

EA NETWORKS (ELECTRICITY ASHBURTON LTD)



Participant Outage Plan

SYSTEM OPERATOR IMPOSED LOAD REDUCTION

Reviewed March 2015



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Documentation Control

Distribution List

DOCUMENT NAME	Type	Location
Security of Supply Participant Outage Plan	Electronic Copy	Intranet Server

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Disclaimer

This participant outage plan has been prepared by EA networks to provide guidance on operating procedures, for use by persons operating EA networks distribution network

Although this plan is recommended as good practice for operating EA networks network, it should not be relied on as a substitute for any legislative requirements or best industry practice as set out in the various national electrical industry publications. .

It needs to be understood that owing to the variable nature of loadings on the network load savings on feeders as indicated are estimations only and further considerations may be required at the time to fulfil actual requirements.

This plan can only be modified with the approval of the System Operator. The most current version is available on EA networks intranet system with one hard copy held by the Operations Manager.

NOTE: Discretionary hard copy publications must be viewed as only being accurate on the day they are published.

Documentation Revision Control

Document Version	Description	Date
Version 001	Initial document	20/1/10
Version 002	Update High Impact Consumers	4/2/10
Version 003	Insert indicative plans section 16. Minor terminology and typo changes	10/3/10
Version 004	Alterations to Grid Emergency flo chart. Insert Weekly MWh saving. Emphasise criteria for high impact consumers. AUFLS clarification % load reduction	22/3/10
Version 005	Reference to Appendix P EA networks Operation Manual "Feeder Rolling Shutdown Sequence" added. Feeder outage duration times clarified	28/3/10
Version 006	Minor changes to clarify wording	22/4/10
Version 007	Change company name	31/5/13
Version 008	Refer to Electricity Authority , Review contact names, Review AUFLS zone 2 load reduction percentages, Alterations Appendix A and B. Add Hyperlink's	1/12/14
Version 009	Changed format, updated schedule of rolling targets, added information as required based on System Operator Rolling Outage Plan (30 September 2010)	24/3/2015

Introduction

This plan is provided to comply with the System Operator Rolling Outage Plan (SOROP).

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.

How an event is declared and how the System Operator should communicate its requests are detailed.

The main energy saving measure listed is rolling outages and how these are structured and implemented is discussed.

NOTE: This plan refers to [EA networks Operating Manual](#) for particular operational responses including Appendix P: Rolling Feeder Outage Sequence Schedule.

Purpose

Under the Code, participant rolling outage plans (PROP) are required to specify the actions that would be taken to;

- Reduce electricity consumption when requested by the System Operator.
- Comply with requirements of the System Operator Rolling Outage Plan (SOROP)
- Supplement the System Operators Rolling Outage Plan

Reducing demand by disconnecting supply to customers must be viewed as a last resort after all other forms of savings including voluntary savings had been exhausted. EA networks will apply best endeavours in providing continuous supply to consumers connected to the network.

Definitions

AUFLS	Automatic under Frequency Load Shedding
Feeder	A high voltage supply line typically supplying between 100 and 2000 customers.
GXP	Transpower Grid Exit Point
GEN	Grid Emergency Notice
Network Controller	The EA Networks employee who at the time is responsible for the Day to Day control and operation of EA networks distribution network
Operations Manager	The EA networks employee who is responsible for the operational management of EA networks distribution network and compliance to the participant outage plan
PROP	Participant Rolling Outage Plan (this plan)
Code	Electricity Industry Participation Code
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
System Operator	Operator of the national electricity transmission grid

Background

System Operator

The Electricity Industry Act 2010 requires the system operator to manage supply emergencies. Specific functions of the system operator in relation to security of supply are set out in Parts 7 and 9 of the Code, including associated policies.

EA networks

EA networks is the electricity network (Lines) company that owns, operates and maintains the lines, cables and substations delivering electricity to the Ashburton District.

Range of Events

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

- Developing Events – an event that evolves over time, for example, a period of unseasonably low inflows to hydro catchments; and
- Immediate Events – an event that occurs with little or no warning, usually as a result of a transmission or major power station failure.

Communication with retailers, civil defence and other stakeholders will be as per notification procedures described in EA networks [Operations Manual](#).

