

# History of electricity security in New Zealand

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1. The history of security of supply in New Zealand is also relevant to our analysis. It provides further context against we can view the current regime. This Appendix sets out a neutral summary of the history of security of supply in the electricity industry since the early 1900s.

## **Until 1988: Pre-corporatisation**

### *Industry structure*

2. Apart from some early projects in the late 1800s, the New Zealand electricity system was developed by local authorities and central government. In 1918, power boards or local councils became exclusively responsible for local distribution networks and electricity supply within their respective network areas. Central government was responsible for developing large scale generation and the transmission system.
3. Culy points out<sup>1</sup> that “[d]uring most of this period, the electricity sector was structured as a combination of national and regional statutory monopolies with public ownership and control at both the state and local level. At the local level, control was exercised by councils and publicly elected boards. At the State level, control was exercised through the normal departmental procedures that were characterised by very rigid constraints, centralised bureaucratic systems, mixed objectives and lack of effective delegation and accountability”. Licences from the Minister were required to generate and sell electricity.
4. “The Minister of Electricity or Energy was directly responsible for approving wholesale tariffs<sup>2</sup>, and all investments of any significant size were approved by the Cabinet Works Committee. Short term political and fiscal factors, both national and regional, played a significant, if not dominant, role in pricing and investment decision making. The nature of the decision making and accountability systems meant that little attention was paid to risk assessment, monitoring and control of investment projects”<sup>3</sup>.

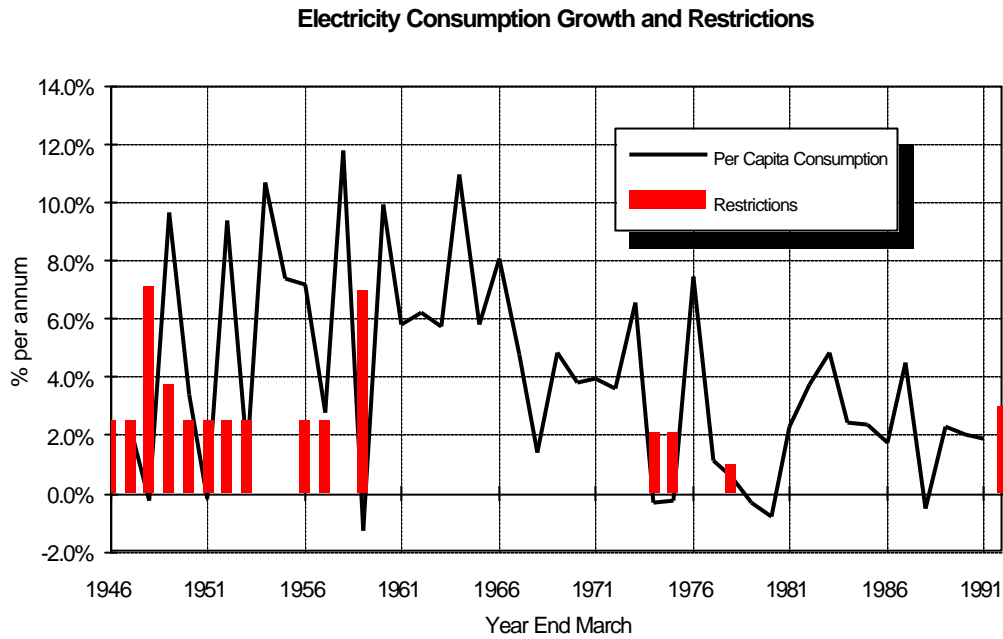
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<sup>1</sup> Culy (1992) at section 4.1

<sup>2</sup> And retail tariffs since these were under price control until the 1980s.

*Security of supply*

5. Security of supply during this period was variable. As shown in the following figure<sup>4</sup>, 10 significant shortage events occurred between 1946 and 1988.



