Emergency Management Policy

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Glossary of abbreviations and terms

AUFLS	Automatic under-frequency load shedding
Authority	The Electricity Authority established in accordance with the Electricity Industry Act 2010 (Act).
developing event	An event that evolves over time, e.g. as the result of a period of unseasonably low inflows to hydro catchments
immediate event	An event that occurs with little or no warning, e.g. as a result of a transmission or major power station failure
Code	The Electricity Industry Participation Code 2010
EMP	This policy, being the Emergency Management Policy
emergency storage guideline	The 10% hydro risk curve as defined in the SoSFIP
hydro risk curves (HRCs)	The profile of New Zealand or South Island hydro storage over a calendar year that represents levels of risk of future electricity shortages identified by the system operator in accordance with the security of supply forecasting and information policy
PPOs	Principle performance obligations
SOROP	System operator rolling outage plan
SoSFIP	Security of supply forecasting and information policy
Critical Contingency Operator or CCO	The critical contingency operator appointed in accordance with the Gas Governance (Critical Contingency Management) Regulations 2008[1]
Gas Critical Contingency	A critical contingency as determined by the Critical Contingency Operator under the Gas Governance (Critical Contingency Management) Regulations 2008

Any term that is defined in the Act or the Code and used but not defined in this Policy has the same meaning as in the Act or the Code.

[1] http://gasindustry.co.nz/sites/default/files/u14/Regulations.pdf

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1 Introduction

1.1 Background

1.1.1 The Act requires the system operator to manage supply emergencies. The system operator's role therefore includes managing emergencies arising from the shortfall or anticipated shortfall of generation, transmission, and or ancillary services through the provision of information and the secure dispatch of the power system.

1.1.2 The Code sets out the responsibilities and functions of the system operator in relation to security of supply and short and extended emergency management in the following ways:

a) through the specification of the principal performance obligations (PPOs) for frequency management and avoiding cascade failure (clause 7.2 of the Code);

b) through the specification of a dispatch objective to be attained by the system operator (clause 13.57 of the Code);

c) through an emergency technical code that sets out the basis on which the system operator and participants will anticipate and respond to emergency events on the national grid (grid), which are typically of a short term nature (Technical Code B of Schedule 8.3 of the Code);

d) through the requirement for the system operator to develop a security of supply forecasting and information policy[2] that includes a requirement for the system operator to prepare and publish:

i) at least annually a security of supply assessment; and

ii) information that assists interested parties to monitor how hydro and thermal generating capacity, transmission assets, primary fuel, and ancillary services are being utilised to manage risks of shortages (clause 7.3(1)(a) of the Code);

e) through the requirement for the system operator to develop an emergency management policy (this policy) which sets out the steps that the system operator must take, and encourage participants to take, at various stages during an extended emergency such as an extended dry sequence or an extended period of capacity inadequacy (clause 7.3(3)(a) of the Code); and

f) through the requirement for the system operator to initiate an official conservation campaign; or manage and coordinate planned outages as an emergency measure in anticipation of, or during, energy shortages (Part 9 of the Code).

[2] http://www.systemoperator.co.nz/f4187,39186770/sos-supply-forcasting-policy-sep-10.pdf

1.1.3 Through the need to ensure generation continually meets electricity demand many of the above functions must be fulfilled concurrently. The system operator publishes a number of policies setting out how it intends to attain the PPOs[3], meet the dispatch objective, anticipate and manage contingent events, and provide information to participants. The Code requires the preparation, and the Authority approves many of these policies.

1.2 Purpose

1.2.1 This emergency management policy (EMP) sets out the steps the system operator will take, as a reasonable and prudent operator, and encourage participants to take at various stages during an extended emergency. The steps to be taken by the system operator include the requirement[4] for the system operator to initiate an official conservation campaign under pre-determined conditions and, if needed, manage and coordinate planned outages as an emergency measure in anticipation of, or during, prolonged energy shortages[5].