Actions for Immediate Events

System Stability

The System Operator is required to keep enough reserve generation to cover the risk of the largest connected generator 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 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 generation 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;

Reserve Market

Generators and load users with interruptible load such as distribution networks may offer in reserve capacity to cover the risk of the largest generating unit 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. EA networks does not presently participate in this market.

Automatic under frequency load shedding (AUFLS)

If the load shed by the Reserve Market tripping is insufficient to stabilise the network, further automatic load reduction will be initiated directly by Transpower at their Transpower ASB GXP.

Note: All EA networks 33kV feeders are ring connected. Transpower have approved that EA networks supply will not be interrupted for Zone 1 shedding. However the entire 33kV supply will be interrupted for Zone 2 shedding. Sufficient load reduction within the 33kV network will be available at all times to meet AUFULS requirements (refer

below). As the 66kV supply has embedded generation (Highbank and Montalto) this supply remains unaffected by the AUFLS control unless the national operator directly requests EA networks to shed feeders connected to its 66kV sub transmission network.

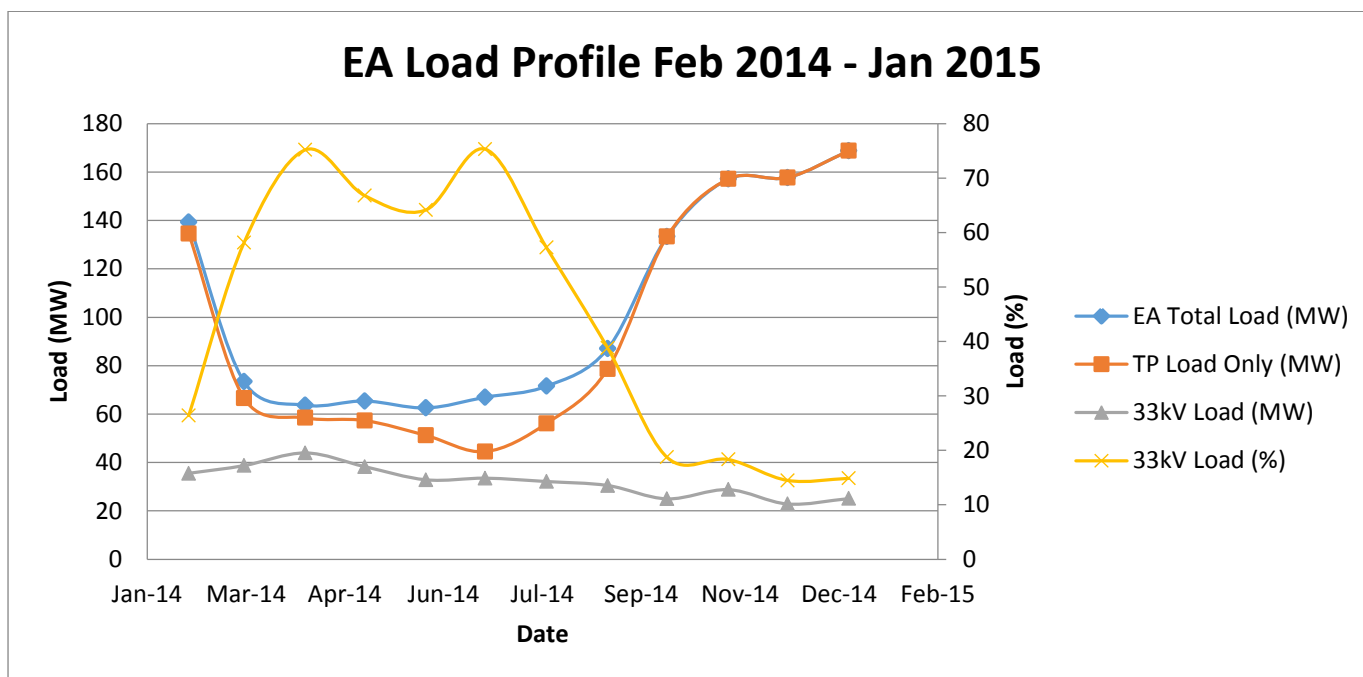
AUFLS Zone 1

If system frequency fails to recover after Reserve Market load shed, AUFLS Zone 1 shedding is implemented. Currently Zone 1 operation does not disconnect EA networks consumers. Please note this arrangement is approved by Transpower as above.