6. In the figure above, the height of the column represents the relative extent of the restrictions in terms of depth and duration. The impact of the restrictions on consumption is approximately indicated by the dips in the annual growth in per capita consumption of electricity.
7. The nature of each shortage event is described below:

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<sup>3</sup> Culy (1992) at section 4.1

<sup>4</sup> From Culy (1992)

<b>Period</b>	<b>Issue</b>
1942	Use of space heaters and radiators prohibited during peak hours between May and August in the North Island
1943	Space heating was controlled further, and so too were indoor and outdoor lighting
1946	20% power cuts imposed in the North Island
1947	30% power cuts imposed in the South Island
1958	A 15% cut was imposed in the North Island
1973	Supply authorities were requested to save up to 6%. Broadcasting hours were reduced, ripple control was increased and in some areas there were daily blackouts.
1974, 1975, 1976, 1977	Government requested "voluntary" savings

Source: Appendix 3, Report of the Electricity Shortage Review Committee 1992

### **1988 to 1996: ECNZ pre-market**

#### *Industry structure*

8. In 1988, the Electricity Division of the Ministry of Energy was corporatised to form the Electricity Corporation of New Zealand (ECNZ). It was established with over 95% of the generation and full control of the bulk transmission network, but without a legal duty to supply electricity.
9. The power boards and municipal electricity departments of local councils were corporatised in 1992, with a legal duty to continue to provide line services<sup>5</sup>, but not energy. All retail franchise areas were removed by 1994. By a shareholding Minister's direction under the SOE Act 1986, ECNZ was prohibited from acquiring any significant share in any electricity supply authority (now energy company).

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<sup>5</sup> s72 of the Electricity Act, which required licensed suppliers to supply electricity, was repealed in 1994. However, s62 of the Electricity Act still requires electricity distributors that held licences as at April 1993 to continue to supply lines function services to consumers. This obligation expires in 2013

### *Real time security*

10. In 1994, ECNZ's transmission assets were transferred to Transpower, a new stand alone State-owned enterprise. Legislation did not require Transpower to ensure any level of security or quality of supply. These were matters for Transpower's directors to determine in the course of meeting the statutory objective of operating as a successful business under section 4 of the SOE Act.
11. Under section 5 of the SOE, all decisions relating to the operation of a State enterprise are to be made by or pursuant to the authority of the board in accordance with its statement of corporate intent. It is likely that Transpower's statements of corporate intent<sup>6</sup> during this period included, in the description of Transpower's principal activities, the role of matching supply and demand in the short term, and coordinating ancillary services (including voltage and frequency control)<sup>7</sup>.
12. Under the then Government's policy statement on transmission<sup>8</sup>, "technical and commercial risks inherent in operating the transmission system [were to be] allocated where they [were] most efficiently and effectively managed". In practice, Transpower<sup>9</sup> decided security and quality levels on the grid, consulting with its customers but often not reaching agreement<sup>10</sup>. It acted as the system operator, dispatching generation and matching real time supply and demand. Transpower also coordinated the provision of ancillary services, including voltage and frequency control. Instantaneous reserves were provided primarily by ECNZ.

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<sup>6</sup> Under s14 of the SOE Act

<sup>7</sup> I have not reviewed a copy of Transpower's statements of corporate intent (SCIs) during this period. Earlier SCIs are only published on Transpower's web site back to 1998/99

<sup>8</sup> Issued in December 1994 under s26 of the Commerce Act 1986

<sup>9</sup> As a subsidiary of ECNZ until 1994, then as a stand alone SOE

<sup>10</sup> Pricing methodology has been a recurring problem. However, as reflected in successive policy documents and various court cases, agreeing contracts with customers for transmission services in general has been a problematic since Transpower was separated in 1994

### *Seasonal security of supply*

13. In relation to seasonal security of supply (dry year risk), hydro storage levels were centrally managed by ECNZ, which estimated the opportunity of using water in the current period relative to holding water for future use. The opportunity cost (the 'water value') was derived from the fuel cost of thermal stations<sup>11</sup>.
14. Required hydro storage levels were set to ensure 'normal' demand could be met if inflows were at least equal to the lowest recorded inflows over a certain number of the previous years. Between 1998 and 1992, it was the previous 20 years. From 1992 to 1996, it was the previous 60 years<sup>12</sup>. However, these parameters were operating policies set by ECNZ. Neither was a legal requirement.
15. ECNZ published 'spot prices' a week ahead. The spot price setting process was internal to ECNZ. In essence, ECNZ matched an internal forecast of demand against an internal forecast of available generation. Prices were set at the marginal cost of the highest cost station expected to run in each half hour<sup>13</sup>.
16. However, prices were capped at 15c/kWh (the cost at the time of oil fired generation at the old Whirinaki plant). As a result, prices could not rise in a dry year to reflect the full risks of shortage and ensure that electricity supply and demand were in balance. Electricity prices continued to have a significant political profile as evidenced by the 1992 Select Committee Inquiry into Electricity Pricing.
17. ECNZ maintained medium term reserves in the form of hydro buffer stocks and 'hydro firming' back up thermal capacity. These reserves were supplied as a 'public good'<sup>14</sup>, the costs of which were recovered from all customers by a mandatory 'pool price margin'<sup>15</sup>. Different values of non-supply for different customers were not recognised<sup>16</sup>. Alternative and less costly insurance options were effectively excluded.

