

# Consultation Paper

## AUFLS Exemptions - Issues and Options

Prepared by Electricity Commission

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## Executive summary

Power generation is dispatched to balance demand so frequency remains at or near 50 Hz. This is because the machines that provide and draw electricity from the system are designed to operate at that frequency. A sudden and unexpected loss of a large amount of generation would cause the frequency to fall. If the frequency falls beyond the design limits of the units generating electricity, the units could start a chain reaction, tripping one-by-one to avoid damage. This could cause cascade failure of the power system and widespread blackouts.

Automatic under frequency load shedding (AUFLS) is one of a set of measures/controls employed to avert a cascade failure of the power system in the event of the loss of the HVDC bipole or the equivalent quantity of power generation. Distributors (in the North Island), including directly connected customers, and the grid owner (in the South Island) are required to provide facilities that will automatically disconnect demand (two blocks amounting to 32% of pre-event demand) to restore the balance between generation and demand, when the frequency drops below specified levels.

At the time the Rules were drafted, rule 6.6 of technical code B of schedule C3 of part C (rule 6.6)<sup>1</sup> was included to enable exemptions from AUFLS requirements because it was considered that mandating AUFLS obligations on distributors could, in extreme circumstances, create manifestly unjust outcomes. This paper originates from issues the Electricity Commission (Commission) discovered in 2004, when it first assessed applications from various parties for exemptions from the requirement to install and maintain AUFLS.

In 2005, the Commission developed a rule change proposal that clarified the arrangements for AUFLS exemptions and provided for an allocation of reserve costs to participants who are granted dispensation from complying with their AUFLS obligations. The proposal also included changes to the method for allocating costs to generators, holding dispensations from under frequency asset owner performance obligations (AOPOs) so that the method better matched the principle contained in rule 7.3.1 of section III of part C of the Rules<sup>2</sup>.

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<sup>1</sup> Rule 6.6 - Where a **distributor** or **grid owner** can satisfy the **Board** that the direct financial impact of providing **automatic under-frequency load shedding** would exceed the **expected interruption costs** for each kW interrupted, the **Board** will grant an exemption from full compliance with the requirements of rule 6.3. The **Board** will advise the **system operator** of any exemptions from full compliance with the requirements of rule 6.3.

<sup>2</sup> Rule 7.3.1 of section II of part C - Where the approval of a **dispensation** could impose readily identifiable and quantifiable costs on other persons, then a condition of the **dispensation** shall be that the **asset owner** is liable to pay the **system operator** for those costs, including the costs of the **system operator** purchasing any other **ancillary services** required as a consequence of its **dispensation**;

The Commission consulted on this proposal in September 2005, considered the received submissions, and discussed implementation with the System Operator with a view to complete the rule change documentation in early 2006. Unfortunately, discussions concluded that implementation would not be possible until after the System Operator's Market Systems Project (MSP) was completed due to internal resourcing constraints. The delays to MSP over the intervening time mean the Rules still remain unchanged and the original exemptions have been extended to accommodate the unresolved issues.

Current AUFLS exemptions are due to expire on 31 March 2010. The expiry of the exemptions, together with the recent implementation of MSP and the limited operation of pole 1, has caused the Commission to reconsider its 2005 proposal.

This paper is not considering changes to the AUFLS requirements themselves. The Commission is considering such a project in the context of its wider review of under frequency management arrangements.

The Commission's immediate objective is to handle the imminent expiry of the current AUFLS exemptions. In meeting this objective, the Commission is also striving to be fair to all participants obligated to provide AUFLS. It considers that the underlining intention of rule 6.6 is fair - when assigning AUFLS obligations to distributors there is a chance that one or two of the smaller networks (such as those owned by directly connected consumers) might have an unusually high concentration of load with high interruption costs. It is unfair to force a distributor to assign sensitive and high cost loads to AUFLS blocks by virtue of the (small) size of the distribution network to which they belong.

The Commission also considers it inefficient to force a distributor to reduce its instantaneous reserve (IR) offers to provide AUFLS. The Commission is therefore considering the use of dispensations and other options that would allow participants, in this situation, to reduce the extent of their obligations and pay any associated costs of doing so. The Commission is looking to maximise compliance with AUFLS obligations by participants without having to reduce the amount of interruptible load (IL) available in the IR market.

The Commission is now ready to consult with participants and persons that it thinks are representative of the interests of persons likely to be substantially affected by any rule changes in this area.

## Glossary of abbreviations and terms

<b>Act</b>	Electricity Act 1992
<b>AOPO</b>	Asset owner performance obligation
<b>AUFLS</b>	Automatic Under Frequency Load Shedding
<b>CE</b>	Contingent event
<b>Commission</b>	Electricity Commission
<b>Committee</b>	Electricity Governance Rules Committee
<b>ECE</b>	Extended contingent event
<b>IL</b>	Interruptible load
<b>IR</b>	Instantaneous reserve
<b>Minister</b>	Minister of Energy and Resources
<b>NZEM</b>	New Zealand Electricity Market
<b>Regulations</b>	Electricity Governance Regulations 2003
<b>RMT</b>	Reserve Management Tool
<b>Rules</b>	Electricity Governance Rules 2003
<b>Rule 6.6</b>	Rule 6.6 of technical code B of schedule C3 of part C of the Rules

# Contents

Executive summary	A
Glossary of abbreviations and terms	C
1. Introduction and purpose of this paper	1
1.1 Introduction	1
1.2 Structure of this paper	2
1.3 Purpose of this paper	2
1.4 Submissions	3
2. Background	5
2.1 Use of AUFLS under the security policy	5
2.2 AUFLS requirements	5
2.3 History of this rule change	6
2.4 Recent activity	7
3. Under frequency management	9
3.1 Introduction	9
3.2 AUFLS obligations	9
3.3 Generator under frequency AOPOs	11
3.4 Procurement of IR	13
4. Participants' options regarding compliance	17
4.1 Introduction	17
4.2 Dispensations	17
4.3 Exemptions	19
4.4 Equivalence	20
5. Options	21
5.1 Introduction	21
5.2 Objectives	21
5.3 Issue A - Provide for distributors with unusually high-cost load	22
5.4 Issue B - Provide for distributors with unusually low-cost load	23

5.5	Example rule sets	28
6.	Next steps and summary of questions	29
6.1	Next steps	29
6.2	Summary of questions	29
Appendix 1	Format for submissions	32
Appendix 2	AUFLS Benchmark Interruption Cost	34
2.1	Background	34
2.2	The Relevance of the Benchmark	35
2.3	The Implications of an Alternative Benchmark	36
Appendix 3	Existing security policy's effect on compliance incentives	37
3.1	Management of ECE under existing security policy	37
Appendix 4	Example rule sets	39
	New Schedule C7	51
Tables		
	Table 1: Minimum period of time generators are required to sustain pre-event output	12
Figures		
	Figure 1: Interruption cost of load	10
	Figure 2: Period North Island generators are required to sustain pre-event output	12
	Figure 3: Management of CE risks	14
	Figure 4: Management of an ECE	15
	Figure 5: AOPO/Dispensation self-equilibrating cycle	18
	Figure 6: Management of under frequency events (present state)	37

# 1. Introduction and purpose of this paper

## 1.1 Introduction

- 1.1.1 Power generation is dispatched to balance demand so frequency remains at or near 50 Hz. This is because the machines that provide and draw electricity from the system are designed to operate at that frequency. A sudden and unexpected loss of a large amount of generation would cause the frequency to fall. If the frequency falls beyond the design limits of the units generating electricity, the units could start a chain reaction, tripping one-by-one to avoid damage. This could cause cascade failure of the power system and widespread blackouts.
- 1.1.2 Automatic under frequency load shedding (AUFLS) is one of a set of measures/controls employed to avert cascade failure of the power system in the event of the loss of the HVDC bipole or the equivalent quantity of power generation. Distributors (in the North Island), including directly connected customers, and the grid owner (in the South Island) are required to have facilities that will automatically disconnect demand (two blocks amounting to 32% of pre-event demand) to restore the balance between generation and load, when the frequency drops below specified levels.
- 1.1.3 Because mandating AUFLS obligations on distributors might, in extreme circumstances, create manifestly unjust outcomes, rule 6.6 in technical code B of Schedule C3 of part C of the Rules provides for exemptions from AUFLS requirements in specific circumstances. This paper originates from issues the Commission discovered in 2004, when it first assessed applications from various parties for exemptions from the requirement to hold and maintain AUFLS. In considering applications for exemptions from AUFLS requirements, the Commission determined that the criteria for granting exemptions in the Rules needed to be clarified and more suitable guidelines implemented. The Commission therefore granted temporary exemptions to the applicants until the Rules were clarified and asked staff to develop appropriate rule changes.
- 1.1.4 In 2005, the Commission developed a rule change proposal that clarified the criteria for granting AUFLS exemptions and provided for an allocation of reserve costs to parties who might be granted dispensation from complying with their AUFLS obligations. The proposal also included changes to the method for allocating costs to generators, holding dispensations from under frequency asset owner performance obligations (AOPOs) so that the method better matched the principle contained in rule 7.3.1 in section III of part C of the Rules<sup>3</sup>.

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<sup>3</sup> A condition of a dispensation shall be that the asset owner is liable to pay the System Operator the readily identifiable and quantifiable costs imposed on other persons, including the costs of the System Operator purchasing any other ancillary services required as a consequence of its dispensation.

1.1.5 The Commission consulted on the original proposal in September 2005, considered submissions received, and discussed implementation with the System Operator with a view to completing the rule change documentation early in 2006. Unfortunately, discussions concluded that implementation would not be possible until after the System Operator's Market Systems Project (MSP) was completed. Resourcing constraints over the intervening time means the rules remain unchanged and the original exemptions had to be extended to accommodate the unresolved issues.

1.1.6 The current exemptions are due to expire on 31 March 2010. The expiry of the exemptions, coupled with the recent implementation of MSP and the limited operation of pole 1, has caused the Commission to review the 2005 rule change proposal. This paper presents and expands on issues uncovered by that review and options for addressing them.

## 1.2 Structure of this paper

1.2.1 The rest of this paper is structured as follows:

- (a) Section 2 contains the background to this paper – the context, a description of AUFLS requirements, and the history of the rule change;
- (b) Section 3 explains how AUFLS fits into the management of under frequency events;
- (c) Section 4 describes participants' options regarding compliance with their AUFLS obligations;
- (d) Section 5 contains the Commission's objectives for making changes to the present arrangements and the available options;
- (e) Section 6 contains a conclusion and the summary of the next steps.

## 1.3 Purpose of this paper

1.3.1 The purpose of this paper is to consult with participants and persons who the Commission thinks are representatives of the interests of persons likely to be substantially affected by any rule changes relating to AUFLS dispensations and exemptions.

1.3.2 This paper is not considering changes to the AUFLS requirements themselves. The Commission is considering such a project in the context of its wider review of under frequency management arrangements.

1.3.3 Following its consideration of the submissions it receives, the Commission will determine what appropriate steps it needs to take next. It is likely that a formal rule change proposal will follow.

## 1.4 Submissions

The Commission's preference is to receive submissions in electronic format (Microsoft Word). It is not necessary to send hard copies of submissions to the Commission, unless it is not possible to do so electronically. Submissions in electronic form should be emailed to [submissions@electricitycommission.govt.nz](mailto:submissions@electricitycommission.govt.nz) with Consultation Paper—AUFLS Exemptions - Issues and Options in the subject line.

If submitters do not wish to send their submission electronically, they should post one hard copy of their submission to the address below.

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- 1.4.1 Submissions should be received by 4pm on 13 November 2009. Please note that late submissions are unlikely to be considered.
- 1.4.2 The Commission will acknowledge receipt of all submissions electronically. Please contact Kate Hudson if you do not receive electronic acknowledgement of your submission within two business days.
- 1.4.3 If possible, submissions should be provided in the format shown in Appendix 1. Your submission is likely to be made available to the general public on the Commission's website. Submitters should indicate any documents attached, in support of the submission, in a covering letter and clearly indicate any information that is provided to the Commission on a confidential basis. However, all information provided to the Commission is subject to the Official Information Act 1982.



## 2. Background

### 2.1 Use of AUFLS under the security policy

2.1.1 The security policy contained in Schedule C4 (Policy Statement) of the Rules outlines the measures the System Operator employs to mitigate the risk of cascade failure following a sudden and significant loss of generation from the power system. One such measure is the System Operator procuring instantaneous reserve (IR), consisting of interruptible load and spare generating capacity, in the half hourly electricity market to ensure frequency is maintained within acceptable limits (ie at or above 48 Hz) for the majority of under-frequency events. These events are referred to in the security policy as contingent events (CEs). The most common CE is the sudden loss of a single generating unit or of a single HVDC pole. There are usually 6 to 12 events of this type each year.