AUFLS Zone 2

If zone 1 tripping fails to restore frequency, the next stage, zone 2 activates. Transpower will disconnect all EA networks consumers connected to the 33kV point of supply at Transpower’s Substation ASB.

AUFLS Zone 2 load reduction achieved by disconnecting 33kV Network



AUFLS Tripping Flow Chart refer Appendix A

Manual Shedding

If AUFLS Zone 1 and Zone 2 tripping fails to stabilize frequency the System Operator may request more load shedding in the form of shedding load connected to EA networks 66kV sub transmission network.

Once the frequency has stabilised the System Operator will advise the EA networks Network Controller when load can be restored.

Supply Restoration

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.

Transmission Grid Emergency

The System Operator may request EA networks to reduce load under a grid emergency notice (GEN). EA networks will shed all water heating load, the National System Operator will be advised and if more shedding is required the

System Operator will instruct EA networks to disconnect load as per the rolling feeder outage sequence schedule. (Refer Appendix P EA networks Operating Manual)

If an Immediate Event is in place, the Grid Emergency will take precedence.

If the System Operator declares a supply shortage during a Grid Emergency, then EA networks will immediately respond to the request by planning, implementing and scheduling rolling outages as provided in sections 12 to 16 of this plan and in the rolling feeder outage sequence schedule. (Refer Appendix P EA networks Operating Manual)

Authorisation to receive direction and activate

System Operator's Point of Contact

For possible participant outages System Operator will initiate dialog with the Duty Network Controller. The communications and directions are to be received via Transpower's TSX telephone or telephone number listed below, while written communications are expected sent through to Network Controller's email address, failing that Fax can be utilised for passing the information.

Duty Network Controller

Control Centre

EA Networks

Phone: +64 3 307 9851

Mobile: +64 27 457 3883

Fax: +64 3 307 9863

Email: control@eanetworks.co.nz

Implementation Responsibility

The Duty Network Controller must notify the Operations Manager as soon as possible and prior to any operations affecting supply to consumers. For some emergencies operating measures may be required immediately. Imposed supply interruptions to consumers shall where possible be applied on a fair and equitable basis. For after normal working hours or where the Operations Manager is not available the Duty Network Controller shall notify company management in accordance with Section 6 EA Networks Operating Manual.

Target Monitoring and Reporting

The Duty Network Controller in conjunction with the Operations Manager will monitor actual demand versus the target and report values to the National System Operator at regular intervals or at intervals agreed by both parties.

For load shedding to a weekly target, the Business Analyst will monitor the System Operator's report of our savings results to our target and together with the General Manager and Operations Manager, review future load shedding to increase or decrease amount of rolling outages to enable the weekly target to be met. In parallel (as a check) with the System Operator, the Business Analyst will be responsible for daily and weekly reporting of consumption relative to target levels (using our data sources).

In the case of daily or real time limits where the System Operator reporting will be too slow for real time action to be taken, the Business Analyst will monitor our savings and adjust accordingly in the timeframe required.

The Network Controller will also provide regular reports to the System Operator (at a frequency notified by the System Operator) assessing compliance with this plan and compliance with directions from the System Operator.

Notifications to Public Agencies

In general, media and consumer notifications will be carried out in accordance with Section 6 of [EA networks Operating Manual](#).

However with the wide scale impact of rolling outages it is not feasible to use the standard planned outage notification process (mainly because retail and postal systems could not process the many outage notifications required).

When implementing an extended rolling outage plan, EA networks will notify outages in a number of ways:

- Public notices - EA networks will place public notice advertisements providing a rolling outage timetable showing the times and areas affected by rolling outages. The advertisement will provide details of our website page for Consumers that wish to seek more information.
- EA networks website - a dedicated website page will be set up which shows the rolling outage timetable. A future plan is to allow consumers to register their ICP and request future planned interruption information.
- Retailer notification - EA networks will provide the rolling outage timetable to all electricity retailers together with a schedule showing the rolling outage group for all ICPs (it is not appropriate to filter the schedule for an individual retailer's ICPs as this places switching ICPs at risk).

