Security of Supply Review
Issues Paper

Relevant Issues and Questions to Facilitate Information Gathering

December
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Table of Contents

1 Introduction

Sections 172O(1)(d) and (j) of the Electricity Act (1992) (Act) state the Electricity Commission's (Commission) functions with respect to security of supply, namely to:

> *use reasonable endeavours to ensure security of supply (including contracting for reserve energy), without assuming any reduction in demand from emergency conservation campaigns, while minimising distortions to the normal operation of the market…*
>
> *give effect to GPS objectives and outcomes…*

The Government Policy Statement on Electricity Governance (GPS), issued by the Ministry of Economic Development (MED), provides further guidance to the Commission on security of supply objectives and how those objectives are to be achieved. The reserve energy regime (Regime) is set out in paragraphs 35 to 67 of the GPS.[1]

To achieve the security of supply objectives of the Act and, in particular, meet the requirements of the Regime, the Commission has developed and implemented the security of supply policy (Policy).[2] The Regime set out in the GPS requires that an independent review of the Regime and the Policy (jointly referred to as reserve energy arrangements) be undertaken. Castalia has been engaged to undertake the review.

Given the review's close relevance to energy-related matters, the review was delayed to ensure it dovetails with the ongoing work being carried out by the MED on the New Zealand Energy Strategy (NZES). Although the review is a separate work stream, issues covered by the review may contribute to NZES work streams.

This review will examine the reserve energy arrangements currently in place, evaluate their efficiency and effectiveness with respect to meeting security of supply objectives while minimising market distortions, and recommend how the current arrangements can be improved. Although the review will need to be undertaken within the context of the Commission's broader work on security of supply, the review is specifically focused on the role of reserve energy in helping ensure security of supply.

The review is intended to be an interactive process, with extensive participation from stakeholders. The purpose of this paper is to set out what Castalia considers to be the key high-level issues relating to the current reserve energy arrangements and to invite initial stakeholder feedback on these issues, as well as any others that may be relevant. This paper will be used to facilitate the interview and information gathering process over the next two months, prior to the preparation of a more extensive consultation paper to be released at the end of February 2007.

[1] http://www.med.govt.nz/templates/MultipageDocumentPage____23103.aspx#A4, October 2006

[2] http://www.electricitycommission.govt.nz/pdfs/opdev/secsupply/policy/Initial-SOS-Policy.pdf

2 Key Issues for Discussion

In our view, the key issues for this review are focused in three main areas:

- What is an optimal definition of security of supply?
- What role should reserve energy play in helping ensure security of supply?
- How can optimal reserve energy arrangements be defined to ensure that reserve energy fulfils its designated role?

2.1 Definition of Security of Supply

The Act does not define security of supply. However a definition is provided in paragraph 36 of the GPS:

> *Key components of security of supply are that:*
>
> *- Sufficient generation capacity is built or energy efficiency improvements made to meet ongoing demand growth*
>
> *- Hydro and thermal generating capacity and fuels are appropriately managed, to deal with the risks of extended dry hydro periods better than we have in the past*
>
> *- The system has sufficient reserve energy (plant and fuel, or contracted demand response) to cope with extreme dry sequences or other unexpected supply disruptions*
>
> *- The national grid and distribution lines meet specified reliability objectives.*

Whilst the full definition is contextually relevant to the review, it seems clear that the reserve energy arrangements are focused on achieving the third bullet point of the definition. This is discussed in more detail in the next section.