2.1.2 The security policy also provides measures to deal with extended contingent events (ECEs). These events are identified by the System Operator as being a lot less common (perhaps once every 5 to 10 years), and more severe than CEs. It is still economic to cover ECEs by a combination of:

- (a) IR;
- (b) generators meeting their obligations to keep generating while frequency remains above specified minimums; and
- (c) mandated AUFLS requirements.

2.1.3 The System Operator calculates whether it needs to procure more IR than that required for a CE to maintain frequency within quality limits (47 Hz in North Island, 45 Hz in South Island) following an ECE, given the modelled response of generators and the operation of AUFLS.

2.1.4 AUFLS systems disconnect two large blocks of load when the frequency of the power system falls beyond specified (low) limits. This is to try to rebalance power generation and demand following a sudden loss of power generation.

### 2.2 AUFLS requirements

2.2.1 Mandated AUFLS schemes are commonly employed around the world to guard against rare, major events, which have the potential to cause cascade failure. It is generally considered to be uneconomic to operate market arrangements for such events.

2.2.2 The obligations to establish and maintain AUFLS systems were requirements created when the old New Zealand Electricity Market (NZEM) rules were revised

to form the new Rules under the Electricity Governance Regulations 2003 (Regulations).

- 2.2.3 Under the Rules, distributors (including directly connected consumers) in the North Island and the grid owner in the South Island are required to make available two blocks of AUFLS at each grid exit point. Subject to the agreement of the System Operator, the Rules provide flexibility for a participant to aggregate its AUFLS obligations across multiple grid exit points.
- 2.2.4 Each AUFLS block is required by the Rules to disconnect at least 16% of the pre-event demand at each grid exit point if the frequency falls to and remains at certain levels for specified duration of times (more detail is given in section 5). As the requirement to provide AUFLS relates to a proportion of “pre-event” demand rather than a proportion of nominal or peak demand, the requirement (in MW) of AUFLS rises and falls with demand. In practice, many participants meet their obligations by providing AUFLS based on a conservative estimate of load, irrespective of the time of day that an event might occur.
- 2.2.5 The Rules require that load set to trip to meet the AUFLS obligations, should be in addition to any interruptible load sold on the IR market<sup>4</sup>.
- 2.2.6 Rule 6.6 is unusual as it provides a very specific exemption. . Rule 6.6 was included when part C was drafted because it was considered that mandating AUFLS obligations on distributors could, in extreme circumstances, create manifestly unjust outcomes. The rule states that the Board must grant an exemption to applicants that can satisfy the Board that the ‘direct financial impact’ of providing AUFLS would exceed the ‘expected interruption costs’ of the second load shedding block. If the Board is satisfied, the Board will grant the exemption.

## 2.3 History of this rule change

- 2.3.1 In 2004, the newly-established Commission discovered difficulties with the wording of rule 6.6, when its Electricity Governance Rules Committee (Committee) assessed applications from various parties for exemptions from the requirement to establish and maintain AUFLS facilities. In considering these, the Committee determined that the criteria in rule 6.6 needed to be clarified and more suitable guidelines needed to be implemented.
- 2.3.2 The ambiguity primarily related to the interpretation of the term ‘direct financial impact’ in rule 6.6. For instance, some applicants’ calculations of direct financial impact included instantaneous reserve (IR) market revenue forgone as a result of any reduction in the provision of interruptible load (IL).

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<sup>4</sup> Rule 6.3 in technical code B, Schedule C3 of part C

- 2.3.3 While this interpretation of “direct financial impact” might be valid, the Commission determined that such an outcome was neither efficient nor intended. The Commission’s view is that relief from the AUFLS obligations was intended only where parties could demonstrate that compliance would result in shedding loads with a significantly greater interruption cost than would be expected from most other parties on block two AUFLS facilities.
- 2.3.4 The Commission therefore granted temporary exemptions under the Regulations to five applicants<sup>5</sup>, until the rule was clarified. The Commission was to investigate changes that could be made to improve the rule it.
- 2.3.5 Subsequently, the Commission developed a rule change proposal,<sup>6</sup> which included amendments to rule 6.6 that clarified the criteria for AUFLS exemptions and aligned the wording of the rule with the Commission’s interpretation of the rule’s intention. The consultation paper also proposed that applicants seeking relief from their AUFLS obligations for the purposes of offering IR might apply to the System Operator for a dispensation. Consequently, the Commission also recommended amending the method for allocating reserve costs to generators who hold dispensations from under frequency AOPOs. The Commission proposed that this method should also be used for allocating reserve costs to participants who might be granted a dispensation<sup>7</sup> from complying with their AUFLS obligations.
- 2.3.6 The Commission consulted on this proposal in September 2005, considered the submissions it received, and discussed implementation with the System Operator with a view to complete the rule change documentation early in 2006. Unfortunately, discussions concluded that implementation would not be possible until after MSP was completed. Resourcing constraints within the System Operator delayed the implementation of MSP so the rules remain unchanged and the original exemptions had to be extended several times, most recently until 31 March 2010.

## 2.4 Recent activity

- 2.4.1 Since the postponement of the rule change in 2005, the Commission has continued to consider its options in light of:

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<sup>5</sup> Norske Skog, Northpower (for the Marsden Oil Refinery), Winstone International, Toll New Zealand, and Pan Pac Forest Products. The Commission has since (September 2009) granted NZ Steel an exemption with the same expiry date.

<sup>6</sup> <http://www.electricitycommission.govt.nz/consultation/aufls>.

<sup>7</sup> Any participant can apply to the System Operator for a dispensation from compliance with some obligations under part C. Key criteria for the System Operator include whether it can continue to meet its PPOs and quantify any costs imposed on others as a result of the non-compliance. Participants may also apply to the System Operator for approval of arrangements that are equivalent to compliance.

- (a) Transpower's concerns about the method of allocating reserves costs to participants who might be granted a dispensation (expressed in its submission on the original consultation<sup>8</sup>);
- (b) possible implications of standing down of pole 1 of the HVDC;
- (c) experience operating the power system with the reduced AUFLS availability over the past few years; and
- (d) the introduction of MSP.

2.4.2 The System Operator is reviewing the security policy as it is required to do so by the Policy Statement. A new draft of the security policy is due to be published by the end of this year and implemented in the 2010 review of the Policy Statement. This may impact on the uses of AUFLS.

2.4.3 The Commission's scope for considering changes to the Rules is framed by its strategic development project to review the AUFLS requirements themselves. The Commission is limiting its present scope to participants' alternatives to compliance with the existing AUFLS obligations, rather than including a review of the actual AUFLS obligations. The System Operator has suggested the Commission conduct an urgent review of the AUFLS requirements and their use. The Commission is presently considering such a project in conjunction with the System Operator in the context of its other commitments and its wider review of under frequency management arrangements.

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<sup>8</sup> <http://www.electricitycommission.govt.nz/archives/Submissions/Commonqual/2005/Aufls-oct05/Transpower.pdf>

### 3. Under frequency management

#### 3.1 Introduction

3.1.1 The System Operator relies on three controls to avert cascade failure after a large and sudden loss of generation:

- (a) the requirement in the Rules for distributors and the grid owner to install and maintain AUFLS systems;
- (b) AOPO for generators to increase or at least maintain their output when frequency remains within specified levels; and
- (c) procurement of spare generating capacity or interruptible load as IR.

3.1.2 The sections that follow describe these measures for managing under frequency events, how they interact, and the Commission's concerns about AUFLS.

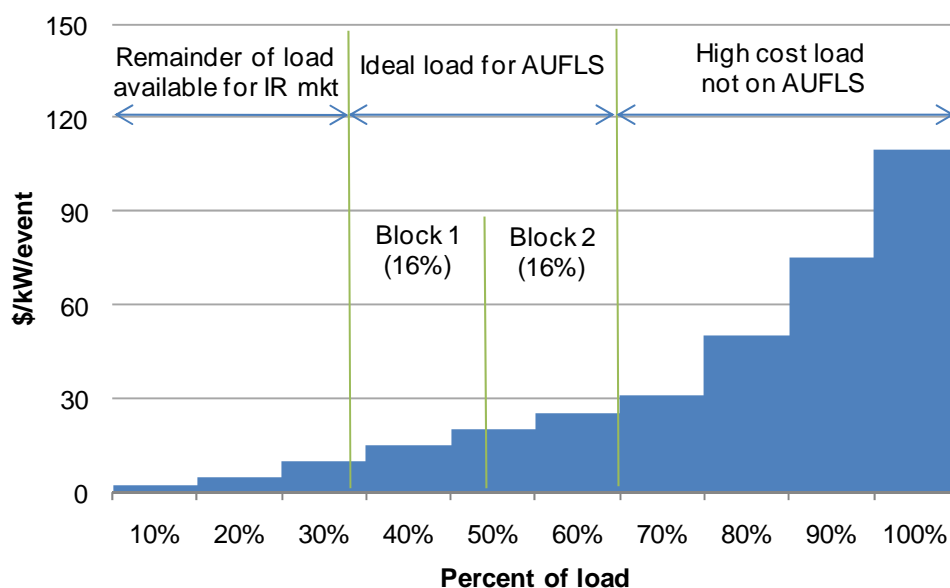
#### 3.2 AUFLS obligations

3.2.1 Details of the rule requirements to establish and maintain AUFLS obligations are contained in section 2.1.3.

3.2.2 AUFLS obligations are mandated because it was considered uneconomic to create a market for this service. Ideally, AUFLS blocks would be allocated selectively to individual loads across each island according to outage cost profiles. In reality, AUFLS responsibilities are allocated separately in each island. The grid owner is assigned AUFLS obligations in the South Island while, in the North Island, AUFLS is imposed on distributors equally. On both islands, the obligated parties have the flexibility to reallocate their obligations between grid exit points, with the permission of the System Operator.

3.2.3 Interruption costs vary substantially between loads and, from an economic perspective, it would appear sensible for distributors (or the grid owner) to attach AUFLS relays to the loads with the lowest value. However, load which has very low interruption costs and which is able to be tripped and restored remotely might deliver greater value to the system if it is offered for other purposes such as in the IR market (see load to the left in Figure 1 below).

Figure 1: Interruption cost of load<sup>9</sup>



- 3.2.4 It is important to note that the Rules make it clear that interruptible load dispatched as IR cannot be counted toward the AUFLS requirement defined in the Rules<sup>10</sup>.
- 3.2.5 Other load (see load in the middle section of Figure 1), with higher interruption costs and/or without (or net of) load attached to mechanisms for remote arming and restoration, may be attached to transmission feeder circuits to largely residential areas. This type of load has relatively low interruption costs and is more suited to be included in the first block of AUFLS. The second block might be attached to feeders that are still predominantly residential, but also includes small commercial and manufacturing loads that have higher interruption costs.
- 3.2.6 Load, which has high interruption costs (for instance, supplying power to central business districts, hospitals, sensitive industrial processes etc), is not suitable to be connected to AUFLS relays at all (see load on the right of Figure 1).
- 3.2.7 Rule 6.6 was drafted because it was accepted that by assigning AUFLS to North Island distributors there is a chance that some of the distributors who own smaller networks (such as those owned by directly connected consumers) might have an unusually high concentration of load, which has high interruption costs. It was

<sup>9</sup> The Commission recognises the cost per kW of interrupting different types of load can vary according to the length of the interruption. Loads for which cost per kW/event for regular interruptions of 15 minutes or so (eg following a CE) might be very low but could be very high if the event were to last hours (eg following an ECE which results in AUFLS load tripping).

<sup>10</sup> Rule 6.3 of schedule C3 of Technical code C includes, "For the avoidance of doubt, **automatic under-frequency load shedding** blocks must not include any **interruptible load** procured by the **system operator**."

considered unfair to force distributors in such situations to assign sensitive and high cost loads to AUFLS blocks.

3.2.8 However, as indicated in the previous section, when the Commission considered the applications for exemptions in 2005, many of the applicants also included revenue from the IR market that an applicant would be forced to forego as a cost of interruption. This suggests they have load, which has a lower cost of interruption than is ideal for an AUFLS block, but is not load which has high interruption cost. As indicated above, the exemption was not intended to cover such load.

3.2.9 It would be inefficient to force a distributor to reduce their IR offers so that the distributor can meet its AUFLS obligations. A more efficient option may be to allow the non-compliance but ask the distributor to pay any costs caused by the non-compliance.

### 3.3 Generator under frequency AOPOs

3.3.1 AOPOs are intended to provide certainty to the System Operator in achieving its principal performance obligations (PPOs)<sup>11</sup>. They attempt to replicate what a well-functioning market would achieve by tapping into the lowest cost means of mandating performance requirements. For example, most generators are able to provide reactive support largely by virtue of the way the plants are designed and built. However, if there were significant extra costs involved in providing this capability when plants are built, it would make little sense to impose these costs on asset owners if there were less expensive ways of achieving the desired outcome.

3.3.2 The AOPOs, crucial to under frequency management, are requirements that each generating unit supports frequency by remaining synchronised and at least sustains pre-event output for a minimum specified period when frequency is at or above 47 Hz in the North Island or 45 Hz in the South Island.<sup>12</sup> Table 1 (below) specifies these periods for generators for both the North and the South Island.