Where possible EA networks will provide 7 days notice of all rolling outage plans, generally publishing and issuing notifications on a Monday to apply from the following Monday.

Implementing rolling outages

Schedule for achieving target levels

EA Networks **indicative** plans for achieving 5%-25% savings are outlined in the following tables. With that durations shall be dependent upon the percentage savings level requested.

Winter

Savings Target	Number of Feeders Impacted	Number of Outages per Week	Maximum Outage Durations	Approximate Weekly MWh savings for typical winter week
5%	3	5	2hrs	29
10%	4	10	3hrs	174
15%	5	15	4hrs	522
20%	7	20	6hrs	1392
25%	9	25	6hrs	2175

Summer

Savings	Number of Feeders	Number of	Maximum	Approximate MWh savings
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Target	Impacted	Outages per Week	Outage Durations	for typical summer week reductions given near peak loadings
5%	3	5	2hrs	83
10%	6	10	3hrs	498
15%	9	15	4hrs	1980
20%	12	20	6hrs	3984
25%	15	25	6hrs	6225

How the Plan meets the criteria set out in Part 5 of the SOROP?

For a planned event (>24hours), to ensure public health and safety is preserved and costs to economy are minimised, priority consumers (refer Appendix B of EA networks Operating Manual) will be notified and where possible arrangements made to satisfy basic requirements.

The priority criteria outlined in section 5.1 of the SOSOP have been applied in developing the strategy for implementing rolling outages within the EA networks supply area.

The process for translating the savings targets into an operational plan designed to achieve the targets

The Operations Manager and Network Controller's will review weekly targets and prepare plans for weekly rolling outages based on savings required.

The process for disconnecting load in a controlled manner and how load reductions are to be coordinated with the system operator in real time (including meeting any reasonable requirements of the system operator to limit the rate of disconnection)

Each distribution feeder exiting a zone substation (or switching station, or group of feeders where they belong to a parallel or ring supply) will be named as a "Rolling outage feeder".

Rolling outage feeders will each be assigned a priority determined from the mix of customers supplied on each feeder (residential, commercial, industrial, farming, essential services and etc.) and by applying the priority criteria included in section 5.1 of the SOSOP. Rolling outage feeders will be included in a rolling outage sequence schedule (refer Appendix P EA Networks Operating Manual) maintained and updated from time to time as appropriate. Regular reviews of the sequence will be made, taking into account seasonal variations and disruptions to high impact consumers.

NOTE: The feeder rolling shutdown sequence schedule allows for winter and summer seasons owing to loadings and load locations being significantly different. Three different orders of interruptions are provided to allow for rotation of interruption times to assist in minimising inconvenience to consumers and to provide a sense of fairness to all consumers.

A set of switching instructions will be prepared for each rolling outage group and a record of the off and on times will be maintained on the supplementary log as illustrated in Appendix C

Load monitoring and recording of load to ensure compliance with the national operator requirements will be undertaken just it is in normal conditions.

Unless advised otherwise by the national system operator, the rolling outages plan must provide sufficient time for switching of load to ensure that EA Networks load does not dramatically increase or decrease load in any 5 minute period. The Duty Network Controller's shall monitor activities in relation to this limit.

If EA networks is unable for some reason to meet the load disconnection/restoration ramp rates, or if there is expected to be a material departure (greater than 20%) from the previously provided half hourly GXP load forecast / load profile, then EA networks would communicate directly with the National System Operator.

Grid exit points at which the distributor plans to implement rolling outages

Rolling Outages will be implemented at EA Networks sole Grid Exit Point – Ashburton ASB

How any AUFLS requirements will continue to be met with rolling outage are being implemented?

At all times during a period in which rolling outages are being implemented, the load on the 33kV supply will be maintained such that it is at least 13% of the total load on the EA networks network.

Form the operational plan will take.

Having established the week ahead rolling outage plan and despite significant uncertainty in predicting customer behaviour during these types of events, EA networks will use best endeavours to produce a rolling week ahead half hourly load forecast. This will be updated daily to reflect any adjustments to our plan and forwarded to the National System Operator.