Paragraph 37 of the GPS further specifies the security of supply objective for the Commission:

> *A function of the Electricity Commission under the Electricity Act 1992 is to use reasonable endeavours to ensure security of supply, without assuming any demand reduction from emergency conservation campaigns, while minimising distortions to the normal operation of the electricity market. In particular, the Government wants the Commission to use reasonable endeavours to ensure security of supply in a 1 in 60 dry year. The Commission should also work with stakeholders to identify industry contingencies and develop strategies consistent with the operation of the electricity market to achieve its security of supply objectives.*

Box 2.1: Discussion Questions

1. Can the GPS paragraph 36 *definition* of security of supply be refined? What alternative definitions of security of supply do you prefer? What are the essential elements of the definition? For example, the PA Consulting Report (3.3) defined it as "…having sufficient generation capacity (GWh) to meet demand over a certain time period with specified probability".
2. What is an appropriate time period over which security of supply should be defined for the purpose of procuring and dispatching reserve generation?
3. Can the Commission's security of supply *objective*, as defined in GPS paragraph 37, be refined? If so, how?
4. How should the term "reasonable endeavours" be interpreted?

2.2 Role of Reserve Energy

The current role of reserve energy is defined mainly in the GPS, though the Act does prescribe contracting for reserve energy as one of the tools the Commission should use to ensure security of supply. The role of reserve energy described in the GPS[3] focuses mainly on the need for reserve energy to provide security of supply "beyond the level achieved by the ordinary market", to manage the hydrological risk of an unusually dry year.

The need to manage hydrological risk is defined as the main criterion to procure additional reserve energy. Paragraph 37 of the GPS requires the Commission to "use reasonable endeavours to ensure security of supply in a 1 in 60 dry year", and paragraph 40 specifies that "the need for additional reserve energy should be based on dry year risk taking into account prudent assumptions about availability of other plant".

Once procured, however, the GPS requires the Commission to also make reserve energy available to help cope with other unexpected supply contingencies. This is inherent in the third bullet of the security of supply definition (quoted in section 2.1) and is also clearly signalled in paragraph 47, which summarises the current role of reserve energy:

> *The Government wants the Electricity Commission to contract for reserve energy (generation and contracted demand response) to provide additional security of supply beyond the level achieved by the ordinary market. This will be a primary mechanism for the Commission in endeavouring to ensure security of supply in a 1 in 60 dry year. Any reserve energy procured to ensure security of supply in a 1 in 60 dry year should also be available to help cope with other unexpected supply contingencies, such as serious grid, plant or fuel supply disruptions.*

The GPS also tightly ring-fences the use of reserve energy to minimise impacts on the market. Paragraph 56 states:

> *The Commission should seek to minimise the impacts of the reserve energy scheme on the 'ordinary' market. The Commission should adopt a tight ring-fence whereby reserve energy may be used only for security of supply objectives, with the exception of distributed generation used for distribution network load management[10]. This will minimise the extent to which incentives to invest in ordinary generation and demand-side management are affected.*

The current role of reserve energy can therefore be summarised as:

- To ensure security of supply is achieved in a 1 in 60 dry year, by providing more capacity than would be economically provided by the ordinary market (primary role)
- If already procured for the primary purpose, to be available to help cope with other unexpected supply contingencies (secondary role)
- To be operated in such a way as to minimise any impact on the market.

[3] GPS Paragraph 47

Box 2.2: Discussion Questions

5. Is the role currently defined for reserve energy appropriate and durable? In particular, should managing dry year risk be the primary role of reserve energy? What alternative roles could reserve energy play?
6. Is it necessary to provide additional security of supply beyond the level achieved by the ordinary market, or can the market be relied on to ensure sufficient security? If it is necessary, how should the additional requirement be determined?
7. Is it appropriate that the role of reserve energy should be ring-fenced to minimise impact on the market? Do you consider that the ring fencing arrangements are adequate for the purpose?
8. Should reserve energy help ensure the desired level of security of supply at any cost, or should some form of cost-benefit analysis be undertaken? How should the benefit of additional security of supply created by reserve energy be weighed up against the cost of providing the reserve energy?

2.3 Reserve Generation Arrangements

This section takes the working assumption that the current approach to reserve energy (having the Commission contract for reserve energy) is optimal. The section then deals with the detailed arrangements that are currently in place to ensure reserve energy fulfils its role and how the current arrangements can be improved.