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<sup>11</sup> The PPOs appear in section II of part C of the Rules

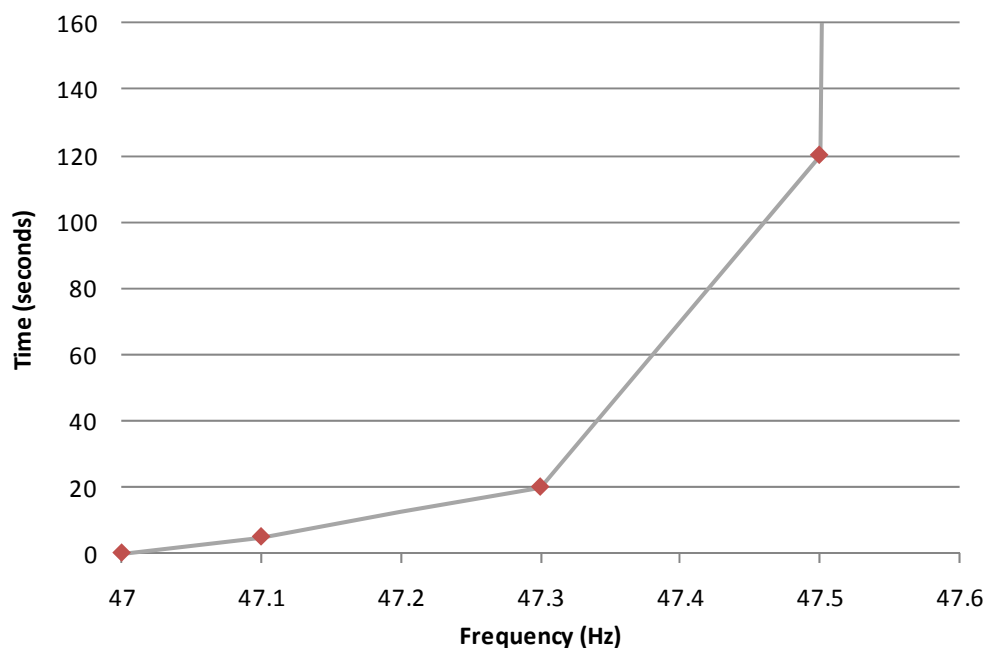
<sup>12</sup> See rules 2.1 and 2.3 in section III of part C

Table 1: Minimum period of time generators are required to sustain pre-event output

Frequency (Hz)	North Island	South Island
>47.5	At all times	At all times
47.5	120 seconds	At all times
47.3	20 seconds	At all times
47.1	5 seconds	At all times
47.0	0.1 seconds	Undefined
<47 Hz	None	30 seconds
45 Hz	None	30 seconds
<45 Hz	None	None

3.3.3 The minimum time period for frequencies between those specified in Table 1 are derived by interpolation as shown in Figure 2 (below) for North Island generators.

Figure 2: Period North Island generators are required to sustain pre-event output



3.3.4 When the under frequency AOPOs in the North Island were developed, most of the generation technologies (eg hydro, thermal, geothermal) were considered to be capable of meeting the AOPOs. However, now there are several large combined-cycle generating turbines (CCGTs) and wind stations in the North Island that cannot meet the AOPO performance required in the Rules once

frequency goes below 47.5 Hz. The owners of these generators hold dispensations from the under frequency AOPOs (see section 4.2 for an outline of the dispensation regime).

### 3.4 Procurement of IR

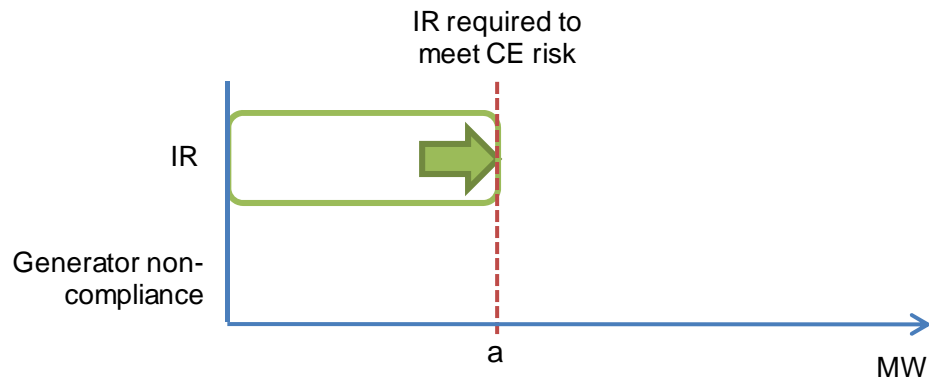
- 3.4.1 Each trading period, the System Operator calculates how much IR is needed to cover two types of events that would cause a sudden loss of a significant quantity of generation:
- (a) CEs; and
  - (b) ECEs.
- 3.4.2 These event types are described in the security policy contained in the Policy Statement. CEs are specifically identified by the System Operator and include:
- (a) the loss of a transmission circuit;
  - (b) the loss of an HVDC link pole;
  - (c) the loss of a single generating unit;
  - (d) the loss of both transmission circuits of a double circuit line, where the System Operator has determined a high level of likelihood of occurrence based on historical information; and
  - (e) the loss of both transmission circuits of a double circuit line, where the System Operator has been advised of a temporary change to environmental or system conditions that give reason to believe there is a high likelihood of occurrence of the simultaneous loss of both circuits.
- 3.4.3 The only ECE identified by the System Operator and included in the security policy is the loss of the HVDC bipole.
- 3.4.4 Every trading period, the System Operator uses its reserve management tool (RMT) to calculate the quantity of IR that will ensure frequency remains within the quality limits outlined in schedule C6 (ie frequency must stay at or above 48 Hz and must return to or above 49.25 Hz within 60 seconds) following a CE<sup>13</sup> (see dotted line marked 'a' in Figure 3 below). In calculating the quantities of IR required, the System Operator assumes generators will maintain their pre-event output while frequency remains within the quality limits. However, if a generator was granted a dispensation because it could not sustain its output if frequency fell to 48 Hz (the Commission is not aware of any generators that are in such a position), the System Operator could simply procure more IR than it would

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<sup>13</sup> The System Operator looks at each CE on its list and covers the one that would result in the loss of the most generation from the power system.

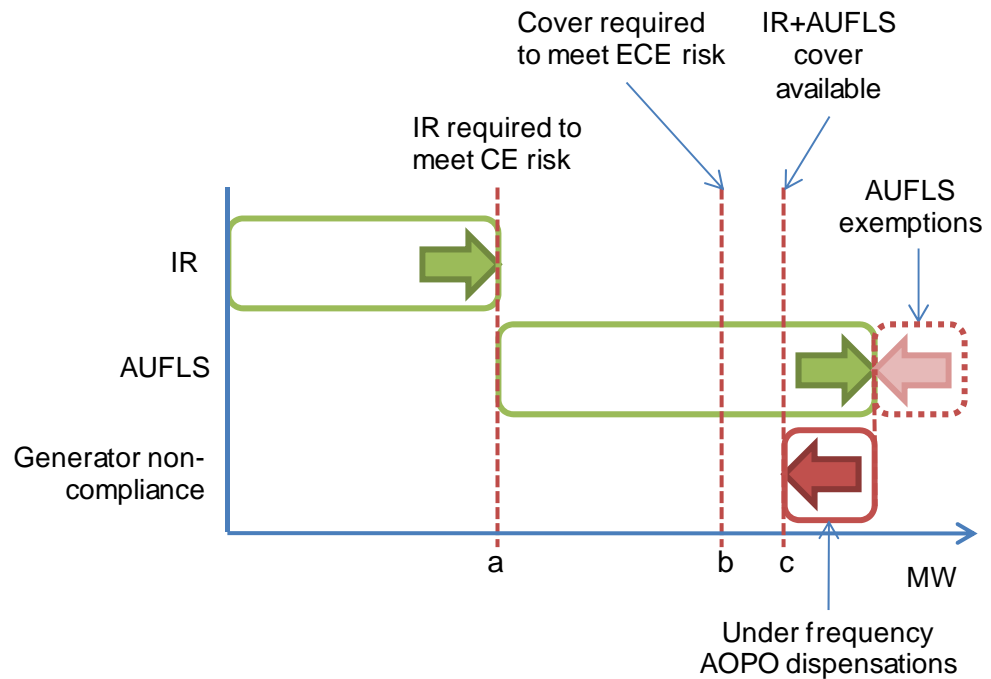
otherwise have needed and allocate the cost, for the extra IR procured, to the generator holding the dispensation.

Figure 3: Management of CE risks



3.4.5 The System Operator's measures to deal with ECEs are designed similarly, but include more elements (see Figure 4). Every trading period, the System Operator uses RMT to calculate how much IR is required to keep frequency within slightly looser quality limits (eg in the North Island, frequency must stay at or above 47 Hz and return to or above 49.25 Hz within 60 seconds) following an ECE. In doing so, the System Operator relies on generators to maintain their output, and on AUFLS to trip load in accordance with the Rules (except where dispensations/exemptions have been granted).

Figure 4: Management of an ECE



- 3.4.6 Often <sup>14</sup>, the IR required to cover a CE is more than enough for the power system to recover from an ECE, as illustrated in Figure 4 (total cover provided by IR and AUFLS is equal to the dotted line marked 'c', which is greater than the dotted line marked 'b'). However, any time the System Operator needs to procure more IR (line 'b' is greater than line 'c' and the ECE is said to be the binding risk), the System Operator allocates costs to generators who cannot meet the under frequency AOPO requirements. The costs are calculated in according with the formula in rule 7.3.3 in section III of part C.
- 3.4.7 Events not explicitly identified and categorised by the System Operator in the security policy as CEs or ECEs are considered by the System Operator to be uncommon. Their impact, probability of occurrence, and the estimated cost of implementing controls do not justify the benefits of implementing controls. That, or no feasible controls have been identified or exist, other than the emergency and restoration procedures<sup>15</sup>.
- 3.4.8 In the past, the ECE has rarely been the binding risk and the power system could be assumed to be safe from other events of a similar magnitude and effect. However, the security policy accepts there are large events that could cause cascade failure of the power system and the System Operator's only available

<sup>14</sup> This depends on the dispensations/exemptions granted and the relative magnitude of the CE or ECE.

<sup>15</sup> See rule 12.3 in Schedule C4 (Policy Statement) of part C of the Rules.

measure in such a situation would be to restore the power system following a partial or complete blackout.

## 4. Participants' options regarding compliance

### 4.1 Introduction

4.1.1 Participants faced with rule requirements in part C of the Rules, including under frequency AOPOs or AUFLS, have the following existing options:

- (a) comply with the requirements;
- (b) apply to the System Operator for a dispensation;
- (c) apply to the Board for an exemption; or
- (d) apply to the System Operator for an equivalence arrangement.

4.1.2 Each path is suited to different circumstances. How each option operates is described below.

### 4.2 Dispensations

4.2.1 Dispensations are a mechanism by which participants may receive relief from some mandated obligations in part C. Generators considering investing in generating units unable to maintain pre-event output as the system frequency falls<sup>16</sup> (under frequency AOPOs), can apply to the System Operator for a dispensation. The System Operator must grant the application if it:

- (a) reasonably expects to continue to be able to operate the power system;
- (b) does not expect the application to affect its ability to meet its PPOs; and
- (c) can readily quantify the costs to other persons of granting the application (even if it is zero).

4.2.2 The Rules include a formula for calculating associated additional IR costs (including costs to other people) to participants holding dispensations from rules 2.3.1 and 2.3.2<sup>17</sup>.

4.2.3 The dispensation mechanism is designed to be a self-equilibrating cycle, as illustrated in Figure 5 (below). Generators make investment decisions based on the expected costs and revenues of those decisions (including expected costs of non-compliance). The System Operator grants dispensations (if it can continue to meet its PPOs) and adjusts the IR procured so the recovery of the system from plant failures is no worse off regardless of a generator's choices. Ideally, if the number of dispensations from the under frequency AOPOs increase:

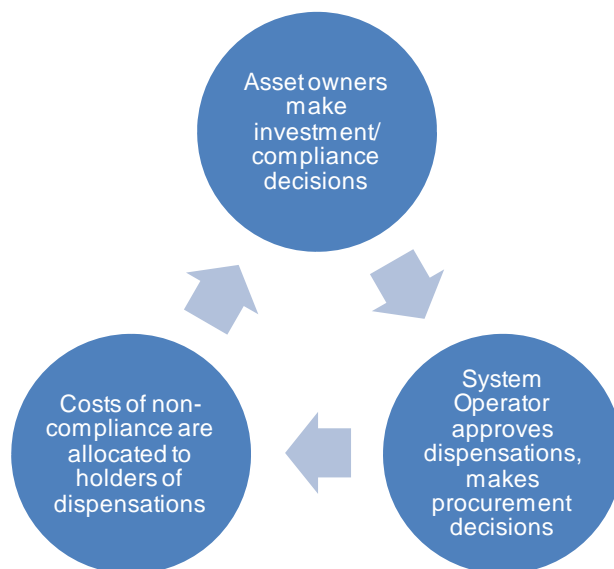
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<sup>16</sup> Rules 2.3.1 or 2.3.2 of section III of part C.