1.2.2 This EMP replaces the EMP published by the system operator on 19th December 2011.

1.3 Scope of Emergency Management Policy

1.3.1 The market is primarily governed by the Code. The Code seeks to create an environment in which competitive processes result in the efficient operation of the electricity industry and at the same time delivers reliable supply of electricity to consumers. To the extent possible these competitive processes are used to discover prices that encourage participants to assess and manage risks inherent within the electricity industry. Such risks include the uncertain availability of capacity (whether offered[6] or through unplanned outages) and the uncertain availability of primary fuel (wind, water, thermal fuel) in the short (days) and longer (months) term. These processes achieve the desired outcomes in all but a few instances.

1.3.2 The Code anticipates the potential for operational outcomes, including extended emergencies, which require management through greater central coordination.

1.3.3 Most emergencies are typically regional in nature and last for at most several days. System operator and participant management of these emergencies is governed by Technical Code B of Schedule 8.3. On more infrequent occasions emergencies may extend over many regions, if not an entire island, that last for more than several days. This EMP sets out the system operator's role in such emergencies.

1.3.4 The EMP is required to set out the steps that the system operator must take, and encourage participants to take, at various stages during an extended emergency such as an extended dry sequence or an extended period of capacity inadequacy. Capacity inadequacies include: generation, transmission and or ancillary service inadequacy.

[3] The PPOs are high level objectives to be attained by the system operator. The policy statement sets out the policies and means that are considered appropriate for the system operator to observe in complying with the PPOs while also meeting the dispatch objective and anticipating grid emergencies a short term nature.
[4] Clause 9.23 of the Code
[5] Clause 9.14 of the Code
[6] The Code requires grid owners to offer available transmission assets

1.3.5 This EMP provides for two last resort emergency measures that the system operator must implement if there is a significant risk that demand for electricity will not be able to be met on a sustained basis.

1.3.6 As this EMP cannot anticipate all possible situations and feasible actions relating to extended emergencies, the system operator may depart from the policies set out in this EMP in the event that an extended emergency situation[7] arises and such a departure is required in terms of the system operator acting as a reasonable and prudent system operator[8].

1.3.7 This EMP also sets out explanatory material about the EMP's relationship and interaction with other relevant Code requirements in the context of emergency planning (as set out in paragraph 1.1.2 above).

1.3.8 In preparing the EMP and implementing the steps set out in the EMP (when required), the system operator must:

a) act as a reasonable and prudent system operator; and

b) plan, and take steps in a manner consistent with the Code.

1.3.9 The EMP explicitly provides for an extended emergency such as an extended dry sequence, an extended period of capacity inadequacy, or a Gas Critical Contingency. In time the EMP will be developed further to include steps that the system operator must take in conjunction with asset owners during civil emergencies (including those arising from loss of power supply).

1.3.10 This EMP is intended to cover events affecting the grid and grid-connected generation. This EMP does not cover events occurring on distribution networks (including embedded networks), within consumer premises, or on networks not connected to the grid.

1.4 The Role of Participants

1.4.1 In preparing this plan the system operator has assumed that the Code and incorporated policies continue in force and will govern the role of participants and itself. The system operator therefore expects participants to monitor, respond, and manage supply risks on a commercial basis commensurate with the prevailing circumstances.

1.4.2 While the EMP sets out the steps that the system operator must take in an extended emergency situation, prudent management of an emergency situation is dependent on the collective response of participants to the situation. In general, the system operator considers that most types of measures to manage extended emergencies are best implemented by participants.

1.4.3 Part 9 of the Code prescribes system operator and participant roles and obligations in the event that an official conservation campaign or rolling outages are required to manage an extended emergency event.

[7] An extended emergency situation is defined as meaning any situation in which the system operator believes on reasonable grounds that complying with the EMP will not:
(a) adequately mitigate an emergency situation; or
(b) minimise risk to public safety or significant damage to assets.

[8] In the event that the system operator does depart from the EMP the system operator must provide a report to the Authority in accord with clause 7.3(6) of the Code.

1.4.4 In the event that the system operator initiates an official conservation campaign the system operator will, as required, seek support for the initiative from participants.

1.5 No Demand Buyback or Energy Procurement

1.5.1 For the avoidance of doubt, the Code does not create a mandate for the system operator to procure demand management or temporary generation. Demand buyback and the procurement of temporary generation or output from standby generation (e.g. generation installed as a source of backup power supply) remains an option for participants to pursue.