2.3.1 The 1 in 60 dry year requirement

The GPS requires that the Commission should ensure security of supply in a 1 in 60 dry year, without the need for emergency conservation campaigns. However, the GPS does not define what a "1 in 60 dry year" is. The Commission's interpretation of the GPS requirement is set out in section 1 of the Policy:

> *Expected Supply under a sixty year return period drought (of any duration) will be sufficient to meet Expected Demand without the need for emergency intervention…*

Expected Supply is currently derived by the Commission using all available annual inflow sequences from historical inflow data. The Policy intends that 1 in 60 inflow sequences be derived from historical data using statistical methods, and this is being investigated by the Commission.

Box 2.3: Discussion Questions

9. Do you consider that the form of the 1 in 60 dry year security of supply requirement is appropriate for New Zealand? Is there a better alternative way to define the security of supply requirement for the purpose of procuring and dispatching reserve energy?
10. Do you consider the 1 in 60 dry year security of supply requirement to be of an appropriate level—if not, what do you consider to be an appropriate level for the security of supply requirement for New Zealand?
11. Does the 1 in 60 requirement need to be supplemented by another requirement that relates to non hydrological risks?
12. Do you consider that historical inflow sequences should continue to be used to derive expected supply, or should statistical methods be used? If the former, is it appropriate to use all of the 75 available sequences, as is currently done by the Commission, or is this approach too conservative?

2.3.2 The Minzone

Paragraphs 43 to 45 of the GPS require the Commission to develop and publish a Minimum Zone (Minzone) and Emergency Zone:

> *To help ensure security of supply, the Electricity Commission should develop and publish a minimum hydro zone giving its estimate of minimum hydro storage levels required at different times of the year to avoid the risk of shortages in a 1 in 60 dry year…*
>
> *Within this minimum zone, the Electricity Commission should have a second zone that would trigger a conservation campaign, on the basis that there is a significant probability that we are in a worse than 1 in 60 dry year event.*

The Commission has developed its Minzone, and the approach to this is set out in the Policy. The analysis involves calculating the amount of hydro storage required to sustain a 1 in 60 low inflow sequence with all non-hydro supply fully committed. This approach assumes that, if storage falls to the Minzone, all thermal plant will be operating at maximum capacity to reduce water usage for hydro generation and that price increases (as a result of the potential for shortage) will produce a demand reduction of 2 percent.

The approach accounts for planned and random outage factors, as well as the impact of transmission and fuel delivery constraints. The second zone, referred to as the Emergency Zone, is set at a level consistent with a 10 percent risk of shortage (consistent with a cost of emergency measures of $2/kWh.)

The Minzone analysis is a forward looking approach that examines the possible future outcomes from the point in time at which the Minzone has been reached. Before the Minzone is reached the analysis does not provide a probability of reaching the Minzone at any point in the future, which would require detailed assumptions about the market behaviour of participants.

Box 2.4: Discussion Questions

13. Do you consider the Minzone/Emergency Zone approach to be the best way to quantify the 1 in 60 dry year requirement?
14. Is it reasonable to assume that when the Minzone is reached all thermal plants will be operating at maximum capacity?
15. What do you think the Commission should do if not all thermal plants are operating at maximum once the Minzone is breached?
16. Is it reasonable to assume that by the time the Minzone is reached, prices will have risen, resulting in a 2% reduction in demand? If not, what price-induced demand response (if any) should be assumed?
17. Should the Minzone analysis seek to provide a probability of reaching the Minzone? If so, how could this be achieved?

2.3.3 Reserve energy information

Both the Act and the GPS require the Commission to minimise market distortion from the procurement and use of reserve energy. The GPS and the Policy address this point by limiting the quantity of reserve energy that may be procured, as well as the timing for such procurement.