<sup>17</sup> Rule 7.3.3 in section III of part C.

- (a) the System Operator would procure more IR to compensate; and
- (b) those increased costs would be allocated to the holders of the dispensations; and
- (c) compliant plants would become relatively more cost-effective to generators making generation investment decisions.

Figure 5: AOPO/Dispensation self-equilibrating cycle



- 4.2.4 The market for IR includes significant quantities of IL from distributors and includes offers for IR from the direct consumers holding exemptions from AUFLS. As indicated in section 3.2, is not efficient to use load that can be interrupted often and at a low cost, to provide AUFLS. The Commission is aware of the potential of AUFLS exemptions and dispensations to affect IR and energy prices.
- 4.2.5 Consequently, the Commission is interested in a solution for load with a low cost of interruption that works in the same manner as the dispensation mechanism used for generators that are not compliant with the under frequency AOPOs. Given their parallels, the Commission is not convinced that the dispensation regime is inappropriate to use to relieve participants from AUFLS obligations where tripping load will be at a very low cost. The existing formula for allocating IR costs could be used to calculate costs in acquiring extra AUFLS. This would ensure the consequences of non-compliance for both generators and distributors are aligned.
- 4.2.6 However, the Commission is aware there are other views on this issue. The Commission received submissions in 2005 that suggested AUFLS was different to other asset owner obligations and technical requirements in part C. Some submitters felt that AUFLS was too important to allow distributors to be granted relief from their obligations.

4.2.7 The Commission is also concerned that the management of ECEs is not as robust as it might be and this reduces participants' compliance incentives. Its analysis on this is presented in Appendix 3.

## 4.3 Exemptions

4.3.1 The general provisions for exemptions, contained in regulation 194 of the Electricity Governance Regulations 2003 (Regulations), provide an avenue for a participant to seek relief from any obligation contained in the Rules. Rule 6.6 is unusual as it provides participants an opportunity to receive a Rules-based exemption from the AUFLS obligations.

4.3.2 The intention of rule 6.6 was to ensure that mandating AUFLS obligations on distributors would not, in extreme circumstances, force a small distributor to assign sensitive load, or load with high interruption costs, to AUFLS blocks. However, due to the ambiguous interpretation of 'direct financial costs', the applications the Commission received for an exemption under rule 6.6 included lost revenue from load the applicant would otherwise have offered into the IR market.

4.3.3 The proposal the Commission considered in 2005 amended the wording of the rule to preserve its original intention. However, the Commission is reconsidering this approach for a number of reasons.

4.3.4 Firstly, the Commission considers that any Rules-based exemption (such as the current rule 6.6) should follow the process set out in regulation 194 of the Regulations. For this reason, an exemption, such as the one in rule 6.6, becomes superfluous, because if necessary a participant can apply for an exemption under regulation 194 instead. Secondly, it is not appropriate for the Commission to use its power to grant exemptions to participants from compliance with the Rules in a way which would usurp or replace the role of the Minister to make rules. A number of considerations, including the size of the class of participants eligible for the exemption and the duration of the exemption are considered by the Commission when deciding whether to grant an exemption to a participant. In regards to AUFLS, the class of eligible participants is large and the exemption would most likely need to be permanent.

4.3.5 Accordingly, the Commission does not consider exemptions to be an appropriate vehicle for distributors, with unusually high interruption costs, to obtain relief from AUFLS obligations. However, the Commission maintains its view that it is unfair to force a distributor to assign sensitive and high cost loads, which they have by virtue of the (small) size of the distribution network to which they belong, to AUFLS blocks.

4.3.6 Instead, the Commission is considering a separate, rule-based mechanism to provide relief from AUFLS obligations in the event that a distributor of a small network (such as one owned by a directly connected consumer) might have an unusually high concentration of load with high interruption costs (which do not include the lost opportunity of IR revenue).

## 4.4 Equivalence

4.4.1 The Rules also enable the System Operator to approve equivalence arrangements where an asset owner can demonstrate an alternative means of meeting a technical performance obligation in Part C of the Rules<sup>18</sup>. Subject to some changes in the Rules, it might be possible for AUFLS equivalence arrangements to be approved by the System Operator. For example, a direct customer with very high outage costs could negotiate with a distribution company to arm additional feeders to provide more than its mandated 32% to make up for a reduced contribution from the direct consumer.

4.4.2 This may require some payment from the direct consumer to the distribution company, and would involve some transactions costs. This could be likened to having an informal market in technical performance obligations. However, this informal market may be somewhat limited if there are only one or two other distributors who are able to offer additional AUFLS within their region.

4.4.3 If there were a number of parties seeking AUFLS equivalence arrangements, then it may be possible to reduce the transactions costs if the System Operator centrally purchased the additional AUFLS from distributors and shared the costs between the parties. In principle, it may be cheaper for the System Operator to procure additional AUFLS capability than to purchase more IR when an ECE is binding. It could then on-charge procurement costs for AUFLS equivalence arrangements directly to the non-compliant parties.

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<sup>18</sup> Rule 7.2 of section III of part C of the Rules

## 5. Options

### 5.1 Introduction

5.1.1 The Commission recognises that the issues surrounding AUFLS are complex and that any changes have the potential to have a wide impact, particularly on IR availability and IR costs. It also notes that there are several key development projects underway that may have implications for AUFLS requirements. These proposed developments will not be completed before the exemptions expire.

5.1.2 It is against this background that the Commission has sought to identify options for addressing the current AUFLS issues. In particular these issues include:

- (a) circumstances of asset owners currently exempted from AUFLS;
- (b) the imminent expiry of the AUFLS exemptions;
- (c) the issues with rule 6.6;
- (d) continuing to grant exemptions from AUFLS under the Regulations being inappropriate;
- (e) potential adverse impact on IR availability and costs;
- (f) uncertainty about the robustness of the current security policy, and about the time to implement changes resulting from the review in the Rules;
- (g) concerns expressed by some generating companies about the existing cost allocation to generators holding a dispensation from under frequency AOPOs; and
- (h) suitability of using dispensations for AUFLS obligations.

### 5.2 Objectives

5.2.1 The Commission has carefully considered these issues and is seeking options that would achieve the following objectives:

- (a) address the issues concerning AUFLS exemptions, which expire at the end of March 2010;
- (b) treat fairly all participants who have obligations to provide AUFLS;
- (c) remove any ambiguity and uncertainty associated with the criteria in the Rules governing the granting of exemptions from compliance with AUFLS obligations;
- (d) enable participants to make compliance choices based on the economic costs/benefits of those decisions while ensuring the recovery of the system

from plant failures is no worse off, regardless of the participants' decisions;  
and

- (e) be sufficiently flexible to generally accommodate development activities relating to AUFLS arrangements and under-frequency management...

5.2.2 As previously indicated, the Commission's immediate objective is to handle the imminent expiry of AUFLS exemptions. In meeting this objective, the Commission is also striving to be fair to all participants who have obligations to provide AUFLS. It considers that the intention of rule 6.6 remains a fair one - by assigning AUFLS to distributors there is a chance that some distributors who own smaller networks (such as those owned by directly connected consumers) might have an unusually high concentration of load with high interruption costs. It would be unfair, in such cases, to force the distributor to assign sensitive and high cost loads to AUFLS blocks.

5.2.3 The Commission also considers it inefficient to force a distributor to reduce its IR offers to provide AUFLS, if it is possible for the distributor to reduce its obligations and pay any associated costs of doing so. Given the Commission's concerns about the present state of the security policy, this is one solution, which could meet objective (d) in section 5.2.1 within prudent limits...

5.2.4 The Commission has considered a number of options, which are discussed in sections 5.3 and 5.4.

### 5.3 Issue A - Provide for distributors with unusually high-cost load

#### **Option A1 - Continued use of exemptions**

5.3.1 The Commission has granted exemptions, under regulation 194 of the Regulations, from AUFLS requirements to six parties (under the Regulations) until such a time when a rule change clarifying rule 6.6 is completed. These exemptions expire on 31 March 2010 and the Commission has explored and ruled out the continued use of exemptions as a means of meeting the objectives set out in section 5.2.1.

5.3.2 For the reasons set out in section 4.3, the Commission is proposing to delete rule 6.6.

5.3.3 However, the Commission maintains the view that it would be unfair to force a distributor to assign load, which has unusually high interruption costs, by virtue of the (small) size of the distribution network, to AUFLS blocks.

### **Option A2 - New provision for participants with AUFLS obligations to apply for waivers**

- 5.3.4 The Commission proposes that a new schedule (C7) replaces rule 6.6. The proposed schedule provides a process for applicants to apply for a waiver from their AUFLS obligations. The proposed schedule also sets out criteria for the Commission to consider when making a decision to grant an AUFLS waiver. A waiver would be granted to participants that can demonstrate to the Commission that they cannot meet their AUFLS obligations without interrupting highly sensitive load and/or load with interruption costs greater than the cost of load that might be expected to be assigned to AUFLS block 2.
- 5.3.5 The Commission is considering setting the interruption cost threshold at \$20/kW, as it did in 2005. The rationale for this figure has been reproduced from the 2005 consultation paper and is included as Appendix 2.
- 5.3.6 The Commission notes that some submissions in 2005 suggested that the units should be kWh rather than kW. The Commission would prefer an AUFLS waiver application to specify the per kW direct costs of an interruption to avoid the need to include a variable duration factor in the analysis of interruption costs.
- 5.3.7 A preliminary draft of the proposed Schedule C7 can be found in *example rule set 1* in Appendix 4 (refer to paragraph 5.5 for a description of *example rule set 1*)

- Q1. Are there any circumstances under which you think participants should be relieved of their AUFLS obligations, eg:
- a. stop short of requiring a distributor to assign sensitive and/or load with high interruption costs to AUFLS blocks (without cost); or
  - b. stop short of requiring a distributor to reduce its IR offers, subject to conditions (un-cleared offers not included, liable for any associated reserve costs)?
- Q2. What do you think of the proposed criteria for receiving a waiver from AUFLS (especially the threshold)?

### 5.4 Issue B - Provide for distributors with unusually low-cost load

#### **Introduction**

- 5.4.1 As indicated in paragraph 4.2.5, the Commission considers the dispensation provisions in part C could provide a mechanism that would maximise the amount of AUFLS made available while retaining load, which is more suited to uses as IR rather than as part of the AUFLS blocks. Rule changes may be required to ensure the dispensation process accommodates participants wishing to apply for a dispensation from their AUFLS obligations.

- 5.4.2 Alternatively, if participants and the System Operator do not believe the dispensation process is suitable to accommodate participants who seek relief from their AUFLS obligations so they could offer load as IR, the Commission proposes to adjust the proposed new schedule, discussed in sections 5.3.4 to 5.3.7 to accommodate these participants. Similar conditions to those for dispensations will apply (eg allocation of costs).
- 5.4.3 The Commission is considering changes to the formula for allocating IR costs to generators holding dispensations from under frequency AOPOs. The Commission proposes to extend the formula to accommodate participants holding dispensations or waivers from AUFLS obligations in conjunction with one of the following options:
- Option B1:** Amend general provisions for dispensations so they specifically accommodate participants with AUFLS obligations;  
or
- Option B2:** Extend the proposed new schedule to include waivers from AUFLS, where the participant wishes to offer the load as IR (under limited circumstances)
- 5.4.4 These options are described in detail below.
- Changes to cost allocation formula**
- 5.4.5 The Commission is considering amendments to the formula used to allocate costs to generators holding dispensations from the under frequency AOPOs, and extending the formula to cover participants holding AUFLS dispensations or AUFLS waivers. These proposed amendments are very similar to those consulted on in 2005.
- 5.4.6 The proposed changes in the existing formula for allocating costs to generators is being considered because the System Operator currently charges generators more than the cost of the extra IR the System Operator accrues. This is because the formula in rule 7.3.3 of section III of part C requires generators to be charged for the MW amount by which each relevant generating unit is unable to sustain pre-event output. The amendments to the formula being considered would charge generators only a share of the extra reserve procured because of their non-compliance, in line with the principle in rule 7.3 to fairly charge the costs of dispensations to dispensation holders.
- 5.4.7 An extension to the formula is also being considered so a share of the extra reserve costs is allocated to any participants who have a dispensation from AUFLS obligations or an AUFLS waiver. These parties have the potential to require the System Operator to procure more IR. Accordingly, it is logical to allocate costs to these parties as well as holders of dispensations from the under frequency AOPOs.

5.4.8 The Commission is aware that the Rules do not currently specify how the System Operator is to calculate the extra IR procured as a direct result of the dispensations from the under frequency AOPOs (or, potentially, from AUFLS obligations). If there is some confusion as to how this should be calculated,<sup>19</sup> it may be useful to include in the Rules this calculation.

