%	1.34	1.93%	1.65	2.46%	2
Kaiapoi North - Sovereign Palms	K37		2.15	2.79%	1.16	1.67%	1.57	2.33%	2
Burnt Hill – North on Burnt Hill	X54		2.39	3.10%	1.76	2.53%	2.06	3.07%	2

Kaiapoi – Wetheral	KAI CB7		2.92	3.80%	2.04	2.94%	2.30	3.43%	2
Kaiapoi – Ohoka Road	KAI CB4		3.17	4.12%	2.52	3.64%	2.73	4.07%	2
Burnt Hill – West on South Eyre	X56		0.23	0.30%	0.58	0.84%	0.32	0.48%	1
Hawarden - Waikari	H21	1	0.35	0.45%	0.26	0.38%	0.25	0.38%	1
Ludstone - South	U92	1	0.40	0.52%	0.49	0.71%	0.45	0.67%	1
Cheviot - Town	T42	1	0.52	0.67%	0.38	0.55%	0.44	0.66%	1
Southbrook - Flaxton	SB1082		0.73	0.95%	0.44	0.64%	0.54	0.81%	1
Ludstone - North	U42	1	0.84	1.09%	0.82	1.19%	0.85	1.26%	1
Mouse Point - Waiau	P45		0.85	1.11%	2.01	2.90%	1.24	1.85%	1
S1 - Site 8140	K15		0.93	1.21%	0.53	0.77%	0.68	1.01%	1
Ludstone - Churchill Street	U32	1	1.03	1.34%	0.73	1.06%	0.89	1.33%	1
Rangiora West - South Belt	S36		1.09	1.41%	0.90	1.30%	1.08	1.60%	1
Amberley - Balcairn	Y23	1	1.11	1.45%	0.79	1.13%	0.65	0.96%	1
Hanmer - Scarborough	N44	2	1.27	1.65%	0.91	1.31%	1.02	1.52%	1
S1 - Site 1302	K19		1.38	1.80%	0.98	1.42%	1.15	1.71%	1
Swannanoa – South West	SW66		1.56	2.02%	2.35	3.39%	1.70	2.53%	1
Kaiapoi North - Woodend West	K35		1.94	2.52%	1.26	1.82%	1.62	2.42%	1
Swannanoa – East	SW64		2.08	2.70%	1.68	2.42%	1.75	2.61%	1
Southbrook - Lineside	SB1152		2.35	3.05%	1.22	1.76%	1.66	2.47%	1
Southbrook - Northbrook	SB1142		2.84	3.69%	1.66	2.40%	2.11	3.14%	1
Southbrook - Borough	SB1172		3.02	3.92%	2.08	3.00%	2.41	3.59%	1
Southbrook – Boys	SB1062		3.19	4.14%	2.13	3.07%	2.47	3.69%	1