Where possible, outages should be programmed to be held during daylight hours, between 8am and 5pm, only extending into the evening where necessary to achieve the required savings level or accommodate switching logistics

The expected timeframes to respond to a direction under a Developing Event and an Immediate Event (paragraph 2.13 of the SOROP);

Developing Event

For a developing event the System Operator will endeavour to provide 9 days prior notice to EA Networks via Duty Network Controller of the requirement for weekly energy savings and any increase in the weekly energy savings target.

The Network Controller will promptly consult with the Operations Manager, Network Manager, General Manager or a member of network management in accordance with section 6 of EA networks Operating Manual review the rolling outage plan and prepare in implementing the scheduled rolling outages as per this documentation and in the rolling feeder outage sequence schedule. (Refer Appendix P EA Networks Operating Manual).

Immediate Event

For an Immediate Event the Duty Network Controller of EA Networks will instantaneously action System Operators desired target. Promptly after implementing this request the Duty Network Controller will advise the Operations

Manager, Network Manager, General Manager or a member of network management in accordance with section 6 of EA networks Operating Manual of the implemented request. Duty Network Controller and Operations manager, General Manager or a member of network management in accordance with section 6 of EA networks Operating Manual will review the rolling outage plan and initiate in implementing the scheduled rolling outages as per this documentation and in the rolling feeder outage sequence schedule (Refer Appendix P EA Networks Operating Manual) while maintaining System Operators desired target.

Process for restoring load in a controlled manner

Prior to notifying and implementing a rolling outage plan, EA networks will consult with the National System Operator Security Coordinator to establish and agree to a process for shedding and restoration, which may include a MW load cap to operate under during restoration phases.

How the operational plan is to be communicated with the system operator;

EA networks will contact the System Operator Emergency Response Project Manager for administration purposes including reporting performance against targets using the following details:

Transpower New Zealand Ltd
Ground Floor, 96 The Terrace, PO Box 1021, Wellington
www.transpower.co.nz
Telephone: +64 4 495 7000

Arrangements for identifying and managing particular health and safety issues that may affect customers, including interfacing with retailers as required;

EA networks uphold a policy of social responsibility in respect to consumer's welfare. Should imposed supply cuts affect this aim reasonable assistance subject to the nature and duration of the emergency will be offered to affected consumers.

Backup arrangements to cover unexpected contingencies.

If an unplanned event (Interruption by fault) were to occur in the distribution network when participant rolling outage plans were in effect, the Operations Manager, Network Manger, General Manager or a member of the network management in accordance with section 6 of EA Networks Operating Manual will make the decision to modify the rolling outage to maintain the designated target. Where possible, any changes to the planned timetable should be published on EA networks website and communicated to retailers.

Coordination with grid emergencies

Grid emergencies

If the System Operator declares a Grid Emergency during a Developing Event, the Grid Emergency will take priority. As water heating load generally would not be used to reduce load in a Developing Event, EA Networks would make water heating load available for load reduction when required for the grid emergency. This load would be shed, and the System Operator advised. The System Operator may then instruct the duty Network Controller to shed load to a predetermined value and time period.

Process for reverting to participant rolling outage plan at the end of grid emergency.

System Operator will directly contact EA Networks Duty Network Controller to advise that the Grid Emergency has been revoked and announce what the desired state of the rolling outage plan is to be.

Maintaining performance over time

Monitoring

Duty Network Controller will enter in the Rolling Outage Log, times of disconnection and reconnection of all feeder interruptions. The log supplement sheet to be used by Network Controllers is shown in EA networks Operating Manual Appendix P

Maintaining targets

Process of restoring and disconnecting other loads while maintaining targets and meeting the criteria for load shedding

If an unplanned event occurs that will alter planned rolling outages, the decision to alter must be made by the Operations Manager, Network Manager, General Manager or a member of network management in accordance with section 6 of EA Networks Operating Manual. Where possible, any changes to the planned timetable should be published on EA Networks website and communicated to retailers.

Process to modify the operational plan to ensure that targets are met as actual load varies from the operational plan.

