Security and Reliability Council

SRC advice to Authority Board on security of supply

26 April 2012

Notes:
SRC members are welcome to share and discuss the papers with relevant people within their organisations prior to the SRC meeting.

This paper has been prepared for the purpose of SRC discussions. Content should not be interpreted as representing the views or policy of the Electricity Authority.

1 SRC advice to Authority Board on security of supply

1.1 Recommendations

1.1.1 Subject to their discussions on this paper, it is recommended the SRC advise the Authority Board that the SRC:

a) has not identified any security of supply risks that are not already captured by the current security of supply arrangements;

b) notes the 13 December 2011 AUFLS event demonstrated that the short term security of supply policy and operational approach is adequate, but that the actions identified through the review of under-frequency arrangements need to be progressed; and

c) notes and supports the current review of the security of supply forecasting and information policy (SOSFIP) and development of the hydro risk curves so that they improve industry participants' understanding of the potential supply risks.

1.2 The Authority is seeking the advice of the SRC on whether there are security of supply risks and issues that are not captured by the existing policy arrangements

1.2.1 As part of its functions, the Security and Reliability Council (SRC) is tasked with providing the Electricity Authority (Authority) with independent advice on issues relating to security of electricity supply.

1.2.2 The second limb of the Authority's objective is to promote reliable supply. The Authority interprets this as a requirement to exercise its functions in a way that "encourages industry participants to efficiently develop and operate the electricity system to manage security and reliability in ways that minimise total costs whilst being robust to adverse events", for the long-term benefit of consumers.

1.2.3 The Security of Supply framework is a key part of fulfilling this objective. Its purpose is to facilitate the management of security of supply risks that could emerge during an extended dry sequence or could be triggered by a sudden loss of generation or transmission capacity. This is accomplished by:

a) providing participants with high quality information about security of supply risks in order to assist their risk management decisions; and

b) providing for centralised emergency measures if security of supply risks increase to extreme levels.

1.2.4 The SRC has been presented with information on the security of supply policy framework as context for their discussions on security of supply risks and issues. The Authority is seeking the advice of the SRC on whether there are security of supply risks and issues that are either not captured by the existing policy arrangements or not adequately addressed within those arrangements.

1.3 The SRC received background information at its 13 December 2011 meeting

1.3.1 The approach the SRC has been taking to the issues it has considered is to receive and consider relevant information at an initial meeting, and to refine this into its specific advice to the Authority at the subsequent meeting.

1.3.2 At its 13 December 2011 meeting the SRC received presentations and/or papers on the following security of supply matters: [1]

a) 'Managing security of supply risks' – an introduction to the security of supply policy framework that is applied through the Electricity Industry Participation Code (Code);

b) 'Lessons from the Maui pipeline outage' – a presentation from the Gas Industry Company on the gas industry's experience in dealing with a significant gas supply shortage that resulted from the failure of key infrastructure;

c) 'The future if natural gas supply for electricity generation' – a presentation from John Kidd on the long term prognosis for natural gas supply; and

d) 'Security of supply – future scenarios' – a presentation from the system operator on the content of the 2012 Annual Security Assessment (a nine year 'look ahead' of security of supply required under the Code).

1.3.3 In summary, the material covered the policy framework (including a focus on one component of that framework), an example of a security of supply event relevant to the electricity industry and an environmental scan looking at one of the key fuel sources.

1.3.4 In addition, at the special meeting on 28 March 2012 the SRC discussed the 13 December 2011 North Island AUFLS event. This discussion provides some useful insight into how security of supply is managed at the very shortest timescales (i.e. AUFLS provides part of the planned response to large, rare loss of supply events – known as extended contingent events in the Code).

1.4 Timescales for security of supply risk management

1.4.1 The security of supply policy framework in the Code attempts to identify the supply risks across the full range of timescales, from seconds to years, and includes tools for managing those risks if they occur. These arrangements are summarised in Table 1, over.[2]

[1] If you no longer hold copies of this material it is available from the Authority's website at http://www.ea.govt.nz/our-work/advisory-working-groups/src/13Dec11/, or please contact Saltanat Cole at saltanat.cole.ea.govt.nz to request a copy.

[2] Note that this table is intended to only provide a very high level overview of the policy arrangements. There are a number of policy measures that have not been described and the Code itself also goes into much more detail on each of the measures identified.