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<sup>11</sup> Turner + Murray (1997b) p10, section 3.2. If too much water was released in the current period, more costly thermal stations would be required to run in later a period to meet demand

<sup>12</sup> Following a recommendation of the 1992 Electricity Shortage Review Committee

<sup>13</sup> Turner + Murray (1997b) p10, section 3.2

<sup>14</sup> See the discussion at paragraph [ ] above

<sup>15</sup> It was a fixed levy of 1.2 cents per kWh. This is a form of capacity payment, to cover the fixed of capacity and fuel which is rarely used. See paragraph [ ] above for how this mechanism fits in the wider spectrum of options

<sup>16</sup> See paragraph [ ] above for how this mechanism fits in the wider spectrum of options

18. As in the pre-corporatisation period, if reserves were insufficient to meet demand in a shortage, ECNZ relied on conservation campaigns and physical rationing on a nationwide basis.

#### *Longer term security of supply*

19. On corporatising ECNZ, the requirement to obtain a licence from the Minister to build new generation, and the traditional legal obligation on the State to supply, were removed. A key objective was that new investment should take place on a competitive and commercial basis, with independent generation initiatives competing to meet demand growth. Greater dynamic efficiency was viewed as probably the most important aspect of overall economic performance in electricity generation<sup>17</sup>.
20. However, ECNZ remained a near monopoly and, in reality, managed longer term security based on its forecasts of future supply and demand. No significant ECNZ or independent new generation was commissioned during this period. As Culy observed, “[t]he surplus of capacity and relatively low growth rates in demand meant that design and construction of new plant was not a major priority for [ECNZ]”<sup>18</sup>.
21. Decisions relating to the longer term security of the transmission grid were for ECNZ until 1994, then Transpower, to determine in the course of meeting the statutory objective of operating as a successful business under section 4 of the SOE Act.

#### *Summary*

22. In summary, ECNZ set a uniform security standard that was delivered by a single (supply side) mechanism with a uniform charge. This relatively costly and inflexible approach was physically possible while ECNZ controlled over 90% of generation assets and nearly all hydro storage. In effect, ECNZ internalised the risk within its balance sheet<sup>19</sup>.

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<sup>17</sup> Culy (1992) at p12, section 3.3. In the same section, Culy notes that with the benefit of hindsight, capital investment of around a billion dollars might have been saved if forecasts of demand growth made in the early 1970s had not been so astray, and if the cheapest projects had been commissioned first. Another half billion might have been saved if the cheapest equivalent scheme had been chosen in place of the expensive Clyde power scheme

<sup>18</sup> Culy (1992) at section 4.2

<sup>19</sup> For example, in a dry year, ECNZ was exposed to lower sales from its hydro generation in the South Island. These losses would be off-set to some degree from higher profits earned by its North Island thermal and hydro stations...The diverse nature of ECNZ’s portfolio of assets [as at 1995] had not

23. Legislation imposed no obligations in relation to security of supply<sup>20</sup>. However, there was an implicit political and industry expectation that ECNZ and Transpower (from 1994) would ensure it to a relatively high level of security.

#### *1992 Shortage*

24. There was one major shortage event between 1988 and 1996. In 1992, hydro inflows were very low<sup>21</sup>. The dry sequence started in March. The storage lakes reached their lowest point in June when the consequences of running were greatest<sup>22</sup>.
25. An industry committee was established to manage the industry's response. It was overseen by a Ministerial committee chaired by the Prime Minister. A large publicity campaign was put in place to reduce demand. Water heating was generally cut for 18 hours a day, and Comalco closed one of its three potlines. Emergency legislation was passed provide access to additional hydro fuel in Lake Pukaki<sup>23</sup>. No physical rationing was required<sup>24</sup>.