For load shedding to a weekly target, the Business Analyst will monitor the System Operator's report of savings results to target and together with the General Manager and Operations Manager, review future load shedding to increase or decrease amount of rolling outages to enable the weekly target to be met. In parallel (as a check) with the System Operator, the Business Analyst will be responsible for daily and weekly reporting of consumption relative to target levels (using our data sources).

In the case of daily or real time limits where the System Operator reporting will be too slow for real time action to be taken, the Business Analyst will monitor our savings and adjust accordingly in the timeframe require

Monitoring and reporting performance against targets

Systems to be used for monitoring savings performance against targets

EA Networks Duty Controller will utilise EA Networks Supervisory Control and Data acquisition (SCADA) System to monitor the savings performance against targets set out by System Operator.

How the nature and extent of the rolling outages is to be monitored

Summer vs Winter Loads

There is a clear difference between what types of load come online, go offline during the respective seasons.

Summer months bring irrigation loads online. Majority of these loads are in the rural sectors of the Distribution Network and hence are serviced from Rural Substations.

Winter months bring heating loads online and irrigation loads go offline. During this time of the year the heating loads are insignificant in relation to national demands.

Arrangements to assess compliance with the plan

For load shedding to a weekly target, the Business Analyst will monitor the System Operator's report of savings results to target and together with the General Manager and Operations Manager, review future load shedding to

increase or decrease amount of rolling outages to enable the weekly target to be met. In parallel (as a check) with the System Operator, the Business Analyst will be responsible for daily and weekly reporting of consumption relative to target levels (using our data sources).

In the case of daily or real time limits where the System Operator reporting will be too slow for real time action to be taken, the Business Analyst will monitor our savings and adjust accordingly in the timeframe require.

How performance will be reported to the system operator

The Duty Network Controller will provide regular reports to the System Operator (at a frequency and communications medium advised by the System Operator) assessing compliance with this plan and compliance with directions from the System Operator.

Load restoration

How load restoration is to be coordinated with the system operator

Duty Controller will consult with the System Operator to establish and agree to a process for restoration, which may include a MW load cap to operate under during restoration phases.

The person intended to receive the direction from the system operator to revoke the supply shortage declaration.

System Operator will advise the Duty Network Controller of the withdrawal of the supply shortage declaration. The communications and directions are to be received via Transpower's TSX telephone or standard telephone or via email. System Operator shall immediately advice Operations Manager, General Manager or a member of network management of the status change.

The process for restoring load in a controlled manner

Restoration of disconnected load must be restored in conjunction with the System Operator by the Duty Network Controller. This is to prevent overloading the transmission grid and/or creating further instability.

Communication Strategy

Strategy for informing rolling outage plan to stakeholders

Communication with retailers, civil defence and other stakeholders will be as per notification procedures described in EA networks Operations Manual.