Table 1 Security of supply risk management framework

Timescale	Policy Approach	Code Response
Seconds to day ahead	Policy Statement requires system operator to identify and plan for contingent and extended events that could affect supply.	Procurement of reserves to manage contingent events and reserves and AUFLS for extended contingent events (that will also respond to any 'other' events).
Days to year ahead	The Security of Supply Forecasting and Information Policy (SOSFIP) sets out how the system operator will provide information on security of supply risks. The hydro risk curves (HRCs) show energy supplies relative to 'critical' levels so that participants can take action according to their own risk management strategies.	The Emergency Management Policy describes how the system operator will respond to supply shortages, and the Code requires the establishment of rolling outage plans for relevant parties in the event of emergency events. Recent Code amendments have put more of an onus on industry participants to take responsibility for responding to security of supply events, and measures such as official conservation campaigns are intended to ensure that participants make appropriate consideration of the potential costs of supply shortages.
One to nine years ahead	The system operator prepares the Annual Security Assessment (ASA) comparing expected energy supplies and generation capacity supplies to the quantities specified in the Code (i.e. the winter energy and capacity margins).	Industry participants can use the information presented in the ASA to determine the need for investment or other action to address potential shortfalls (i.e. investment in new generation capacity).

1.4.2 In addition to these policy arrangements, other market information is available from which security of supply risks might be inferred. For example, the forward price curve for electricity futures contracts provides an indication of perceived security of supply risk in the months and years ahead. Increased trading and/or higher prices might suggest that the risk of shortage is perceived to have increased.

1.4.3 As a reference for the discussions at this meeting, the following information has been included as an appendix:

a) an extract from the Policy Statement, discussing the risk management approach that is currently being applied;

b) the most recent version of the HRCs;

c) a summary of the results of the 2012 ASA; and

d) a chart of the current electricity futures pricing at Benmore.

1.5 Current policy developments

1.5.1 Two aspects of the security of supply arrangements are currently under review: the under-frequency management arrangements for very short term events; and the hydro risk curves.

Short term events – under-frequency management

1.5.2 At the special meeting to consider the 13 December 2011 North Island AUFLS event, the system operator presented some information on the risks associated with an over-procurement of AUFLS. Over-procurement of AUFLS can see the system recover to an over-frequency situation that may cause generator tripping and ultimately cascade failure. This risk of over-procurement had been identified through a review of the under-frequency management (UFM) arrangements that the system operator is carrying out with the Authority. This is one of several issues that the UFM review has identified, including the number and size of the AUFLS blocks and the type of AUFLS relays. The UFM project has also identified the need for a review of the Security Policy, including the identification of the specific risks that the system operator is expected to plan for.

1.5.3 The system operator is expected to be reporting shortly to the Authority on the 'technical' outcomes and recommendations of the UFM project. The Authority and system operator will then work together on appropriate Code amendments. The Authority considers the UFM project to be a high priority project for its 2012/13 work programme.

Near term events – the hydro risk curves

1.5.4 The paper 'Managing security of supply risks' from the 13 December 2012 meeting posed some questions to the SRC about how the HRCs were used, derived and presented. The SRC members confirmed that the HRCs were widely used by purchasers of electricity as part of their own risk assessment processes, but found it difficult to comment on the specific details of the paper as a result of a lack of specific knowledge and expertise in the area.[3]

1.5.5 The Authority has gone on to discuss some of the specific issues and questions with the system operator in more detail, with a view to:

a) increasing the confidence of participants in the information presented in the HRCs and its accuracy;

b) making as much of the information used in the derivation of the HRCs transparent and available to participants; and

c) providing information or tools that will enable participants to make assessments of the potential risks.

[3] Paragraphs 25 and 26 of the draft minutes of meeting.

1.5.6 The system operator is continuing to develop its thinking in this area, and expects to consult on a revision to the SOSFIP with potential changes to the HRCs later this year.

Review of the winter energy and capacity margins and investigation of a summer capacity margin

1.5.7 The Authority is currently undertaking a review of the winter energy and capacity margins that form the reference points for the calculations made in the ASA. It is anticipated that changes will be required as a result of system changes such as the commissioning of Pole 3 of the HVDC link. This work is expected to be completed in the third quarter of 2012, with a consultation process to follow this if changes are found to be required.