1.5.2 Similarly the Code does not create a role for the the system operator to be involved in gaining access to extended hydro storage. Exercising or gaining access to extended hydro operating ranges remain options for participants operating hydro storage reservoirs.

1.6 No Compensation of Participants

1.6.1 For the avoidance of doubt, the system operator will not pay compensation to any person taking actions to manage an extended emergency, whether at the request of or instructed by the system operator, or of that person's own volition. The Code does not contain any provision for compensation to be paid.

1.7 No Link to Whirinaki Offer Strategy

1.7.1 For the avoidance of doubt, the system operator does not control the price or quantity at which the Whirinaki generating station is offered into the market.

2 Interaction with Other Emergency Response Requirements

2.1 Interaction with other Code Requirements

2.1.1 The relationship and interaction between this policy, other policies, and Code requirements pertaining to emergency management are set out below.

2.2 Security of Supply Forecasting and Information Policy

2.2.1 The system operator's approach to emergency management places an emphasis on providing timely information on security of supply risks that enhances the opportunity for participants to respond to, and manage their exposure to, such risks.

2.2.2 The Supply of Supply Forecasting and Information Policy (SoSFIP)[9] sets out the minimum information to be provided by the system operator. In accord with the SoSFIP, the system operator must prepare and publish information that may assist participants monitor the aggregate capability of thermal generation, transmission, and ancillary services to manage risks of shortage, particularly during extended periods of low hydro inflows. To this end the system operator is required to prepare and publish a comparison of storage in the hydro lakes with hydro risk curves (HRCs) to provide a measure of the possible risk of future shortages of supply.

2.2.3 The HRC measure of security is a deterministic assessment of, in particular, the capability of thermal generation (gas, coal, and oil) to compensate for low inflows within New Zealand's hydro generation catchments. The HRCs reflect the risk of future electricity shortages taking into account the range of likely inflows to hydro catchments. Along with the capability of thermal generation the derivation of the HRCs also incorporates a forecast of electricity demand and transmission availability. The HRCs are updated whenever there is a material change to any of the input assumptions.

2.2.4 HRCs are determined for a range of assessed risks of shortage. The range of HRCs and an example of a storage trajectory are illustrated in Figure 1, over.

2.2.5 The Code requires the system operator to commence an official conservation campaign when either:

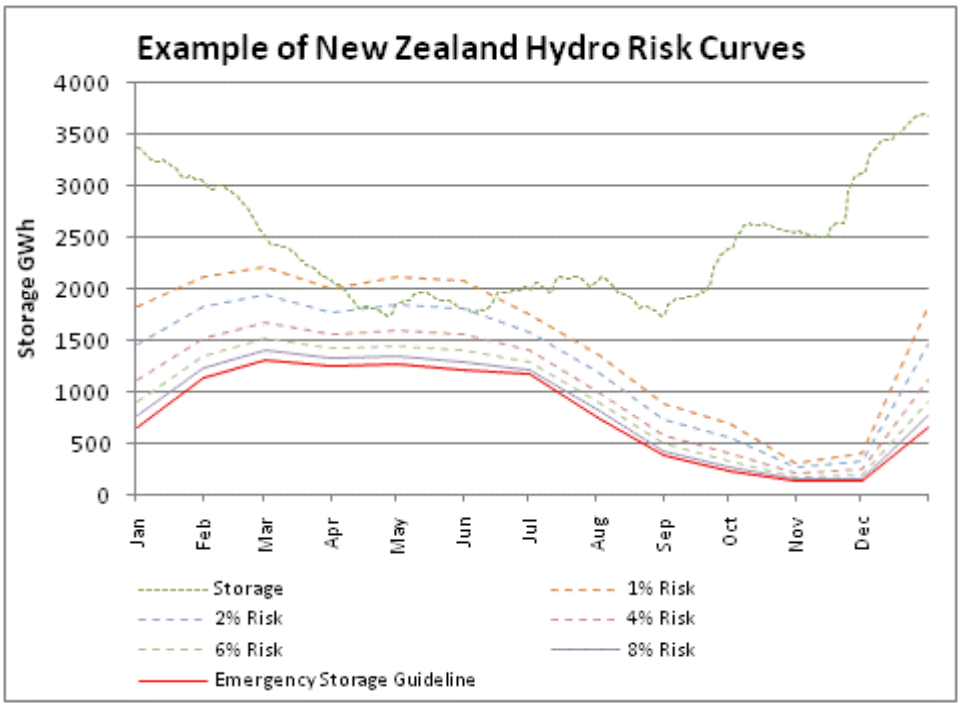
a) in the South Island or New Zealand when the hydro risk curves for the South Island or New Zealand, respectively, shows a risk of shortage of 10% or more; or;