In addition, the Commission's Policy also provides for a "strong focus on providing information and analysis of supply and demand and security of supply, in order to

maximise the opportunity for market participants to manage security of supply risks". The Policy provides for the publication of:

- Short-term assessments of the security margin for 2, 4 and 6 months ahead
- A two-year forecast of the 1 in 60 Minzone
- A long-term (10 year) forecast of the winter energy margin.

Currently only the two-year and the long term forecasts are published, though work is underway on the short-term security assessments. The Commission also publishes and updates a "risk meter" pie chart on its website. The intent of the publications is to provide participants with relevant information and encourage them to manage security of supply by making timely investments and thus avoiding the need for reserve energy procurement and dispatch.

The underlying analysis for the publications relies to large degree on information that is voluntarily made available by market participants (such as information on plant availability, fuel stockpiles levels and upcoming generation build). The information is currently not adjusted for any possible bias of the parties providing it.

Box 2.5: Discussion Questions

18. Do you find the Commission's publications helpful? How can the existing publications be improved?
19. Do you think that the timeframes covered by the publications are appropriate?
20. Is it appropriate for the Commission to base its analysis on information provided voluntarily by market participants? If so, can the information be adjusted for any possible bias and, if so, how?
21. If the Commission was to provide additional information to the market, would this help manage or address the concerns about security of supply raised by some stakeholders in the first half of 2006 when storage was nearing the Minzone? If so, what information should be provided for this purpose and how would it help address those concerns?
22. Do you think the Commission's publications, the limit on the amount of reserve energy that can be procured, and the commitment to delaying any procurement decisions as long as possible help minimise market distortion?

2.3.4 Procurement of additional reserve energy

Section 2 of the Policy commits the Commission to delaying the procurement of additional reserve energy for as long as possible, in order to maximise opportunities for market-led investment:

> *If insufficient new generation or demand side initiatives are forthcoming then additional Reserve Energy may be required to be contracted. The decision to contract will be delayed as long as possible in order to provide as much opportunity for other solutions to be implemented and to reduce the possibility of redundant Reserve Energy.*

The GPS does not mandate a trigger for procurement of reserve energy, but rather requires that the Commission develop and publish its processes for procuring reserve energy (paragraph 55). Nor does the Commission's Policy define a precise trigger that would activate the procurement of additional reserve energy. Sections 7-10 of the Policy state:

7 The Commission will forecast the Minzone over a two year timeframe and will use a trigger for the purchase of additional Reserve Energy based on the top of the Minzone exceeding a particular trigger storage level. The trigger storage level will be set according to an approach that involves assessing a trade-off between the cost of Reserve Energy and the cost of spill. This would involve establishing a trigger level below 100% storage at the top of the Minzone.

8 The Commission intends to undertake additional work on the precise trigger to be used for determining the need to purchase Reserve Energy.

9 For the initial security of supply policy, the Commission will not adopt a precise trigger for the purchase of Reserve Energy, pending the completion of the additional work.

Price effects consideration

When deciding whether additional reserve energy should be procured in 2005 and 2006, the Commission considered a "needs analysis" carried out by Concept Consulting,[4] as well as input from Commission staff, the Security Advisory Group and submissions from interested parties. The analysis carried out by Concept Consulting considers the physical capability of the system to maintain security of supply during a 1 in 60 dry year. The analysis does not take into account price effects resulting from storage nearing or entering the Minzone.

In the first half of 2006 storage neared the Minzone. Despite the Commission's analysis showing that the system was physically capable of ensuring security of supply, even if 2006 were to become a 1 in 60 dry year, spot prices rose significantly, potentially severely impacting individual market participants. At the time, some industry commentators suggested that the Commission should also factor the risk of high spot prices into the derivation of the minzone and, therefore, the decision process for the procurement and dispatch of reserve energy.