1.5.8 The Authority is also investigating whether a summer capacity margin is required, and expects this work to be completed late in the third quarter or early in the fourth quarter of 2012.

1.6 Questions the SRC might like to ask or consider before providing its advice

1.6.1 SRC members might like to consider the possible sources of risk to security of supply that they and their companies have identified and plan for, and the ways in which they manage these risks, and see how these fit within the existing policy framework and the policies themselves, i.e.

a) When considering the highest priority and/or most frequently raised security of supply issues that are discussed within your organisation, are these discussed in context of the security of supply policy arrangements or are these issues managed largely or entirely outside of these arrangements?

b) Are there industry-wide or specific risks that are missing, or that might not be captured within the current arrangements (this might see participants dealing with these risks individually, when a coordinated response might be possible)?

c) Are you confident in the communications around security of supply within your company, within the industry and to stakeholders?

d) Thinking of your own business or interests, is there information that you seek or use outside of this policy framework (or in addition to it) to give you the necessary level of comfort or assurance?

Appendix A Extract from the Policy Statement

A.1 From Chapter 1 – Security Policy

A.1.1 The Security Policy describes the processes and policies the system operator will apply to identifying events, assessing the risk of occurrence of those events in advance, categorising those event risks and managing these defined events on the power system in real time in order to achieve the principal performance obligations.

A.1.2 The Code requires the system operator to identify and review the credible events that may result in cascade failure. The most recent review of these events was completed in 2009, and it is this review that has informed the events discussed in the Security Policy. The credible event reviews are required to be undertaken at least every 5 years.

A.1.3 Clause 12.3 describes contingent and extended contingent events as follows:

- "***Contingent events:*** *Events where the impact, probability of occurrence and estimated cost and benefits of mitigation are considered to justify implementing policies that are intended to be incorporated into the scheduling and dispatch processes pre-event.*
- ***Extended contingent events:*** *Events for which the impact, probability, cost and benefits are not considered to justify the controls required to totally avoid demand shedding and maintain the quality limits defined for contingent events.*"

A.1.4 The following credible events have been classified as contingent or extended contingent events in the Security Policy:

12.4 Categorising, at the date of this **policy statement** the following credible events:

Contingent events:

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.

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. The **system operator** will display on its website a range of environmental or system conditions that it considers may create a high likelihood of occurrence of simultaneous loss of both circuits (but this list may not be exhaustive and will not limit the definition of the **contingent event**).

f) The loss of reactive injections, both when provided as an **ancillary service** or when available from transmission assets.

g) The loss of the largest possible load block as a result of paragraphs a) to f) above for each **island**.

Extended contingent events:

a) The sudden loss of the **HVDC link** bipole.

b) Any of the following as **notified** by the **system operator** in accordance with clause 12.6:

- The loss of a 220 kV **interconnecting transformer**:
- The loss of a 220kV or 110kV busbar:
- The loss of a 66kV busbar directly connected to the **core grid**.

A.1.5 Five further events were classified as "other events", i.e. (also from 12.3):

- "***Other events**: Events which are considered to be uncommon and for which the impact, probability of occurrence and estimated cost and benefits do not justify implementing available controls, or for which no feasible controls exist or have been identified, other than unplanned demand shedding, AUFLS and other emergency procedures or restoration measures.* "

A.1.6 These events were (also from 12.4):

Other events:

a) The loss of a 66kV busbar not connected to the **core grid**.

b) The loss of a 110kV interconnecting transformer.

c) The loss of both **transmission circuits** of a double circuit line.

d) The simultaneous loss of two or more of any of the components in clause 12.1.1.

e) The close consecutive loss of two or more of any of the components in clause 12.1.1. [4]