Coordination of public messages with System Operator

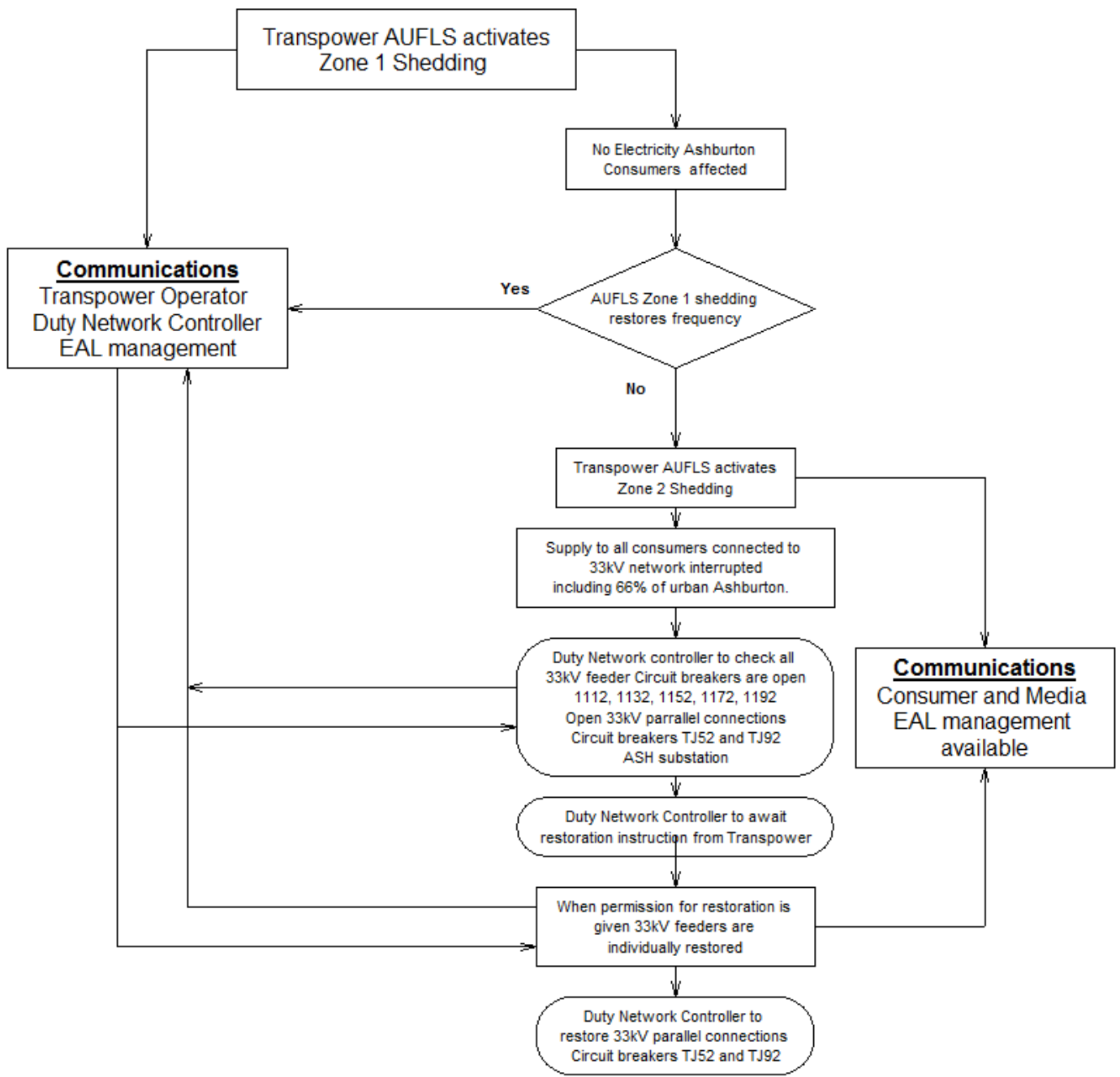
If the System Operator has made a supply shortage declaration in response to a Developing Event it may put in place general media advertising covering the need to conserve electricity and advising that rolling outages will be necessary.

If EA networks plans to issue a public message related to rolling outages then this will be sent to the System Operator for review before being released. Any such communication will give a time for response from the System Operator, so as their feedback can be included before EA networks issues the message to the public.