The reserve energy portfolio cap

Paragraph 49 of the GPS, limits the Commission's reserve energy portfolio to being capable of producing no more than 1200 GWh in any given 4 month period. Paragraph 50 sets out that the reason for this restriction:

…to ensure market participants have certainty as to the maximum role of the Electricity Commission in providing for reserve energy, and to minimise the risk of reserve energy affecting incentives for market participants to construct new capacity, enter into hedge and other contracts, and invest in demand-side management.

[4] "2006 Reserve Energy Needs Analysis", Concept Consulting Group, November 2004. http://www.electricitycommission.govt.nz/pdfs/opdev/secsupply/pdfsconsultation/consultation-2006-assessment-report.pdf

Box 2.6: Discussion Questions

23. Do you agree with the Commission's approach to delaying investment in reserve energy for as long as possible? What alternative approaches would you prefer?
24. At a principle level, do you agree with the Commission's approach to triggering the procurement of additional reserve energy? What alternative approaches could be used?
25. Should the trigger for reserve energy procurement include a consideration of price risks as well as the physical capability of the power system to attain the desired level of security? If so, how should it be defined? How should the quantity of reserve energy to be procured be determined?
26. Is it appropriate to have a GWh restriction on the amount of reserve energy the Commission can procure in any given time period? Is the current restriction set at an appropriate level?
27. Do you consider that the effect of procuring reserve energy on the 'ordinary' market is significant? If so, please provide evidence of this.
28. What alternative ways are there of reducing or mitigating any market distortion caused by procurement (and operation) of reserve energy?

2.3.5 Dispatch of reserve energy

Sections 11 to 13 of the Policy set out the approach the Commission will use to decide on the dispatch of reserve energy and the price at which it will be offered:

> *11 Reserve Energy contracts will normally be offered for dispatch at the higher of 20c/kWh or the variable cost of each Reserve Energy option…*
>
> *12 When storage falls below the Minzone, Reserve Energy is expected to be dispatched at security guidelines derived for different levels of Reserve Energy variable cost (accounting appropriately for start up costs and the like).*
>
> *13 Reserve Energy is expected to be withdrawn when storage rises above the security guideline appropriate to the Reserve Energy option.*

The Electricity Commission has a contract to procure energy from the Whirinaki oil-fired power station with a rated capacity of 155MW. The offer strategy for the plant stipulates that, in times when the Minzone has been breached, Whirinaki will be offered to the system operator at 20c/kWh or the contracted price, whichever is higher. In exceptional circumstances, the reserve energy can be offered at a lower price to preserve hydro storage. The reserve energy will continue to be offered at 20c/kWh until hydro storage is 25GWh above the Minzone. If the average price at the Whirinaki node exceeds 20c/kWh for the next four hours (eight trading periods), the reserve energy from the plant will be offered at 20c/kWh. In all other cases, the Whirinaki power station will be offered at $1/kWh.

Box 2.7: Discussion Questions

29. Is the Commission's general approach to dispatching reserve energy, as set out in the Policy, appropriate?
30. Should the Minzone analysis be used as a basis for triggering the dispatch of reserve energy?
31. Is the Whirinaki power station offer strategy appropriate?
32. Do you consider that the operation of the Whirinaki power station creates market distortion and, if so, in what way? How can such market distortion be minimised?

2.3.6 Levy arrangements

Paragraphs 62 and 63 of the GPS provide for the Commission to recover the net cost incurred to contract for reserve energy—operating and capital payments less any revenue received from the sale of reserve energy—through a levy. The GPS requires the levy to be one that is "…administratively simple and applies to all consumers based on wholesale purchases on an equal basis…"

Paragraph 66 of the GPS states that the review should

> *"…recommend whether alternative levy arrangements would produce a fairer and more efficient outcome. In particular, it should investigate whether to allow for some element of self-provision of security of supply with an associated exemption from the levy, and if so whether the extent of any self-provision should be audited by a body independent of the Commission."*

Box 2.8:

33. Are the levy arrangements currently in place optimal? What alternative arrangements could be put in place?
34. Should an exemption be provided for in the levy, allowing for some element of self-provision of security of supply? If so, should the extent of self provision be audited by the Commission or an independent body?
35. One means of "self-provision" of security of supply would be through hedging. If you agree that self-provision should be allowed for, what is your preferred approach?