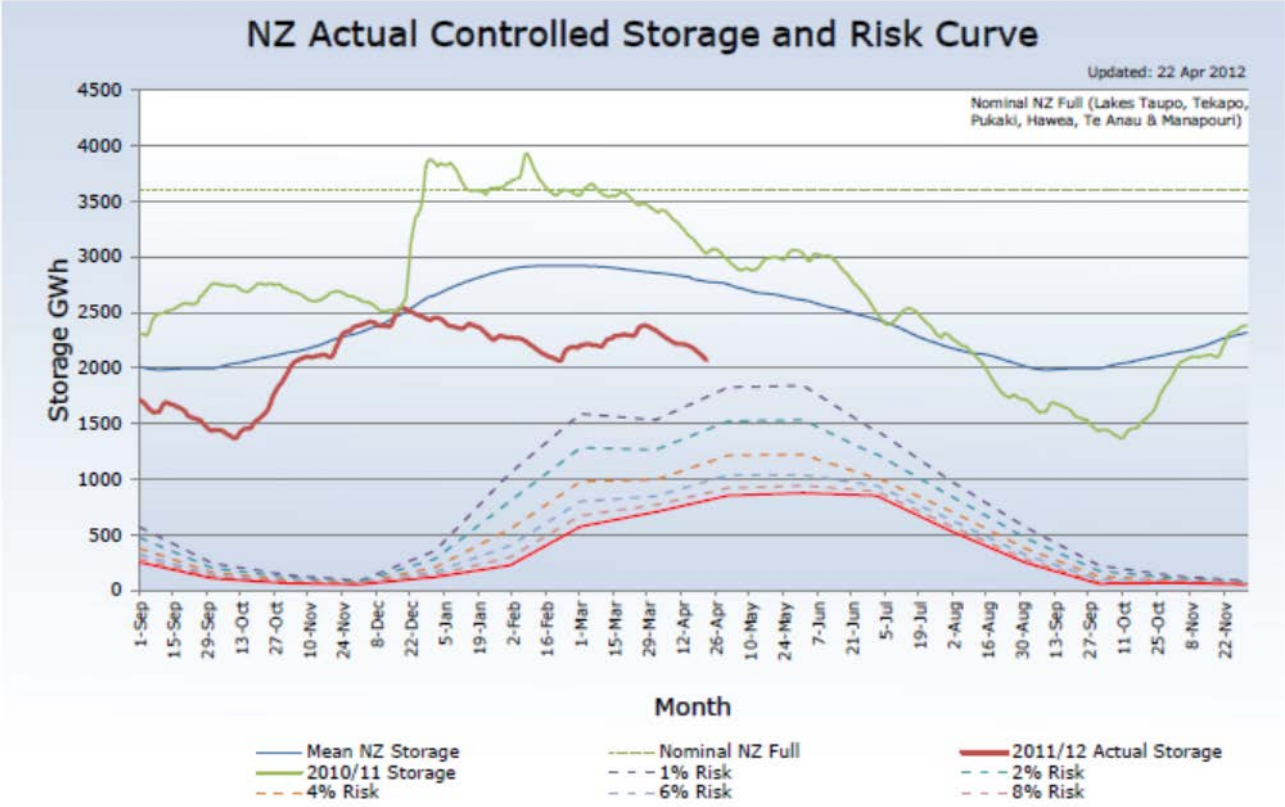
[4] The components identified in 12.1.1 include generating units, transmission circuits, the poles of the HVDC link, interconnecting transformers, busbars, large loads or load blocks and reactive injections.

Appendix B Latest version of the hydro risk curves

B.1 Hydro risk curves as at 22 April 2012

B.1.1 The hydro risk curves, together with an explanation of how they are developed and the relevant input assumptions are available at: http://www.systemoperator.co.nz/hydro-status

B.1.2 The New Zealand and South Island curves are attached below:



Appendix C Extract from 2012 Annual Security Assessment

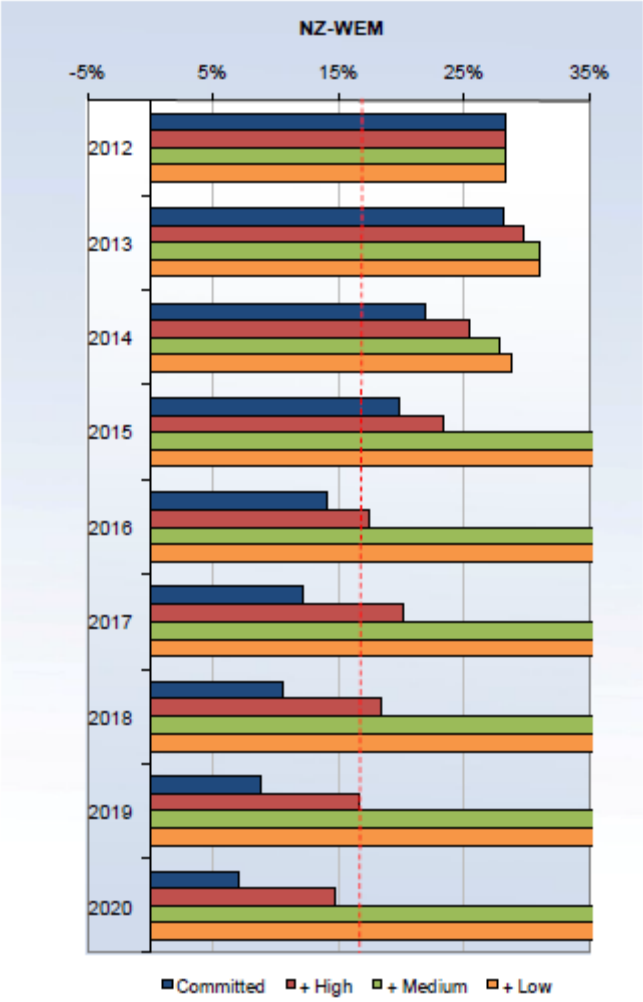
C.1 Winter Energy Margin

C.1.1 The 2012 Annual Security Assessment (ASA) is available at http://www.systemoperator.co.nz/sos-reporting

C.1.2 The New Zealand winter energy margin (NZ-WEM) is the difference between the expected amount of energy that can be supplied and the expected demand during the period 1 April to 30 September, expressed as a percentage of expected demand. The ASA assesses the actual margin against the standard of 17%, as per clause 7.3 of the Code. A standard of 30% is also applied specifically for the South Island, but only the assessment of the New Zealand margin is shown below.

C.1.3 The base case projection of NZ-WEM from the ASA is:[5]

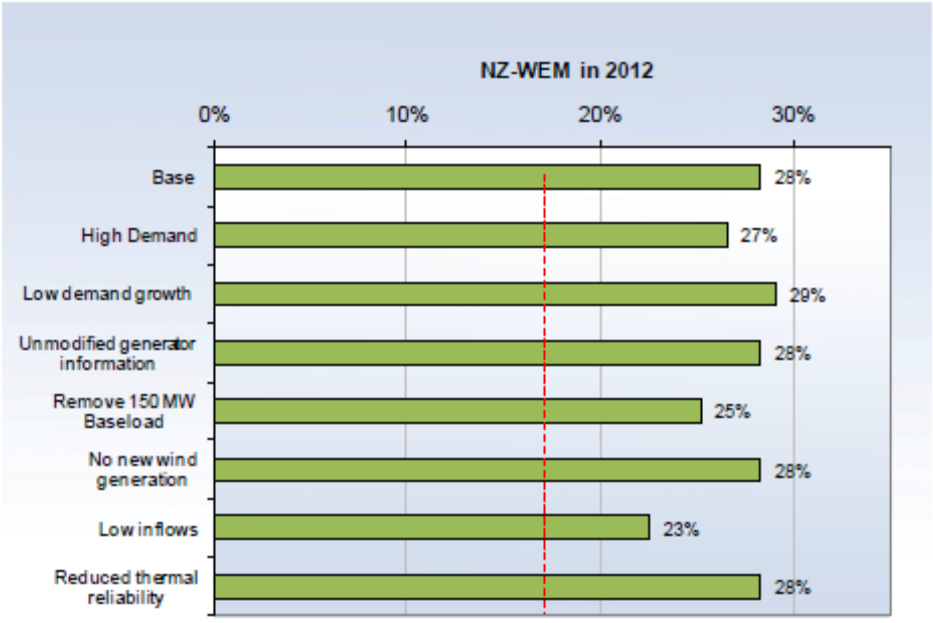
Figure 1 Base-case projection of NZ-WEM



[5] "Committed" means projects for which the investment decision has been publicly confirmed, with "high", "medium" and "low" being projects that have been announced but not confirmed, and where a judgement has been made regarding the chances of the project proceeding.