b) on a date agreed with the Authority.

2.2.6 The system operator will declare a supply shortage situation and initiate rolling outages, after consultation with the Authority, when it is considered that it is more likely than not that a sustained period of forced outages under grid emergency provisions would be required in the absence of rolling outages.

[9] http://www.systemoperator.co.nz/f4187,39186770/sos-supply-forcasting-policy-sep-10.pdf

Figure 1: Range of hydro risk curves and example storage trajectory



2.3 Policy Statement

2.3.1 The principal performance obligations (PPOs) of the system operator are to manage the power system, through the scheduling and dispatch of assets (generation transmission, and demand management), to maintain frequency and avoid cascade failure. The Code specifies the PPOs and requires the system operator to prepare a policy statement[10] that sets out the policies and means that are considered appropriate for the system operator to attain the PPOs.

2.3.2 The policies adopted by the system operator to avoid cascade failure range from the management of single asset contingencies (e.g. the loss of a single generator) to multiple concurrent asset contingencies (e.g. multiple generators and or transmission lines restricting generation) and inadequate assets to meet expected demand in the short term (e.g. one to several hours over a high demand period).

2.3.3 More common single asset failures, “contingent events”, should be managed within normal frequency limits. Contingent events are classified as events where the: impact, probability of occurrence, and estimated cost and benefits of mitigation justify the scheduling and dispatch of reserve capacity (generation or, offered, interruptible load) to mitigate the consequences.

2.3.4 Extended contingent events are classified as events for which the: impact, probability, cost and benefits do not justify management options that completely avoid demand shedding, are managed through a combination of automatic under-frequency load shedding, the scheduling and dispatch of reserve capacity, and or planned (pre-event) load management.

2.3.5 Other events, are classified as uncommon events for which the: impact, probability, and estimated cost and benefits do not justify pre-event management options, other than unplanned demand shedding, AUFLS and other emergency

[10] http://www.systemoperator.co.nz/policy-statement

procedures or restoration measures. Such events occur with little (up to several hours) or no warning. The demand shedding and restoration procedure to be followed, at least initially, by the system operator and participants for these events are set out in Technical Code B of Schedule 8.3 of the Code. It may transpire that such events, because of their severity, may require measures set out in the EMP.

2.4 Code: Grid Emergencies

2.4.1 Grid emergencies are managed pursuant to Technical Code B of Schedule 8.3 of the Code. In simplified terms, a grid emergency occurs when the system operator's ability to comply with its PPOs is compromised, and urgent action is required of the system operator and/or participants to alleviate the situation. The PPOs include an obligation to avoid cascade failure and to maintain frequency quality.

2.4.2 The policy statement under Part 8 of the Code requires the system operator to issue a grid emergency notice to relevant participants whenever the ability of the system operator to comply with the PPOs is at risk or is compromised. The notice must specify the trading periods to which it applies.

2.4.3 If insufficient generation and frequency regulating reserve gives rise to a grid emergency the system operator can request generators to vary their offer, request purchases or distributors to reduce demand, require the grid owner to reconfigure the grid, require the disconnection of demand and/or take any other reasonable action to alleviate the grid emergency.

2.4.4 If insufficient transmission capacity gives rise to a grid emergency the system operator can invite generators to vary their offer, request asset owners to restore out of service assets, request purchasers or distributors to reduce demand, require the disconnect demand, and/or take any other reasonable action to alleviate the grid emergency.