2.3.7 Conflicts of interest

Paragraph 46 of the GPS requires the Commission to put in place and publish protocols to manage conflicts of interest resulting from its role as a regulator and a market participant. The Commission's protocols are set out in Section 16 of the Policy:

> *The Commission's conflict of interest will be addressed by the publication (and transparent compliance with) clearly articulated security of supply policies. These policies will provide for:*
>
> - *Key details of Reserve Energy contracts to be published including how and when the contracts will be triggered relative to spot prices and published security guidelines.*
> - *Reserve Energy to be offered into the market along the same lines as normal supply and interruptible load.*
> - *Reserve Energy contracts to be settled by the Clearing Manager.*

- *Ex-post publication of reserve energy triggers, offers and use.*
- *Investigations of any compliance issues relating to reserve energy contracts directly by the Rulings Panel rather than the Board…*

Box 2.9: Discussion Questions

36. Do you consider that the current conflicts of interest protocols are sufficient to manage the Commission's conflicts of interest? How can the protocols be improved?

2.4 Alternative Arrangements

The current arrangements specify that the Commission should contract for reserve energy when needed. However, this is only one of many valid methods used internationally to ensure adequate reserve energy margins.

Some of the alternative security of supply arrangements that were suggested in past submissions include:

- Requirements for fuel stockpiles for thermal plants or commission-held fuel stockpiles
- Draining lakes below minimum levels rather than using rationing or load shedding
- Preventing premature decommissioning of older power plants
- Capacity payment mechanisms
- Energy payment mechanisms
- Development mechanisms
- Increased demand side response through (for example) a day ahead market to encourage demand side response
- Nodal price risk management instruments
- Forward contracts and hedges.

Box 2.10: Discussion Questions

37. Is it necessary to provide security of supply beyond the level achieved by the market, or can the market be relied on to deliver sufficient security of supply?
38. If it is necessary, is it optimal for the Commission to contract for reserve energy or should other options be considered?
39. If you have suggested an alternative, how does it ensure security of supply while minimising market distortion? Should it replace the current arrangements or should the two be integrated?

3 Next Steps

Feedback on this paper is welcomed in written and/or oral form. Written comments should be provided by 12 January 2007. For Written comments, electronic responses are preferred and should be emailed to anton.murashev@castalia.fr. Hardcopy responses can be mailed to:

Anton Murashev
Manager
Castalia Ltd
PO Box 10225
Wellington

Castalia will be conducting interviews, either in person or by phone conference, with market participants and any other stakeholders that wish to contribute their views. Interviews will take place between 18 December 2006 and 15 January 2007. We will be contacting market participants shortly. Interested parties that are not market participants, but would like to be interviewed, should contact Anton Murashev (04 913 2823, anton.murashev@castalia.fr)

Following this first round of consultation, Castalia will prepare a detailed consultation paper, scheduled for release at the end of February 2007. The consultation on that paper will provide a more extensive opportunity to comment on the issues outlined in this paper and any other issues that arise out of the interviewing and information gathering phase of the review. The consultation will include submissions and a public hearing. Castalia will then publish its final report in mid-April 2006.

T +1 (202) 466-6790
F +1 (202) 466-6797
1700 K Street NW Suite 450
WASHINGTON DC 20006
United States of America

T: +64 (4) 913 2800
F: +64 (4) 913 2808
Level 2, 88 The Terrace
PO Box 10-225
WELLINGTON
New Zealand

T +33 (1) 45 27 24 55
F +33 (1) 45 20 17 69
7 Rue Claude Chahu
PARIS 75116
France

---------- www.castalia.fr