C.1.4 A sensitivity analysis has also been completed considering potential alternative scenarios for supply and demand in 2012:[6]

Figure 2 Sensitivity projection for NZ-WEM for 2012

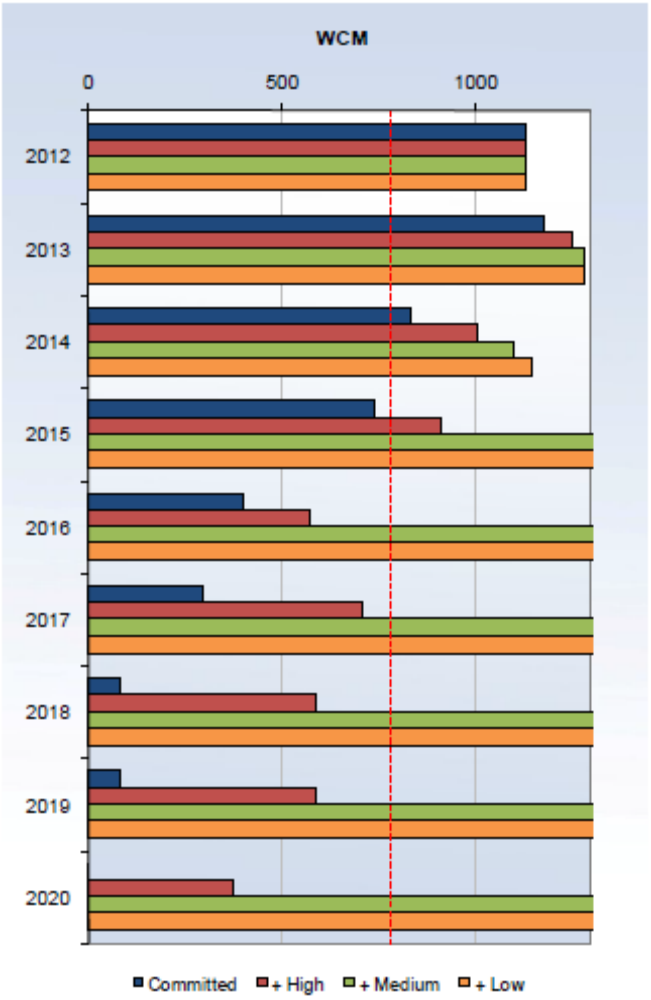


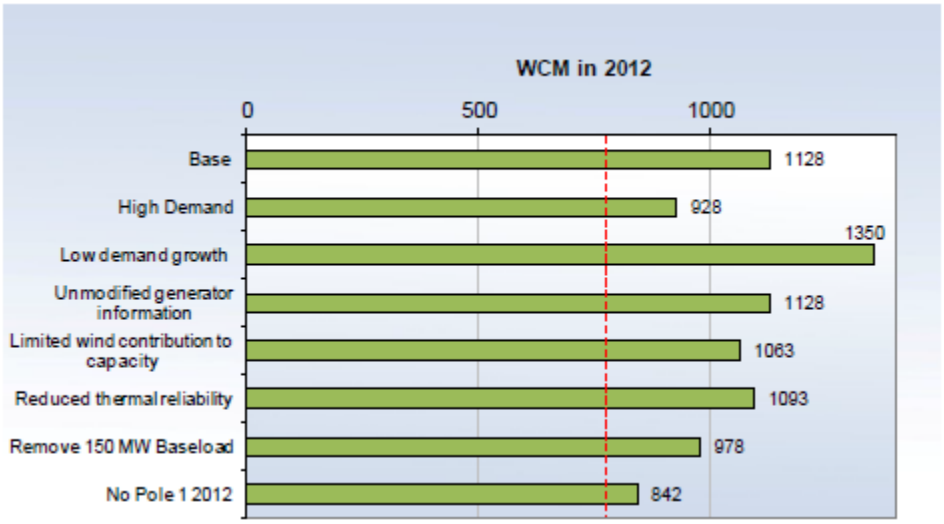
C.2 Winter capacity margin

C.2.1 The winter capacity margin (WCM) is the difference between a measure of expected generation capacity and expected demand from 1 April to 31 October between 7am and 10pm, expressed as a MW margin over demand. The ASA assesses the actual margin against a standard of 780 MW for the North Island. The system operator also investigates a range of scenarios for generation and demand. The margin calculation and scenario for analysis for 2012 are included below:

[6] These scenarios are also run looking out to 2013, 2014 and 2016.