2.4.5 Each North Island distributor, and in the South Island each Grid Owner, is required to maintain an automatic under frequency load shedding (AUFLS) system to enable automatic disconnection of two blocks of demand when the frequency falls to predefined levels.

2.4.6 These grid emergency provisions are intended to cover short-term emergency situations that typically occur as a result of system contingencies such as a loss of a transmission line or a major source of generation.

2.4.7 This EMP does not cover grid emergency situations, although it is possible that emergency measures included in this EMP may be required following a grid emergency.

2.5 Gas Critical Contingencies

2.5.1 A significant proportion of North Island generation capacity relies on gas supplied via the gas transmission system as a primary fuel, and therefore can be affected by gas supply disruptions resulting from Gas Critical Contingencies.

2.5.2 Events of this kind can impact on the real time operation of the power system, and on the medium term electricity security of New Zealand and the South Island indicated on the Hydro Risk Curves. The extent of the latter impact depends in part on the duration of the gas supply disruption.

2.5.3 The remainder of this section identifies the key steps the System Operator will take in order to respond to a Gas Critical Contingency.

2.5.4 The CCO advises the System Operator and affected gas transmission users, including generators that may rely on the supply of gas, of the existence of a Gas Critical Contingency using established and tested communication protocols.

2.5.5 In the event of being advised of a Gas Critical Contingency by the CCO, the System Operator will issue a Customer Advice Notice (CAN) to all electricity market participants advising them of the Gas Critical Contingency.

2.5.6 The System Operator will respond to the forced outage of any thermal generators using standard operational and market procedures, which may require the System Operator to respond in real-time in accordance with the grid emergency provisions under Part 8 of the Code.

2.5.7 The System Operator will monitor the Hydro Risk Curves based on information provided by the CCO and affected market participants, and will update the Hydro Risk Curves if necessary.

2.5.8 The updating of the Hydro Risk Curves and any emergency measures that may follow will be in accordance with the provisions for “Immediate Events”, set out in the Extended Emergency Events section of this policy.

2.5.9 Upon being notified by the CCO that the Gas Critical Contingency has been terminated, the System Operator will issue a CAN to all electricity market participants informing them the Gas Critical Contingency is over.

2.6 Civil Defence Emergencies

2.6.1 Lifeline utilities (including lines companies and generators) have direct responsibility under section 60 of the Civil Defence Emergency Management Act 2002 to ensure that they are able to function to the fullest possible extent, even though this may be at a reduced level, during and after a civil defence emergency.

2.6.2 Civil defence emergencies could have impacts on both supply and demand. In the event that a civil defence emergency impacts within cities and towns it is likely that demand for electricity will fall and the focus will be on restoring supply to critical consumers, rather than managing limited supply using the emergency measures included in this EMP. Most civil defence emergencies are likely to be of this nature.

2.6.3 In the event that a civil defence emergency impacts on power stations and there is insufficient supply to meet consumer demand, the emergency measures included in this EMP may be required.

2.6.4 To the extent that a civil defence emergency produces circumstances covered by this EMP, the system operator must act in accordance with this EMP.

3 Extended Emergency Events

3.1 Duration of and Nature of Extended Emergency Events

3.1.1 Extended emergency events are events that are expected to last for at least one week and typically last for several weeks.

3.1.2 Extended emergency events are expected to arise from a shortfall in either thermal fuel (availability or interruption to delivery of gas or coal) or hydro inflows, or a combination of both, or the loss of a large generating asset (e.g. a large thermal unit) for at least several weeks.

3.2 Types of Event

3.2.1 There is a spectrum of extended events that could lead the system operator to determine that extended emergency measures are required. Two categories of events that typify the ends of the spectrum are:

developing events – Events that evolve over time – for example as the result of a period of unseasonably low inflows to hydro catchments; and

immediate events – Events that occur with little or no warning – for example as a result of a transmission or major power station failure, the impact of which are expected to extend over a period of weeks rather than days.

3.2.2 These types of events are illustrated by reference to the hydro risk curves and actual hydro storage published in accord with the SoSFIP in Figures 2a and 2b, which contrasts the two categories of event and the likely sequence of storage.