Q3. What do you think of the proposal to charge generators holding dispensations from the under frequency AOPOs (and participants holding dispensations or waivers from AUFLS) only a share of the extra costs of procuring reserves, caused by the generators' non-compliance?

Q4. Do you think the formulas contained in the draft rules<sup>20</sup> make it sufficiently clear how any extra reserve costs should be calculated and allocated?

#### **Option B1: Amend general provisions for dispensations**

5.4.9 In considering changes to the dispensation rules, the Commission has identified two issues for consideration:

- (i) drafting general provisions to accommodate dispensations for AUFLS; and
- (ii) identifying the conditions under which a participant would be granted a dispensation from its AUFLS obligations.

#### *Drafting of general provisions*

5.4.10 The Commission has received suggestions stating that the dispensation rules are designed to 'grandfather' arrangements for existing non-compliant assets and are not suitable for obligations such as AUFLS.

5.4.11 Rule 7.1 of section III of part C allows an asset owner who cannot comply with an AOPO or technical code in respect of a configuration of assets (existing, new or proposed) to apply for a dispensation or equivalence arrangement. Rule 7.3 requires the System Operator to grant an asset owner a dispensation if it has an asset or a configuration of assets that will not or does not comply with a technical code or AOPO (if it can continue to operate the system, meet its PPOs and readily quantify costs).

5.4.12 The Commission is aware that AUFLS systems are not assets as "assets" are defined in part A<sup>21</sup>. The Commission is considering whether changes are

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<sup>19</sup> The quantity of extra IR could be calculated (when the binding risk is the ECE) as being the lesser of:

- (a) sum of generation lost (MW) when frequency falls to 48/47/45Hz and AUFLS requirements (MW) lost to dispensations; and
- (b) difference between IR procured for ECE and CE (MW).

<sup>20</sup> Rule 7.3.4 in example rule set 1 and rule 9.1 in example rule set 2 of Appendix 4.

<sup>21</sup> "asset" means equipment or plant which is connected to, or forms part of the **grid** and, in the case of part C, includes equipment or plant which is intended to become connected to the **grid** and equipment or plant of **embedded generators**.

required to the definition so it includes “equipment required to meet the AOPOs and technical codes in part C”.

- 5.4.13 The Commission is also aware of an opinion that rule 7.1 of section III of part C is in conflict with rule 7.3 of section III of part C because there is a subtle difference between asset owners who **cannot** comply with an AOPO or a technical code (rule 7.1) and those who have or will have a configuration of assets which **are not** compliant with either an AOPO or technical code. When applied to applicants seeking dispensation from their AUFLS obligations, it could be argued that under rule 7.1, a distributor is not eligible to apply for a dispensation because it can comply with its obligations if it so chooses.
- 5.4.14 Consequently, the Commission is considering changes to the definition of assets or the general dispensation provisions (see 7.3 in Appendix 3) to accommodate participants with AUFLS obligations.

Q5. Do you think the Rules should provide for dispensations from AUFLS technical requirements?

*Conditions under which a participant might be granted a dispensation from their AUFLS obligations*

- 5.4.15 As previously indicated, the Commission recognises that it is efficient to use IL where it is of most value. The dispensations regime could allow a participant to reduce its AUFLS obligations, if the participant was prepared to pay the costs of any extra reserve procured. However, in light of its concerns about the present state of the security policy outlined in Appendix 3, the Commission is instead considering ways in which the System Operator could limit the number of dispensations from AUFLS it grants, until the security policy is made more robust.
- 5.4.16 Distributors currently holding exemptions from AUFLS could apply for dispensations once their exemptions expire, if they do not meet the criteria for an AUFLS waiver under the proposed new schedule. If this occurs, there is potential for more AUFLS to become available. The System Operator is entitled to place reasonable conditions on a dispensation, under rule 7.4 of section III of part C. Therefore, it might be considered reasonable that, in addition to requiring the holder of a dispensation to pay associated costs, the System Operator could also require it to:
- (a) comply with its AUFLS obligations, to the extent practicable, without having to reduce its IR offers; and
  - (b) assign all load not cleared in the IR market to AUFLS relays (leaving IL armed to trip at 49.2 Hz could be deemed to be equivalent AUFLS load).

- 5.4.17 Alternatively, the Commission has drafted proposed example changes to the rules, specifically for dispensations from AUFLS, which would have the same effect as the conditions described above (*example rule set 1* in Appendix 4).

Q6. What do you think of the Commission's suggestions for managing the way in which participants can receive dispensations from AUFLS?

**Option B2: Extension of provision for parties to obtain AUFLS waivers**

- 5.4.18 If participants are adamant that amendments to the existing dispensation provisions will not be suitable for AUFLS obligations, the Commission proposes that the proposed AUFLS waiver provisions are extended to capture distributors who cannot provide AUFLS without having to remove their IR offers from the IR market. It is proposed that similar conditions to those for dispensations (eg allocation of costs) are attached. This option would preserve the Commission's objective to provide relief to participants that cannot meet their AUFLS obligations without removing IL from the IR market. Any load subject to an AUFLS waiver would have to be offered as IL in the IR market.
- 5.4.19 The Commission has drafted a set of rules associated with this option (*example rule set 2* in Appendix 4). This second set differs from *set 1* in the following ways:
- (a) the proposed schedule C7 accommodates waivers for both unusually high-cost load and unusually low-cost load);
  - (b) the proposed schedule C7 includes the cost allocation formula for AUFLS dispensations; and
  - (c) a new rule is proposed which would expressly preclude participants from applying for dispensations from their AUFLS obligations.

Q7. What do you think of the option that the proposed AUFLS waiver provisions (proposed schedule C7) are extended to capture distributors who cannot provide AUFLS without having to remove their IR offers from the IR market?

## 5.5 Example rule sets

5.5.1 The Commission has drafted two example rule sets to demonstrate how some combinations of the proposed options outlined above may be implemented in detail within the Rules. The examples provided are:

- (a) *example rule set 1* – **option A2** combined with **option B1**; and
- (b) *example rule set 2* – **option A2** combined with **option B2**.

The example rule sets are included in Appendix 4. For clarity, some consequential changes required to other rules are not included in the example sets.

## 6. Next steps and summary of questions

### 6.1 Next steps

6.1.1 The Commission is now seeking participants' feedback on the analysis it has undertaken and the rule changes being considered.

6.1.2 Once this consultation process is completed, the Board will consider the submissions on the options and prepare a formal consultation paper with rule change proposals, including an assessment of the costs and benefits of those proposed changes.

### 6.2 Summary of questions

6.2.1 The questions the Commission would particularly like submitters to answer are summarised below:

1. Are there any circumstances under which you think participants should be relieved of their AUFLS obligations, eg:
  - a. enforce AUFLS obligation short of requiring a distributor to assign sensitive and/or load with high interruption costs to AUFLS blocks (without cost); or
  - b. enforce AUFLS obligations short of requiring distributor to reduce its IR offers, subject to conditions (un-cleared offers not included, liable for any associated reserve costs)?
2. What do you think of the proposed eligibility criteria for receiving a waiver from AUFLS (especially the threshold)?
3. What do you think of the proposal to charge generators holding dispensations from the under frequency AOPOs (and participants holding dispensations from AUFLS) only a share of the extra costs of reserve caused by their non-compliance?
4. Do you think the formulas contained in the draft rules make it sufficiently clear how any extra reserve costs should be calculated and allocated?
5. Do you think the Rules should provide for dispensations from AUFLS technical requirements?
6. What do you think of the Commission's suggestions managing the way in which participants can receive dispensations from AUFLS?
7. What do you think of the option that the proposed AUFLS waiver provisions (proposed schedule C7) are extended to capture distributors who cannot provide AUFLS, without having to remove their IR offers from the IR market?

8. What specific costs and benefits, which might be associated with the options proposed, can you identify? In particular for the proposed:
  - a. replacement of rule 6.6 (exemptions) with the proposed schedule C7 (AUFLS waivers)?
  - b. amendments to the cost allocation formulas for dispensations?
  - c. amendments to the general dispensation provisions, and the proposed extension of the proposed schedule C7, to include participants that would have been eligible for dispensations?
9. What comments do you have on the preliminary rule drafting?

# Appendices

Appendix 1	Format for submissions	32
Appendix 2	AUFLS Benchmark Interruption Cost	34
2.1	Background	34
2.2	The Relevance of the Benchmark	35
2.3	The Implications of an Alternative Benchmark	36
Appendix 3	Existing security policy's effect on compliance incentives	37
3.1	Management of ECE under existing security policy	37
Appendix 4	Example rule sets	39

## Appendix 1 Format for submissions

Question	Response
<p>1. Are there any circumstances under which you think participants should be relieved of their AUFLS obligations, eg:</p> <ul style="list-style-type: none"> <li>a. enforce AUFLS obligation short of requiring a distributor to assign sensitive and/or load with high interruption costs to AUFLS blocks (without cost); or</li> <li>b. enforce AUFLS obligations short of requiring distributor to reduce its IR offers, subject to conditions (uncleared offers not included, liable for any associated reserve costs)?</li> </ul>	
<p>2. What do you think of the proposed eligibility criteria for receiving a waiver from AUFLS (especially the threshold)?</p>	
<p>3. What do you think of the proposal to charge generators holding dispensations from the under frequency AOPOs (and participants holding dispensations from AUFLS) only a share of the extra costs of reserve caused by their non-compliance?</p>	
<p>4. Do you think the formulas contained in the draft rules make it sufficiently clear how any extra reserve costs should be calculated and allocated?</p>	
<p>5. Do you think the existing provisions in the Rules are sufficient to accommodate dispensations from AUFLS technical requirements?</p>	
<p>6. What do you think of the Commission's suggestions for limiting the extent to which participants can receive dispensations from AUFLS?</p>	
<p>7. What do you think of the option to extend the new proposed schedule (C7) for granting waivers from AUFLS to include participants that cannot provide AUFLS without removing their IR offers?</p>	
<p>8. What specific costs and benefits can you identify might be associated with the options proposed, in particular:</p> <ul style="list-style-type: none"> <li>c. replacement of rule 6.6 (exemptions) with schedule C7 (waivers)?</li> <li>d. amendments to the cost allocation formulas for dispensations?</li> <li>e. amendments to the general dispensation provisions and/or extension of the schedule C7 for participants that would otherwise be eligible</li> </ul>	

for a dispensation?	
9. What comments do you have on the preliminary rule drafting?	