Figure 3 Winter capacity margin and scenario analysis from the 2012 ASA



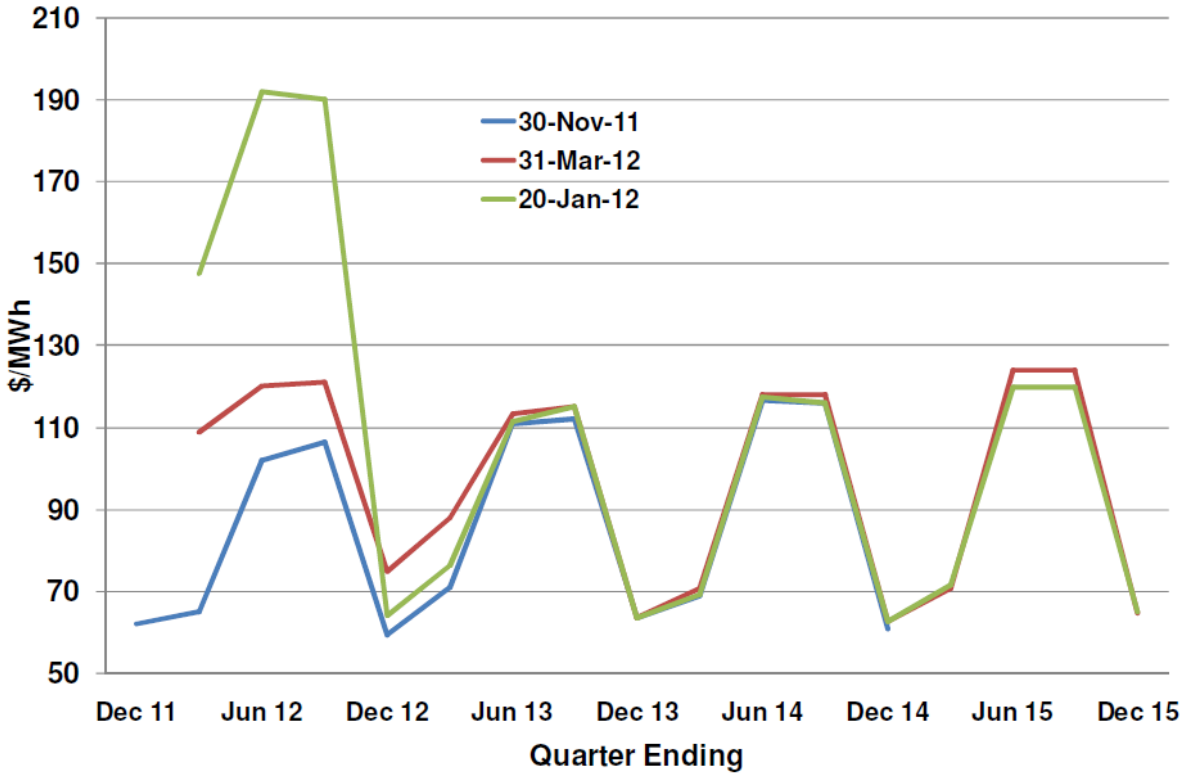


Appendix D Electricity forward price curve

D.1.1 The Authority has been pursuing a number of market facilitation measures to strengthen the hedge market. Strengthening the hedge market is intended to provide greater transparency and more confidence in the electricity forward price curve, and allow retailers and consumers to manage electricity purchasing risk more effectively. The forward price curve provides an indication of perceived energy supply risk.

D.1.2 In its recent information paper 'Hedge Market Performance Update' (19 April 2012)[7] the Authority presented the following forward price curve for electricity futures contracts traded through ASX since November 2011:

Figure 4 ASX Benmore Forward Price Curve since November 2011



D.1.3 The paper suggested that the curve has changed since November 2011 in response to the changing hydro situation, and that it appeared that the market had been responding to concerns over the immediate year's hydro storage situation, but that this was not impacting the market's view of what might occur in following years.

D.1.4 The Authority is now providing weekly updates of hedge market activity, including this forward price curve, via its website.[8]

[7] This information paper is available at http://www.ea.govt.nz/our-work/programmes/market/hedge-market-development/

[8] See http://www.ea.govt.nz/industry/market/statistics-reports/nz-electricity-hedge-contracts/