Figure 2a: Developing event

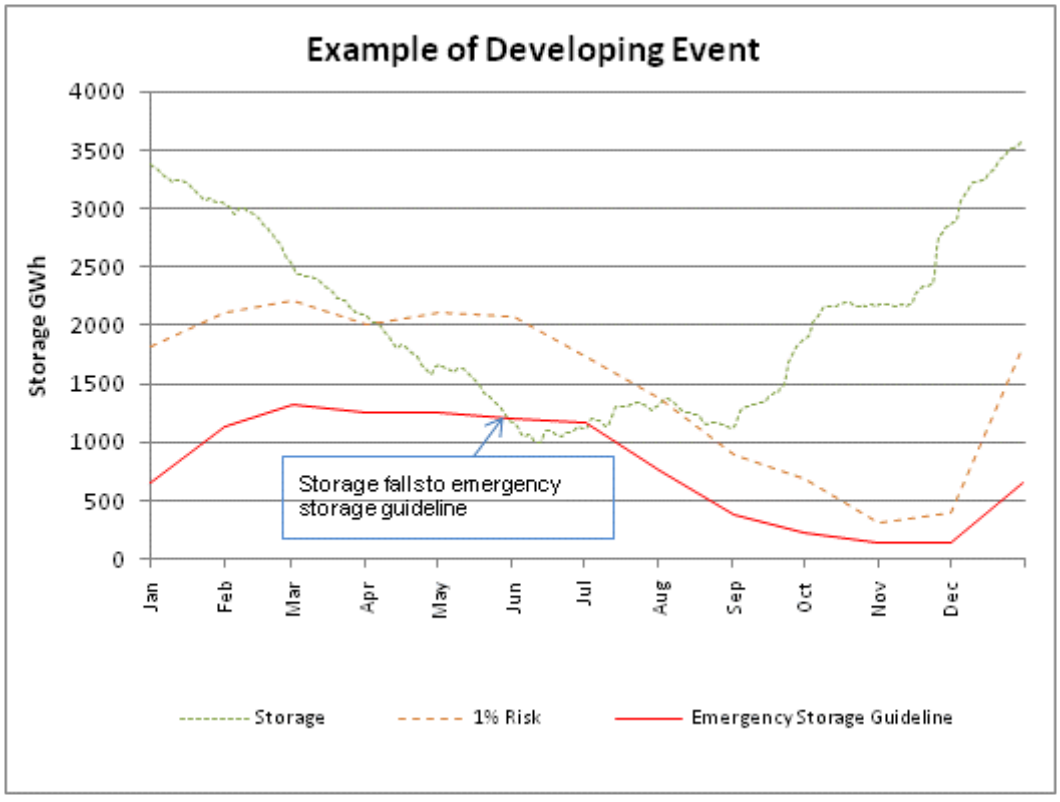
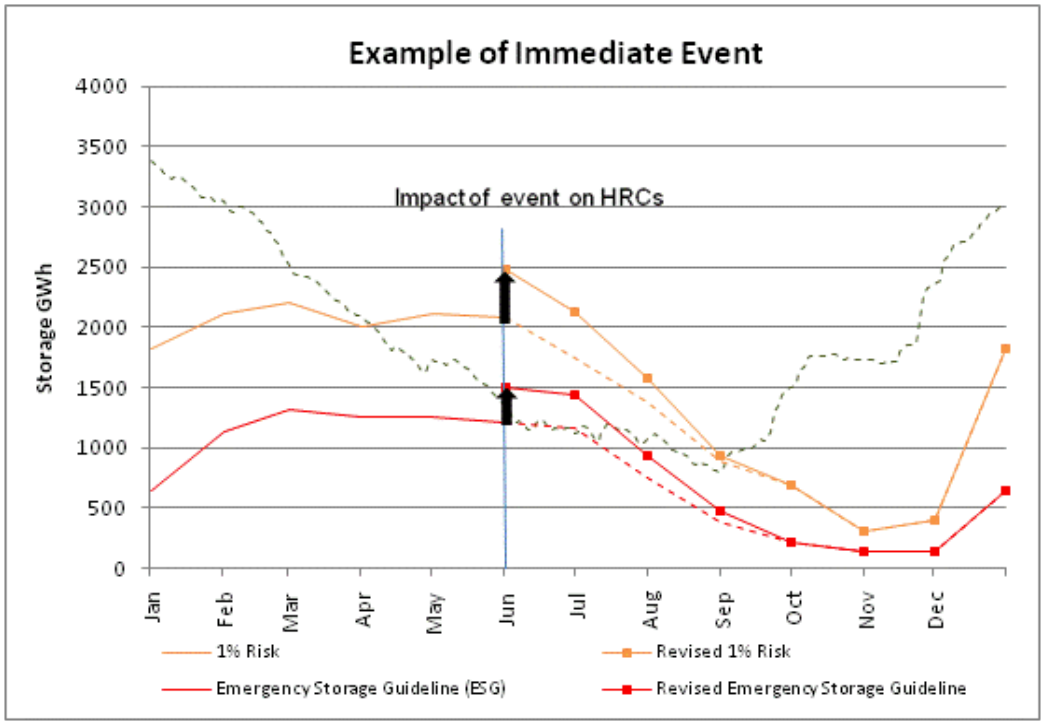