## Appendix 2 AUFLS Benchmark Interruption Cost

### 2.1 Background

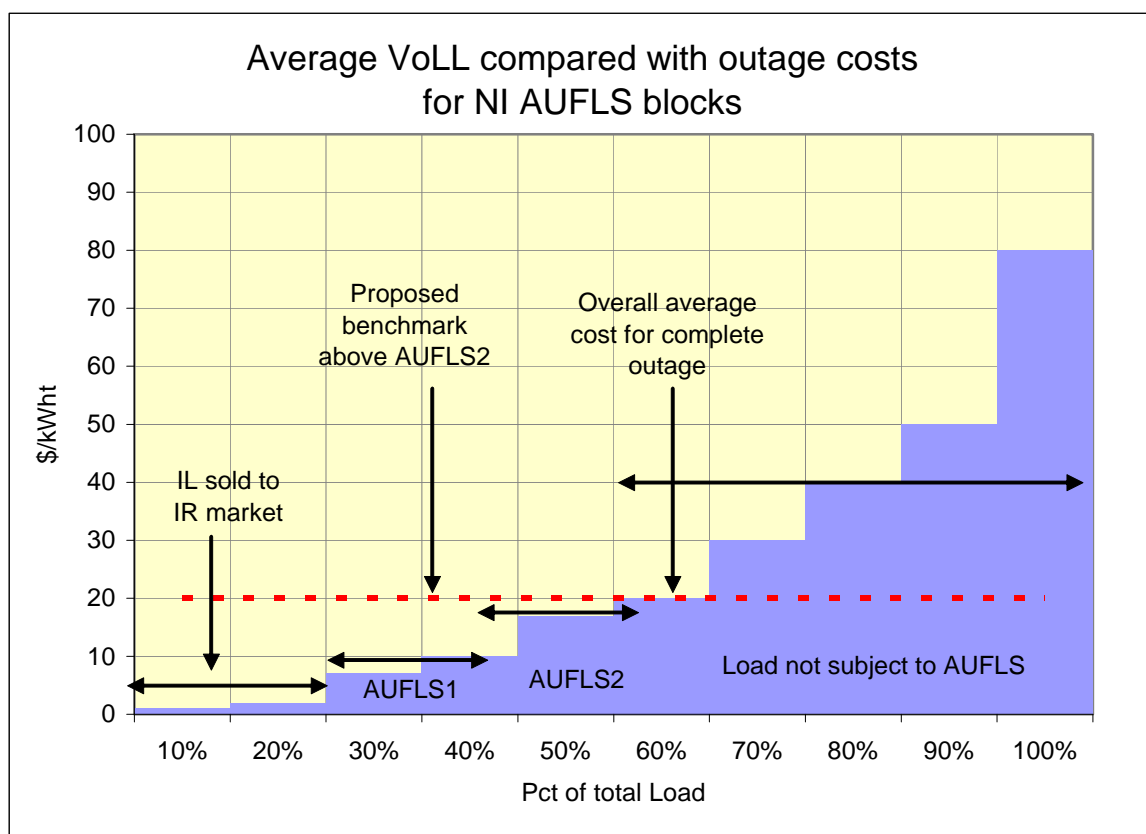
- 2.1.1 The current AUFLS exemption provision, set out in rule 6.6 of technical code B of schedule C3 of part C of the Rules, provide for an exemption where the Board is satisfied that the direct financial impact of providing AUFLS exceeds the “expected interruption cost”. As it is currently defined under the Rules, “expected interruption cost” means “the cost per kW, estimated by the **Board** from time to time, which exceeds the cost per kW that any persons are expected to incur as a direct consequence of block 2 **automatic under-frequency load shedding** facilities...”.
- 2.1.2 The reference to “any persons” arguably implies that the exemption criteria is not the average cost of block 2, but rather a higher level which is above the outage cost for most persons within the block.
- 2.1.3 Interruption costs are highly variable and difficult to estimate. Hence, the setting of an “expected interruption cost” is a somewhat subjective judgement call.
- 2.1.4 Previous work carried out by the FSWG<sup>22</sup> estimated average AUFLS costs of approximately \$20/kW/event for AUFLS block 2 outages of 1 hour<sup>23</sup> (equivalent to \$20/kWh). In July 2004, initial analysis of AUFLS expected interruption costs, by the Commission’s advisors, recommended that the benchmark for expected interruption costs be set at twice this level (\$40/kW/event). Work undertaken for the Commission by the Centre for Advanced Engineering (CAE) derived a VoLL estimate of around \$21/kWh<sup>24</sup>. This is broadly consistent with estimates in Australia and is within the \$10 to \$30/kWh range of values specified in the proposed Grid Investment Test.
- 2.1.5 The following chart indicates how the average outage cost relates to the average cost for AUFLS block 1 and block 2. This indicates that the average cost for block 2 may be slightly lower than the average VoLL for a complete outage (set at \$20/kWh in this illustrative chart to be consistent with the VoLL value being used for transmission reliability assessments).

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<sup>22</sup> Frequency Standards Working Group established under the auspice of the Grid Security Committee.

<sup>23</sup> There are a number of estimates of the frequency and duration of interruptions – 1 in 5 years for bipole but only some bipole trips result in AUFLS trips. The duration was assessed to be 1 to 2 hours depending on the block.

<sup>24</sup> “Assessment of the Value of Lost Load for the Electricity Commission”; Consultation Discussion Paper, Centre for Advanced Engineering (CAE)<http://www.electricitycommission.govt.nz/advisorygroups/tag/pdfs2nov04/cae-on-voll.pdf> .



2.1.6 Thus, a suitable figure for expected interruption costs could be set at \$20/kW for a 1 hour outage. This is a margin above the expected costs for AUFLS block 2 as would be required if the average outage cost (for 100% outage) was \$20/kW. This is the figure being used for transmission reliability planning. It is also equal to the average AUFLS block 2 cost estimated by the FSWG.

2.1.7 It is proposed that parties claiming exemptions from AUFLS requirements demonstrate that their direct interruption costs exceed this benchmark.

## 2.2 The Relevance of the Benchmark

2.2.1 The relevance of this benchmark has been questioned on the grounds that for any exemption that is granted in practice the System Operator will purchase additional IR when the ECE risk is binding, rather than by increasing the AUFLS requirements on non-exempt parties.

2.2.2 This is a valid concern. However, the Commission can review the proposed mandated standards at any time and decide to adjust the percentage requirements to account for the level of exemptions granted. The proposed block 2 AUFLS interruption cost benchmark seems appropriate in the medium term.

2.2.3 It should be noted that the current mandated standard has not been optimised but simply reflects a “base line” translation of the previous North Island AUFLS requirement. The previous requirement was expressed as 2 x 20% blocks of demand, but this included an estimated 400MW of IL and directly connected consumers. The current 2 x 16% blocks were considered to be equivalent to the previous requirement since they do not include IL and are specified to be 16% “at any time”. This assessment assumed that there would be around 150 to 300MW worth of exemptions.

## 2.3 The Implications of an Alternative Benchmark

2.3.1 It may be theoretically valid to derive a benchmark based on the cost of procuring additional IR.

2.3.2 The estimated annual cost of additional IR is estimated by:

- annual cost = percent of time ECE risk is binding \* IR price \* hours/year
- low value = 5% \* \$4/MWh\*8.76 = \$2/kW/year = \$10/kW/event (assuming a 1 hour event every five years)
- high value = 10%\*\$8/MWh\*8.76 = \$7/kW/year = \$35/kW/event

2.3.3 The proposed benchmark of \$20/kW/event for AUFLS exemptions is in the middle of this range. From an administrative perspective, it would be simpler to establish a well-defined benchmark for exemptions rather than attempt to set the benchmark on actual costs incurred by the system operator.

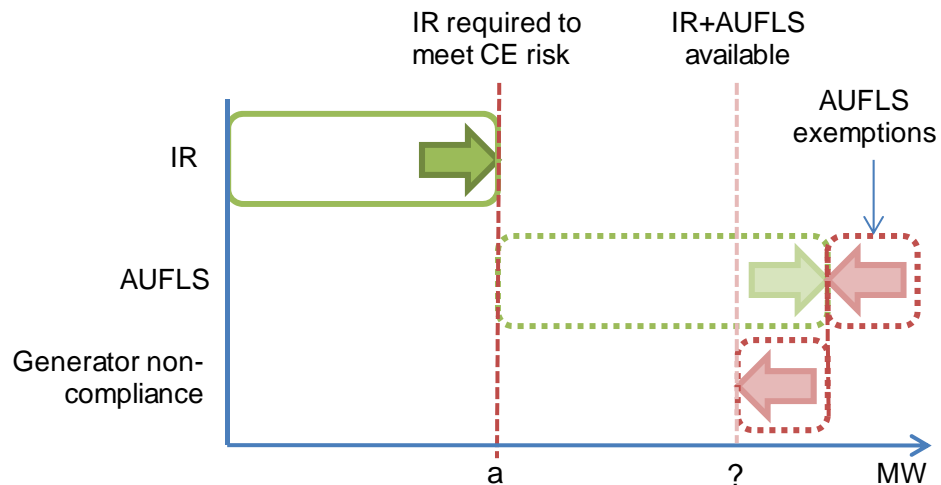
## Appendix 3 Existing security policy's effect on compliance incentives

### 3.1 Management of ECE under existing security policy

3.1.1 The 2005 consultation proposal was based on a presumption that procurement of IR to cover an extended contingent event would place a natural limit on the level of non-compliance with the under frequency AOPOs and AUFLS obligations. The System Operator raised concerns in its submission that the Commission's proposal for dispensations could cause an imprudent erosion of AUFLS protection against large events. The Commission notes that the quantity of generation non-compliant with the under frequency AOPOs has increased significantly in the last few years<sup>25</sup> and the Commission is concerned such an erosion is already occurring.

3.1.2 Section 3.4 in the main body of the paper describes how the System Operator calculates how much IR is needed to ensure the power system recovers from an ECE. Figure 6 (below) illustrates the present state of under frequency management. The security policy only identifies one ECE – the HVDC bipole – and it is generally not a credible risk because pole 1 is available only in a very limited capacity.

Figure 6: Management of under frequency events (present state)



3.1.3 Without an ECE, the cycle illustrated in Figure 5 (page 18) breaks down. Non-compliance with the under frequency AOPOs is free as the System Operator has no basis on which to:

- assess the system's ability to meet events larger than a CE;
- procure additional IR; and

<sup>25</sup> Huntly unit 6 (up to 400 MW) and Te Apati (up to 90 MW) being significant examples.

- (c) allocate costs to those holding under frequency (or proposed AUFLS) dispensations.
- 3.1.4 Generators making generation investment decisions might have lower expectations of the costs associated with a non-compliant plant. Even if the HVDC bipole was a credible risk more often, it is not common for the transfer north or south to be significantly greater than the CE risk. Therefore, when an ECE does not exist, there is no assessed level of cover for larger events and this reduces the relative merits of non-compliant/compliant plant below levels than would otherwise occur.
- 3.1.5 The Commission notes that there have been other events in the last ten years (the timeframe in which an ECE is expected to occur), which have resulted in the loss of more generation than a CE. There have been at least two occasions where two combined-cycled gas turbine units (CCGTs) have tripped within a few seconds of each other and resulted in the loss of as much as 600 MW. On those occasions, the conservatism in the quantity of IR delivered resulted in frequency recovering just short of the trip setting for the first AUFLS block.
- 3.1.6 The Commission has shared its concerns with the System Operator in discussions regarding the system Operator's review of the security policy. According to the information on its website, the System Operator is due to release its draft event management policy toward the end of October 2009. The Commission awaits this document with interest.

## Appendix 4 Example rule sets

### *Example rule set 1 - Option A2 combined with option B1*

(Refer to section 5 of the main body of the paper for a description of these proposed options.)

#### **Section III Part C:**

##### **7.2A System operator to grant dispensations**

7.2A.1 The **system operator** must grant a **dispensation** to an **asset owner** who has or will have **assets**, or a configuration of **assets**, which are not compliant with either an **AOPO** or **technical code**, only if the **system operator** expects that it can—

7.2A.1.1 continue to operate the existing system; and

7.2A.1.2 meet its **principal performance obligations**; and

7.2A.1.3 readily calculate any costs on other persons of that **dispensation**, including the costs of the **system operator** purchasing any other **ancillary services** required as a consequence of its **dispensation**.

7.2A.2 Despite paragraph 1, the **system operator** must grant a **dispensation** to an **asset owner** from providing an **AUFLS** system under clause 6.1 of **technical code** B of schedule C3 only if the **system operator**—

7.2A.2.1 expects that it can continue to operate the existing system; and

7.2A.2.2 expects that it can meet its **principal performance obligations**; and

7.2A.2.3 expects that it can readily calculate any costs on other persons of that **dispensation**, including the costs of the **system operator** purchasing any other **ancillary services** required as a consequence of the **dispensation**; and

7.2A.2.4 is satisfied that the **asset owner** cannot, during normal operation, meet its obligations under rule 6.1 of **technical code** B of schedule C3 without disconnecting load within its **network** that it wants to **offer** as **instantaneous reserves**.

### 7.3 Grant of dispensations

~~The~~ If the **system operator** ~~will~~ grants a **dispensation** under subclause 2A, the following provisions apply to an **asset owner** who has or will have **assets** or a configuration of **assets** which are not compliant with either an **AOPO** or **technical code** where the **system operator** has a reasonable expectation that it can continue to operate the existing system and meet its **principal performance obligations** and where the **system operator** can readily quantify the costs on other persons of that **dispensation**, notwithstanding the particular non-compliance of those **assets**, provided that:

#### 7.3.1 Costs to be paid

~~Where the approval of a dispensation could impose readily identifiable and quantifiable costs on other persons, then a condition of the dispensation shall be that the~~ The **asset owner** ~~must~~ is liable to pay to the **system operator** ~~the~~ for those costs identified under rule 7.2A.1.3 or rule 7.2A.2.3; ~~including the costs of the system operator purchasing any other ancillary services required as a consequence of its dispensation; and~~

#### 7.3.2 Acknowledgement regarding dispatch

The **asset owner** acknowledges that ~~the~~ granting the ~~of a~~ **dispensation** does not guarantee that the **system operator** will **dispatch** the ~~that~~ **asset** for which the **dispensation** was granted, as **dispatch** will only occur in accordance with the **dispatch objective**; ~~and;~~

#### 7.3.3 Generator under-frequency AOPO dispensation costs

For the purposes of a **generating unit dispensation** from rule 2.3.1 or rule 2.3.2, a **generator** ~~must pay~~ will be allocated the following costs in a relevant **trading period** ~~with respect to~~ under paragraph 1 ~~rule 7.3.1~~ for ~~each of~~ **fast instantaneous reserves** or **sustained instantaneous reserves** (as the case may be):

$$\text{DispCost}_{\text{GENxt}} = 0.5 * Q_{\text{GENxt}} * P_{\text{IRt}} * \underline{\text{UFDF}_t}$$

Where: —

$\text{DispCOst}_{\text{GENxt}}$  is the cost payable by a **generator** for **generating unit x** in any **trading period t** in which fast instantaneous reserve or sustained instantaneous reserve (as the case may be) ~~a class of instantaneous reserves~~ is procured as a direct result of that **generating unit's dispensation** to ensure that the frequency does not fall below 47 Hertz or, in the South Island,

below the **minimum South Island frequency** established in accordance with rule 3 of section II;

$Q_{GENxt}$  is the quantity in **MW** by which **generating unit x** is unable to sustain pre-event output in **trading period t** with reference to rule 2.3.1 or 2.3.2 (as the case may be) as determined from the capabilities specified in that **generating unit's dispensation** (different amounts may be specified with respect to each class of **instantaneous reserves**); and

$P_{IRt}$  is the **final reserve price** for **fast instantaneous reserves** or **sustained instantaneous reserves** (as the case may be) in **trading period t** in the relevant **island**.