EA NETWORKS

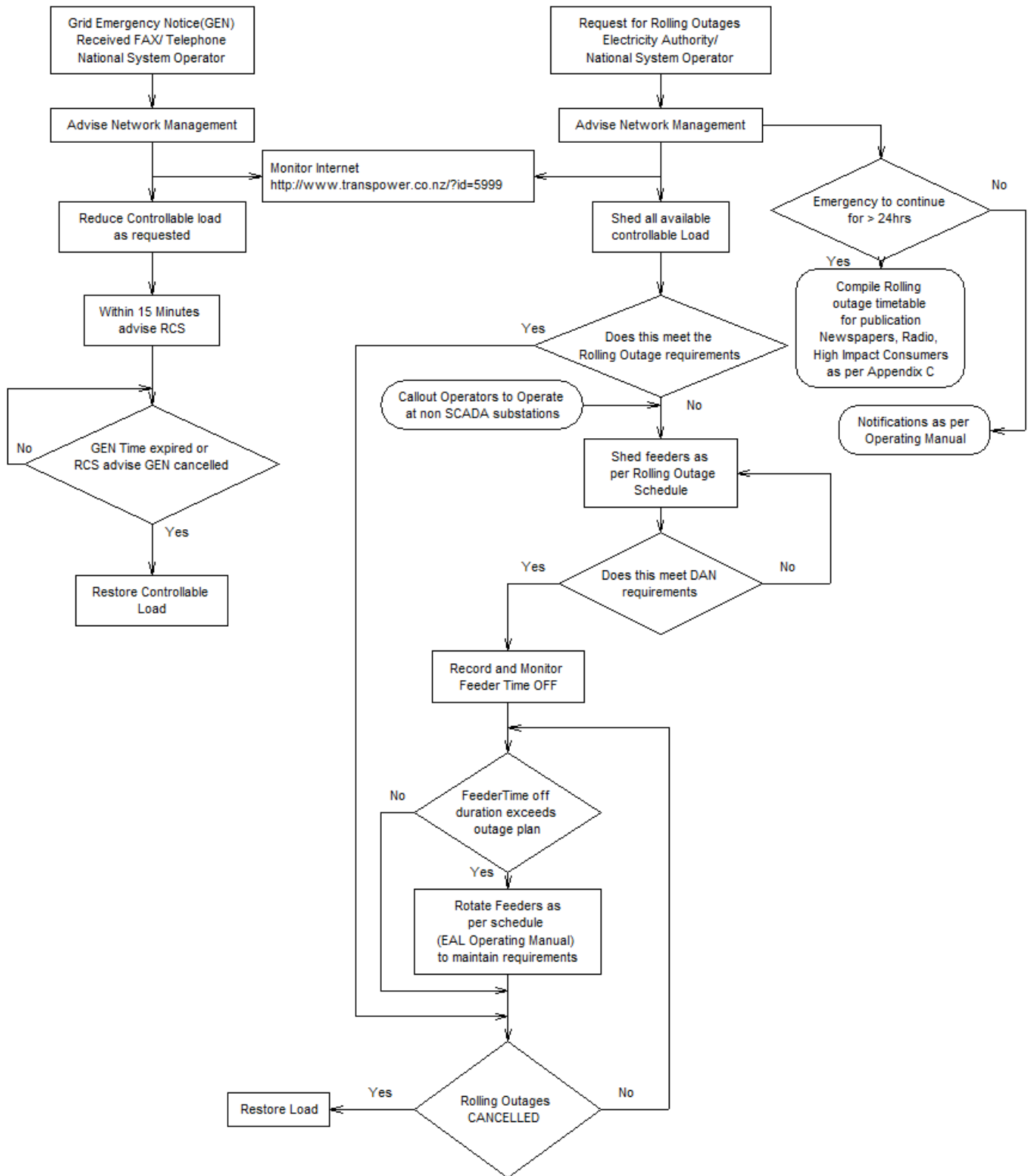
UNDER FREQUENCY (AUFLS) EMERGENCY FLOW CHART

Note: 66kV supply remains energised with embedded generation in circuit



AUFLS FLO CHART 2014.flo

GRID EMERGENCY FLOW CHART



Grid Emergency process 2014.flo

Appendix D: Draft of Rolling Outage Public Notice

ELECTRICITY SUPPLY INTERRUPTIONS

Please read - your supply may be affected

EA networks is required to reduce electricity consumption with rolling power outages across the Ashburton District to meet a X% savings target set by the System Operator in response to the current energy crisis.

Voluntary savings have already helped us reduce the impact of rolling outages, and further savings may allow us to reduce these planned cuts further.

Outages will occur within the time periods noted in the schedule below. Wherever possible, we will delay cuts and restore power early, so please treat all lines as live.

Within each area we have prioritised individual circuits to minimise the cost and disruption to our community, and timed outages accordingly.

YOUR SAFETY AND PROTECTION

It is important to ensure you keep safe around electricity even when it is off.

- Power may be restored at any time.
- Please leave all appliances off during power cuts, particularly ovens and cook tops.
- To prevent damage to computers and other electrical equipment turn power off at the wall prior to outages.

Are you reliant on power ... If your health may be affected by these outages you will need to make alternative arrangements, or contact your health care provider for assistance. Please note telephones that rely on a mains supply may not operate during outages, so plan in advance.

Traffic lights will be affected by these outages, so please avoid travelling in the affected areas if possible. Avoid using lifts.