Figure 2b: Immediate event



3.2.3 The extended emergency measures set out in this EMP are intended to be appropriate for a spectrum of extended emergency events. In practice, an extended emergency could have elements of both categories of event described above.

3.3 Developing Events

3.3.1 The first example illustrated in Figure 2a is for a developing event that involves low inflows to hydro catchments resulting in storage falling through the hydro risk curves and ultimately below the emergency storage guideline. It is assumed that any restriction in available thermal fuel would be known and factored into the derivation of the hydro risk curves.

3.3.2 This illustrates how a dry-year emergency would take some time to unfold, with opportunities to manage security of supply risks and prepare extended emergency measures during the early part of the event.

3.4 Immediate Events

3.4.1 The second example illustrated in Figure 2b is an Immediate Event, such as a sudden and long term failure of a major thermal generator. Such a failure may require immediate action in order to balance supply and demand. The instantaneous failure of generation may require the system operator to respond in real-time in accordance with the grid emergency provisions under Part 8 of the Code.

3.4.2 If a major outage is expected to be of significant duration, the system operator will:

a) re-calculate the hydro risk curves including the emergency storage guideline; and

b) if the emergency storage guideline rises to a position above the level of hydro storage, implement the emergency measures in this policy that are triggered by such an outcome, including if necessary rolling outages in accordance with Part 9 of the Code.

3.4.3 If extended emergency measures are needed at short notice, unlike a Developing Event, little time will be available to prepare and implement emergency measures.

3.4.4 If extended emergency measures are needed at short notice, the system operator must in the first instance implement those emergency measures that are feasible and immediately available.

4 Monitoring

4.1 Hydro Storage and Inflows

4.1.1 The system operator must monitor security of supply on an ongoing basis. Under the security of supply forecasting and information policy, the system operator is required to prepare and publish a regular report that includes a comparison of storage in the hydro lakes with the hydro risk curves, an indicator of the risk of possible future shortages of supply. This will provide participants with an opportunity to consider the system operator's analysis and manage supply risks on a commercial basis commensurate with the prevailing circumstances.

4.2 Immediate Event

4.2.1 If an Immediate Event occurs, the system operator must re-evaluate the HRCs and determine whether the event has accelerated the need to implement extended emergency management measures.

5 Staged Approach to Management of Extended Emergencies

5.1 Publish Information

5.1.1 When a comparison of storage in the hydro lakes with the HRCs indicates South Island or New Zealand is below the 1% risk curve the system operator must:

a) publish a current reference list of publically available information used by the system operator to assess security of supply; and

b) while respecting the basis on which it has received information, in particular confidential information, ensure that participants have to the extent possible, the information necessary to understand asset availability, thermal fuel availability, hydro storage levels, and transmission constraints.

5.2 Forecast Storage

5.2.1 When a comparison of storage in the hydro lakes with the HRCs indicates South Island or New Zealand is below the 4% risk curve the system operator must:

a) publish weekly hydro storage projections based upon historic inflows; and

b) ensure that any public messages from the system operator about the security of supply risks are low key and focus on the slight elevation of security of supply risks; and

c) monitor whether generation is operating in a manner that is consistent with the assumption made within risk assessment metrics, e.g. in respect of the HRCs, generation operates to conserve hydro storage in at-risk areas whenever storage falls below the 4% risk curve. If this is not the case, the system operator must investigate why generation is not operating to conserve hydro storage in at-risk areas.