$UFDF_t$  is the under-frequency dispensation factor as calculated in accordance with paragraph 5 for fast instantaneous reserve or sustained instantaneous reserve (as the case may be), in trading period t in the relevant island:

#### 7.3.4 Under-frequency load shedding dispensation costs

If the **system operator** grants a **dispensation** from clause 6.1 of **technical code B** of schedule C3, the **asset owner** must pay the following costs in a relevant **trading period** under paragraph 1 for **fast instantaneous reserve** or **sustained instantaneous reserve** (as the case may be) for a set of **grid exit points** approved by the **system operator**:

$$DispCost_{DISGOyt} = 0.5 * Q_{DISGOyt} * P_{IRt} * UFDF_t$$

Where—

$DispCost_{DISGOyt}$  is the cost payable by the **asset owner** in any **trading period t** in which **fast instantaneous reserve** or **sustained instantaneous reserve** (as the case may be) is procured as a direct result of that **asset owner's dispensation** at **grid exit point y**

$P_{IRt}$  is the **final reserve price** for **fast instantaneous reserve** or **sustained instantaneous reserve** (as the case may be) in **trading period t** in the relevant **island**

$Q_{DISGOyt}$  is the difference between—

- (a) the quantity in MW that, in the absence of the dispensation at grid exit point y, the asset owner would have had to provide to comply with the automatic under-frequency load shedding requirements in clause 6.1 of technical code B of schedule C3; and
- (b) the quantity of automatic under-frequency load shedding (including as a result of an equivalence arrangement) actually provided by the asset owner in the relevant trading period t

UFDF<sub>t</sub> is the under-frequency dispensation factor as calculated in paragraph 5 for fast instantaneous reserve or sustained instantaneous reserve (as the case may be), in trading period t in the relevant island:

### 7.3.5 Under-frequency dispensation factor

For the purpose of paragraph 3 and paragraph 4, the under-frequency dispensation factor must be calculated as follows:

$$UFDF_t = \frac{Q_{IRt}}{\sum_{y=1}^{n_1} Q_{DISGOyt} + \sum_{x=1}^{n_2} Q_{GENxt}}$$

Where—

Q<sub>IRt</sub> is the quantity in MW of fast instantaneous reserve or sustained instantaneous reserve (as the case may be) procured by the system operator in trading period t in the relevant island as a direct result of all generator dispensations from rule 2.3.1 or rule 2.3.2 and all distributor or grid owner dispensations from clause 6.1 of technical code B of schedule C3

$\sum_{x=1}^{n_2} Q_{GENxt}$  is the sum of Q<sub>GENxt</sub>, (as that term is described in paragraph 3), for fast instantaneous reserve or sustained instantaneous reserve (as the case may be), for all generating units x in trading period t in the relevant island

$\sum_{y=1}^{n_1} Q_{DISGOyt}$  is the sum of  $Q_{DISGOyt}$  (as described in paragraph 4)

for fast instantaneous reserve or sustained instantaneous reserve (as the case may be) for all grid exit points y in trading period t in the relevant island.

#### 7.4 Other conditions can be imposed

The **system operator** may also impose other reasonable conditions on ~~the grant of a dispensation pursuant to rule 7.3~~, including conditions as to the duration of the **dispensation**.

#### 7.5 Dispensations from automatic under-frequency load shedding requirements

If the **system operator** has granted a **dispensation** from clause 6.1 of technical code B of schedule C3 to an **asset owner**, the **asset owner** must **offer** the load, to which the **dispensation** relates, as **instantaneous reserve** under rule 6 of section II of part G. The **system operator** will count interruptible **load offered** as **fast instantaneous reserve** that is armed to trip but not is **dispatched**, as part of the **participant's** contribution to **automatic under-frequency load shedding** required under clause 6.1 of technical code B of schedule C3.

#### **Technical Code B Schedule C3 Part C:**

#### ~~6.6—Exemptions from automatic under-frequency load shedding requirements~~

~~Where a distributor or grid owner can satisfy the Board that the direct financial impact of providing automatic under-frequency load shedding would exceed the expected interruption costs for each kW interrupted, the Board will grant an exemption from full compliance with the requirements of rule 6.3. The Board will advise the system operator of any exemptions from full compliance with the requirements of rule 6.3.~~

#### 6.6A Application for AUFLS waiver or dispensation

A distributor or a grid owner must provide an AUFLS system in accordance with clause 6.1, unless the distributor or grid owner has been granted an AUFLS waiver or a dispensation. A distributor or a grid owner may apply for an AUFLS waiver in accordance with Schedule C7.

#### **New Schedule C7**

#### 1 Application to Board for AUFLS waiver

1.1 A **participant** who wishes to be excused from the obligation to provide an **AUFLS** system under clause 6.1 of **technical code B** of schedule C3, may apply to the **Board** for an **AUFLS waiver**.

(i) 1.2 A **participant** must make its application in accordance with this schedule.

## 2. **Application in writing**

A **participant** applying to the **Board** for an **AUFLS waiver** must—

2.1 apply in writing; and

2.2 use the form **publicised** by the **Board** from time to time; and

2.3 clearly indicate whether any of the information it provides is commercially sensitive.

## 3 **Board to publicise each application**

Within [number of days] after the **Board** receives an application for an **AUFLS waiver**, the **Board** must—

3.1 **publicise** the application; and

3.2 when **publicising** the application, specify a time within which **participants** can make their views about the application known to the **Board**; and

3.3 provide a copy of the application to the **system operator**.

## 4 **Board's decision to grant AUFLS waiver**

4.1 The **Board** may only grant an **AUFLS waiver** if the **participant** has satisfied the **Board** that the **participant** cannot, during normal operation, meet its obligations under clause 6.1 of **technical code B** of schedule C3 without being obligated to disconnect load within its **network**, if disconnecting the load—

4.1.1 would have a direct cost of interruption that exceeds \$20/kW; or

4.1.2 [may cause risk to the health and safety of any person; or

4.1.3 is contrary to the **participant's** obligations under the Resource Management Act 1991 or any other enactment].

4.2 In considering an application, the **Board** must take into account—

4.2.1 the **system operator's** view on the effect the **AUFLS waiver** may have on the **system operator's** ability to meet its **PPOs** and perform

its obligations under the Security Policy set out in chapter 1 of schedule C4; and

4.2.2 any views made known to the **Board** within the time specified by the **Board** when it **publicised** the application in accordance with clause 3; and

4.2.3 the extent to which the **participant** can comply with its obligations under clause 6.1 of **technical code B** of schedule C3; and

4.2.4 the extent to which the **participant** has other reasonably practicable alternative means of complying with its obligations under clause 6.1-of **technical code B** of schedule C3.

## 5 **Additional information**

5.1 The **Board** may, at any stage during the application process, request the **participant** to provide additional information.

5.2 The **participant** must provide the requested information within [number of days] or within the time specified by the **Board**.

## 6 **Board may seek independent expert advice**

In considering an application, the **Board** may seek and take into account independent technical expert advice.

## 7 **Participant may withdraw or amend application**

7.1 The **participant** may, at any time, withdraw or amend an application being considered by the **Board**. All withdrawals and amendments—

7.1.1 must be made in writing; and

7.1.2 must be submitted to the **Board**.

7.2 A withdrawal will take effect from the date of receipt by the **Board**.

7.3 The **Board** must **publicise** a withdrawal.

7.3 This schedule, with all necessary modifications, applies to an amended application as if the amended application were the original application.

## 8 **Board must approve or decline application**

8.1 The **Board** must either approve or decline an application.

8.2 If the **Board** declines an application, the **Board** must—

8.2.1 notify the **participant** of its decision and the reasons for its decision; and

8.2.2 publicise that it has declined the application and the reasons for its decision.

8.3 The Board may approve the application on any conditions that it thinks fit.

8.4 As soon as practicable after approving an application, the Board must publicise and notify in writing to the participant—

8.4.1 that the application has been approved; and

8.4.2 any conditions that apply to the AUFLS waiver; and

8.4.3 the Board's reasons for approving the application.

## 9 Duration of approval

9.1 Approval of an application takes effect from the date specified in the approval.

9.2 Each AUFLS waiver is effective for [2/3] years after the date on which it takes effect or for a shorter period specified by the Board at the time the application is approved.

## 10 Board's decision to be recorded

The Board must keep a register of all AUFLS waivers, available for public inspection free of charge during normal office hours at the offices of the Board and on the Board's website at all reasonable times. The register must state for each AUFLS waiver—

10.1 the name of the participant to whom it is granted; and

10.2 the date it was granted; and

10.3 its duration; and

10.4 the quantity of load subject to the AUFLS waiver; and

10.5 any conditions imposed under clause 8.3.

## 11. Participant must advise change of circumstances

11.1 A participant who has an AUFLS waiver must advise the Board, as soon as practicable after it becomes aware of any change in circumstances which materially affects:

11.1 the participant's ability to comply with its obligations to provide an AUFLS system under clause 6.1 of technical code B of schedule C3:

11.2 the participant's ability to comply with any conditions of its AUFLS waiver.

11.2 A **participant** must advise the **Board** as soon as practicable after it becomes aware of the change of circumstances.

## 12 **Board may revoke or amend AUFLS waiver**

12.1 In accordance with paragraph 2, the **Board** may revoke or amend an **AUFLS waiver** where the **Board** becomes aware of any change of circumstances which materially affects:

12.1.1 the ability of the **participant**, to whom the **AUFLS waiver** was granted, to comply with its obligations to provide **AUFLS** system in accordance with clause 6.1 of **technical code B** of schedule C3:

12.1.2 the ability of the **participant**, to whom the **AUFLS waiver** was granted to comply with any conditions imposed under clause 8.3.

12.2 In deciding whether to amend or revoke an **AUFLS waiver**, the **Board** must follow the process set out in this schedule, with all necessary modifications.

12.3 If the **Board** amends or revokes an **AUFLS waiver**, the **Board** must—

12.3.1 give the **participant** to whom the **AUFLS waiver** has been granted, [1/2/3] months' notice before the amendment or revocation becomes effective; and

12.3.2 advise the **participant** to whom the **AUFLS waiver** has been granted, of the reasons for its decision to amend or revoke the **AUFLS waiver**; and

12.3.3 **publicise** the amendment or revocation.

**(b) Rule 1 Part A:**

**(c) AUFLS waiver** means a waiver granted by the **Board**, in accordance with schedule C7 of part C to a **participant** from the obligations to provide an **AUFLS** system in accordance with clause 6.1 of **technical code B** of schedule C3 of part C

~~“automatic under-frequency load shedding” and AUFLS means~~ automatic shedding of electrical load when frequency falls below preset frequency as specified in ~~rule-clause~~ 6.3 of **technical code B** of schedule C3 of part C;

*Example rule set 2 - Option A2 combined with option B2*  
(Refer to section 5 of the main body of the paper for a description of these proposed options.)

**Part C Section III:**

**7.2A System operator to grant dispensations**

The system operator must grant a dispensation to an asset owner who has or will have assets, or a configuration of assets, which are not compliant with either an AOPO or technical code, only if the system operator expects that it can—

7.2A.1 continue to operate the existing system; and

7.2A.2 meet its principal performance obligations; and

7.2A.3 readily calculate any costs on other persons of that dispensation.

**7.3 Grant of dispensations**

~~The~~ ~~if the system operator will~~ grants a dispensation ~~under subclause 2A, the following provisions apply to an asset owner who has or will have assets or a configuration of assets which are not compliant with either an AOPO or technical code where the system operator has a reasonable expectation that it can continue to operate the existing system and meet its principal performance obligations and where the system operator can readily quantify the costs on other persons of that dispensation, notwithstanding the particular non-compliance of those assets, provided that:~~

**7.3.1 Costs to be paid**

~~Where the approval of a dispensation could impose readily identifiable and quantifiable costs on other persons, then a condition of the dispensation shall be that the~~ The asset owner must ~~is~~ is liable ~~to pay to the system operator the for those costs identified under rule 7.2A.1.3 or rule 7.2A.2.3; including the costs of the system operator purchasing any other ancillary services required as a consequence of its dispensation; and~~

**7.3.2 Acknowledgement regarding dispatch**

The asset owner acknowledges that ~~the~~ granting ~~the of a~~ of a dispensation does not guarantee that the system operator will ~~dispatch the that~~ dispatch that asset for which the dispensation was granted, as ~~dispatch will only occur in accordance with the dispatch objective; and;~~

**7.3.3 Generator under-frequency AOPO dispensation costs**

For the purposes of a **generating unit dispensation** from rule 2.3.1 or rule 2.3.2, a **generator** ~~will be allocated~~ must pay the following costs in a relevant **trading period** ~~with respect to~~ under rule 7.3.1 for ~~each of fast instantaneous reserves~~ or **sustained instantaneous reserves** ~~(as the case may be)~~:

$$\text{DispCost}_{\text{GEN}t} = 0.5 * Q_{\text{GEN}t} * P_{\text{IR}t} * \text{UFDF}_t$$

Where: ~~—~~

$\text{DispCOst}_{\text{GEN}t}$  is the cost payable by a **generator** for **generating unit x** in any **trading period t** in which fast instantaneous reserve or sustained instantaneous reserve (as the case may be) ~~a class of instantaneous reserves~~ is procured as a direct result of that **generating unit's dispensation** to ensure that the frequency does not fall below 47 Hertz or, in the South Island, below the **minimum South Island frequency** established in accordance with rule 3 of section II;

$Q_{\text{GEN}t}$  is the quantity in **MW** by which **generating unit x** is unable to sustain pre-event output in **trading period t** with reference to rule 2.3.1 or 2.3.2 (as the case may be) as determined from the capabilities specified in that **generating unit's dispensation** (different amounts may be specified with respect to each class of **instantaneous reserves**); ~~and~~

$P_{\text{IR}t}$  is the **final reserve price** for **fast instantaneous reserves** or **sustained instantaneous reserves** (as the case may be) in **trading period t** in the relevant **island**.

UFDF<sub>t</sub> is the under-frequency dispensation factor as calculated in accordance with paragraph 4 for fast instantaneous reserve or sustained instantaneous reserve (as the case may be), in trading period t in the relevant island:

#### 7.3.4 Under-frequency dispensation factor

For the purpose of paragraph 3, the under-frequency dispensation factor must be calculated as follows:

$$UFDF_t = \frac{Q_{IRt}}{\sum_{y=1}^{n_1} Q_{DISGOyt} + \sum_{x=1}^{n_2} Q_{GENxt}}$$

Where:

$Q_{IRt}$  is the quantity in **MW** of **fast instantaneous reserve or sustained instantaneous reserve** (as the case may be) procured by the **system operator** in **trading period t** in the relevant **island** as a direct result of all **generator dispensations** from rule 2.3.1 or rule 2.3.2 and all **asset owner's dispensations** from clause 6.1 of **technical code B** of schedule C3

$\sum_{x=1}^{n_2} Q_{GENxt}$  is the sum of  $Q_{GENxt}$ , (as that term is described in paragraph 3), for **fast instantaneous reserve or sustained instantaneous reserve** (as the case may be), for all **generating units x** in **trading period t** in the relevant **island**

$\sum_{y=1}^{n_1} Q_{DISGOyt}$  is the sum of  $Q_{DISGOyt}$ , (as described in paragraph 3) for **fast instantaneous reserve or sustained instantaneous reserve** (as the case may be) for all **grid exit points y** in **trading period t** in the relevant **island**.

#### 7.4 Other conditions can be imposed

The **system operator** may also impose other reasonable conditions on ~~the grant of a dispensation pursuant to rule 7.3~~, including conditions as to the duration of the **dispensation**.

#### 7.5 No dispensations from AUFLS obligations

7.5.1 This sub-clause applies to a **participant** who wishes to be excused from the obligation to provide an **AUFLS** system under clause 6.1 of **technical code B** of schedule C3.

7.5.2 A **participant** to whom this sub-clause applies—

7.5.2.1 must not apply for a **dispensation**; but

7.5.2.2 may apply for an **AUFLS waiver**.

## Technical Code B Schedule C3 Part C:

### ~~6.6 Exemptions from automatic under-frequency load shedding requirements~~

~~Where a **distributor** or **grid owner** can satisfy the **Board** that the direct financial impact of providing **automatic under-frequency load shedding** would exceed the **expected interruption costs** for each kW interrupted, the **Board** will grant an exemption from full compliance with the requirements of rule 6.3. The **Board** will advise the **system operator** of any exemptions from full compliance with the requirements of rule 6.3.~~

### 6.6A Application for AUFLS waiver

A **distributor** or a **grid owner** must provide an **AUFLS** system in accordance with this clause, unless the **distributor** or **grid owner** has been granted an **AUFLS waiver**.

## New Schedule C7

### 1 Application to Board for AUFLS waiver

1.1 A **participant** who wishes to be excused from the obligation to provide an **AUFLS** system under clause 6.1 of **technical code B** of schedule C3, may apply to the **Board** for an **AUFLS waiver**.

(i) 1.2 A **participant** must make its application in accordance with this schedule.

### 2. Application in writing

A **participant** applying to the **Board** for an **AUFLS waiver** must—

2.1 apply in writing; and

2.2 use the form **publicised** by the **Board** from time to time; and

2.3 clearly indicate whether any of the information it provides is commercially sensitive.

### 3 Board to publicise each application

Within [number of days] after the **Board** receives an application for an **AUFLS waiver**, the **Board** must—

3.1 **publicise** the application; and

3.2 when **publicising** the application, specify a time within which **participants** can make their views about the application known to the **Board**; and

3.3 provide a copy of the application to the **system operator**.

#### 4 **Board's decision to grant AUFLS waiver**

4.1 The **Board** may only grant an **AUFLS waiver** if the **participant** has satisfied the **Board** that—

4.1.1 the **participant** cannot, during normal operation, meet its obligations under clause 6.1 of **technical code B** of schedule C3 without being obligated to disconnect load within its **network**, if disconnecting the load—

4.1.1.1 would have a direct cost of interruption that exceeds \$20/kW:

4.1.1.2 may cause risk to the health and safety of any person;

4.1.1.3 is contrary to the **participant's** obligations under the Resource Management Act 1991 or any other enactment;  
or

4.1.2 the **participant** cannot, during normal operation, meet its obligations under clause 6.1 of **technical code B** of schedule C3 without enabling disconnection of load within its **network** that it wants to offer as **instantaneous reserve**.

4.2 In considering an application, the **Board** must take into account—

4.2.1 the **system operator's** view on the effect the **AUFLS waiver** may have on the **system operator's** ability to meet its **PPOs** and perform its obligations under the Security Policy set out in chapter 1 of schedule C4; and

4.2.2 any views made known to the **Board** within the time specified by the **Board** when it **publicised** the application in accordance with rule 3.2; and

4.2.3 the extent to which the **participant** can comply with its obligations under clause 6.1 of **technical code B** of schedule C3; and

4.2.4 the extent to which the **participant** has other reasonably practicable alternative means of complying with its obligations under clause 6.1 of **technical code B** of schedule C3.

#### 5 **Additional information**

5.1 The **Board** may, at any stage during the application process, request the **participant** to provide additional information.

5.2 The **participant** must provide the requested information within [number of days] or within the time specified by the **Board**.

## 6 **Board may seek independent expert advice**

In considering an application, the **Board** may seek and take into account independent technical expert advice.

## 7 **Participant may withdraw or amend application**

7.1 The **participant** may, at any time, withdraw or amend an application being considered by the **Board**. All withdrawals and amendments—

7.1.1 must be made in writing; and

7.1.2 must be submitted to the **Board**.

7.2 A withdrawal will take effect from the date of receipt by the **Board**.

7.3 The **Board** must **publicise** a withdrawal.

7.3 This schedule, with the necessary modifications, applies to an amended application as if the amended application were the original application.

## 8 **Board must approve or decline application**

8.1 The **Board** must either approve or decline an application.

8.2 If the **Board** declines an application, the **Board** must—

8.2.1 notify the **participant** of its decision and the reasons for its decision; and

8.2.2 **publicise** that it has declined the application and the reasons for its decision.

8.3 The **Board** may approve the application on any conditions that it thinks fit.

8.4 As soon as practicable after approving an application, the **Board** must **publicise** and notify in writing to the **participant**—

8.4.1 that the application has been approved; and

8.4.2 any conditions that apply to the **AUFLS waiver**; and

8.4.3 the **Board's** reasons for approving the application.

## 9 **Mandatory Conditions**

If a **participant** is granted an **AUFLS waiver** for the reason set out in clause 4.1.2, then the **participant** must comply with the following conditions:

9.1 The **participant** must pay the following costs in a relevant **trading period** for **fast instantaneous reserve** or **sustained instantaneous reserve** (as the case may be) for a set of **grid exit points** approved by the **system operator**:

$$\text{DispCost}_{\text{DISGO}_{y,t}} = 0.5 * Q_{\text{DISGO}_{y,t}} * P_{\text{IRt}} * \text{UFDF}_t$$

Where—

$\text{DispCost}_{\text{DISGO}_{y,t}}$  Is the cost payable by a **participant** in any **trading period**  $t$  in which **fast instantaneous reserve** or **sustained instantaneous reserve** (as the case may be) is procured as a direct result of that **participant's AUFLS waiver** at **grid exit point**  $y$

$P_{\text{IRt}}$  is the **final reserve price** for **fast instantaneous reserve** or **sustained instantaneous reserve** (as the case may be) in **trading period**  $t$  in the relevant **island**

$Q_{\text{DISGO}_{y,t}}$  is the difference between—

- (a) the quantity in **MW** that, in the absence of the **AUFLS waiver** at **grid exit point**  $y$ , the **participant** would have had to provide to comply with the **automatic under-frequency load shedding** requirements in clause 6.1 of **technical code B** of schedule C3; and
- (b) the quantity of **automatic under-frequency load shedding** (including as a result of an **equivalence arrangement**) actually provided by the **distributor** or **grid owner** (as the case may be) in the relevant **trading period**  $t$

$\text{UFDF}_t$  is the under-frequency **dispensation** factor described in rule 7.3.4 of section III of part C for **fast instantaneous reserve** or **sustained instantaneous reserve** (as the case may be), in **trading period**  $t$  in the relevant **island**.

9.2. The **participant** must offer the load subject to an **AUFLS waiver** as **fast instantaneous reserve** under rule 6 of section II of part G. **Interruptible**

load offered as fast instantaneous reserve that is armed to trip but not dispatched will be counted by the system operator as part of the participant's contribution to automatic under frequency load shedding required under clause 6.1 of technical code B of schedule C3.

## 10 Duration of approval

10.1 Approval of an application takes effect from the date specified in the approval.

10.2 Each AUFLS waiver is effective for [2/3] years after the date on which it takes effect or for a shorter period specified by the Board at the time the application is approved.

## 11 Board's decision to be recorded

The Board must keep a register of all AUFLS waivers, available for public inspection free of charge during normal office hours at the offices of the Board and on the Board's website at all reasonable times. The register must state for each AUFLS waiver—

11.1 the name of the participant to whom it is granted; and

11.2 the date it was granted; and

11.3 its duration; and

11.4 the quantity of load subject to the AUFLS waiver; and

11.5 any conditions imposed under clause 8.3.

## 12 Participant must advise change of circumstances

12.1 A participant who has an AUFLS waiver must advise the Board, as soon as practicable after it becomes aware of any change in circumstances which materially affects:

12.1.1 the participant's ability to comply with its obligations to provide AUFLS system under clause 6.1 of technical code B of schedule C3;

12.1.2 the participant's ability to comply with any conditions of its AUFLS waiver.

12.2 A participant must advise the Board as soon as practicable after it becomes aware of the change of circumstances.

## 13 Board may revoke or amend AUFLS waiver

13.1 In accordance with paragraph 2, the **Board** may revoke or amend an **AUFLS waiver** where the **Board** becomes aware of any change of circumstances which materially affects:

13.2.1 the ability of the **participant**, to whom the **AUFLS waiver** was granted, to comply with its obligations to provide **AUFLS** system under clause 6.1 of **technical code B** of schedule C3:

13.2.1.2 the ability of the **participant**, to whom the **AUFLS waiver** was granted to comply with any conditions imposed under clause 8.3.

13.2 In deciding whether to amend or revoke an **AUFLS waiver**, the **Board** must follow the process set out in this schedule, with all necessary modifications.

13.3 If the **Board** amends or revokes an **AUFLS waiver**, the **Board** must—

13.3.1 give the **participant** to whom the **AUFLS waiver** has been granted, [1/2/3] months' notice before the amendment or revocation becomes effective; and

13.3.2 advise the **participant** to whom the **AUFLS waiver** has been granted, of the reasons for its decision to amend or revoke the **AUFLS waiver**; and

13.2.3 **publicise** the amendment or revocation.

(d) **Rule 1 Part A:**

(e) **AUFLS waiver** means a waiver granted by the **Board**, in accordance with schedule C7 of part C to a **participant** from the obligations to provide an **AUFLS** system in accordance with clause 6.1 of **technical code B** of schedule C3 of part C

**“automatic under-frequency load shedding”** and **AUFLS** means automatic shedding of electrical load when frequency falls below preset frequency as specified in **rule-clause** 6.3 of **technical code B** of schedule C3 of part C;