5.3 Official Conservation Campaign

5.3.1 The Code requires[11] the system operator to commence an official conservation campaign for the South Island or New Zealand when a comparison of storage in the South Island or New Zealand hydro storage lakes respectively shows a risk of shortage of 10% or more and the system operator forecasts that such risk will last for a week or more. That is storage is below the 10% risk curve and is forecast to remain below the 10% risk curve for at least a week. To determine when to initiate an official conservation campaign the system operator must monitor the comparison of storage in the hydro lakes with the HRCs.

5.3.2 The Code also requires the system operator to commence an official conservation campaign for the South Island or New Zealand if it has agreed a date with the Authority[12].

[11] Clause 9.23(1)(a) or clause 9.23(2)(a) of the Code
[12] Clause 9.23(1)(b) or clause 9.23(2)(b) of the Code

5.4 Rolling Outages

5.4.1 As a last resort measure the system operator may[13] initiate rolling outages, after consultation with the Authority, only if there is a shortage of electricity supply (generation) or transmission capacity if the system operator considers:

a) that the normal operation of the wholesale market is, or will soon be, unlikely to facilitate the adjustment of supply and demand necessary to ensure that supply matches demand; and

b) that, if planned outages are not implemented, unplanned outages are more likely than not.

[13] Clause 9.14 of the Code

6 Extended Emergency Measures

6.1 Introduction

6.1.1 Consistent with the expectation that the market design provides adequate incentive for industry participants to manage security of supply risks the EMP includes two last resort emergency measures to be initiated by the system operator during extended periods of imbalance between available generation and expected electricity demand.

6.2 Official Conservation Campaign

6.2.1 An official conservation campaign involves encouraging voluntary reductions in demand through public communications.

6.2.2 Clause 9.23 of the Code requires the system operator to commence an official conservation campaign:

a) when a comparison of storage in the South Island or New Zealand hydro lakes with the South Island or New Zealand hydro risk curves, respectively shows a risk of shortage of 10% or more and forecasts for the risk of shortage will be 10% or more for 1 or more weeks; or

b) on a date agreed with the Authority.

South Island hydro storage lakes are Lakes Tekapo, Pukaki, Hawea, Te Anau, and Manapouri. New Zealand hydro lakes are the South Island hydro lakes and Lake Taupo

6.2.3 The system operator must use reasonable endeavours to give each participant and the Authority at least 2 weeks' notice of an official conservation campaign commencing.

6.3 Rolling Outages

6.3.1 Rolling outages involve the system operator instructing distributors and selected direct connect consumers to cut load to meet savings targets. The system operator may direct specified participants to implement outages to achieve reductions in the consumption of electricity under Part 9 of the Code.

6.3.2 The Code requires the system operator to prepare and publish a system operator rolling outage plan[14] (SOROP) outlining how it intends to implement rolling outages, and designating participants (such as distributors and direct connect consumers) that are required to prepare participant rolling outage plans. The current SOROP is published on the system operator's website[15].

6.3.3 In accordance with the Code the system operator may direct specified participants[16] to implement rolling outages as the last resort extended emergency measure when the system operator considers that it is more likely than not that a sustained period of forced outages under grid emergency provisions[17] would be required in the absence of rolling outages.

[14] Clause 9.2 of the Code
[15] http://www.systemoperator.co.nz/f4189,39196221/system-operator-rolling-outage-plan.pdf
[16] Clause 9.15 of the Code
[17] Under Technical Code B of Schedule 8.3 of the Code

7 Emergency Response – Communication and Co-ordination

7.1.1 Transpower's CEO, or designate, is responsible for national media communications and briefings to stakeholders on behalf of the system operator.

7.1.2 If the system operator initiates an official conservation campaign in accordance with the Code, the system operator may seek assistance from participant group(s) to implement the campaign including the development and implementation of the associated communication plan.