#### *Government's response*

26. The Government set up an independent committee to review the 1992 shortage. It recommended that<sup>25</sup>:
- ECNZ's security standard should be reviewed. Until the review was completed, the standard should in 1 in 60;
  - Better early warning mechanisms for low storage levels should be put in place;
  - The 15c/kWh price cap should be removed;

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emerged as the most efficient means of managing risk in a market environment. Rather, it was the outcome investment decisions made centrally in the absence of both spot and contracts markets – Turner + Murray (1997) at p43

<sup>20</sup> In relation to energy, as opposed to lines services

<sup>21</sup> In lower 25% of the historical range for a significant period – Morrison & Co (2003a) at p21, section 2.1.3

<sup>22</sup> Morrison & Co (2003a), p25, section 2.1.5

<sup>23</sup> This power was not exercised

<sup>24</sup> Morrison & Co (2003a), section 2.1.1

<sup>25</sup> 1992 Electricity Shortage Review Committee Report

- Communications and information flows with customers and the public were required;
  - ECNZ's modelling should be improved, with increased research into forecasting, better testing of assumptions and improved demand information from power boards;
  - ECNZ should provide longer term flexible contracts; and
  - Financial incentives for demand reductions should be offered, together with increased awareness of energy efficiency opportunities.
27. The inquiry also noted a trend (even then) for statutory resource consents to limit flexibility of operations.
28. Between 1993 and 1996, ECNZ adopted the recommended interim 1 in 60 security standard.

### **1996 to 2004: Initial wholesale market**

#### *Industry structure*

29. In 1996, about 27% of ECNZ's generation assets were transferred to Contact Energy. An independent wholesale market was established by multilateral agreement among industry participants. By an agreement with its shareholding Ministers, ECNZ was restrained in the amount of new capacity it could build. ECNZ was also required to offer a high level of its firm capacity to customers on long term contracts<sup>26</sup>.

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<sup>26</sup> The Memorandum of Understanding between ECNZ and the Government dated 8 June 1995 explains that these restraints were imposed with a view to mitigating ECNZ's market power and promoting competitive new entry into generation



### *Short term security of supply*

30. Legislation continued to impose no legal obligations on any party in relation to short term security of supply. However, Transpower's statement of corporate intent was changed in 1998 to provide that Transpower's responsibilities in relation to system coordination and real time electricity security were to be governed by contracts with customers. In the process of agreeing the contracts, it was intended that customers would make trade-off choices between alternative levels of service (including grid security) and Transpower's prices for each service level<sup>27</sup>.
31. In late 1999, the industry established the Grid Security Committee under MACQS<sup>28</sup>, which established a process to agree rules to allow standards to be set for common quality, including security, a contractual structure for implementing agreed common quality standards, and robust monitoring, compliance and dispute resolution process. However, MACQS never became operational<sup>29</sup>.
32. In 2000, the Government issued a new Government Policy Statement under section 26 of the Commerce Act, which (among other things) stated that transmission services "should be provided at the standards of quality and security required by [grid] users through a process of agreement with those users, of the Electricity Governance Board on behalf of users"<sup>30</sup>. It was intended that choices between prices and standards would be made by customers. This policy was reflected in Transpower's statements of corporate intent until 2003<sup>31</sup>.

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<sup>27</sup> See section A, para 1.2(c) and section B, para 1(b) and 1(c) of Transpower's 1998/99 statement of corporate intent

<sup>28</sup> Multilateral Agreement on Common Quality Standards, which was authorised by the Commerce Commission in August 1999

<sup>29</sup> It was absorbed and overtaken by Part F of the rules developed under the industry's self-governance proposal. This also did not become operation (see Commerce Commission (2002) at para 39). Parts C and F of the rules issued by the Minister of Energy under the Electricity Act have similarities to the self-governance proposed versions, but also many key differences

<sup>30</sup> Para 4, second bullet, Attachment 1 to the GPS entitled "Further Development of New Zealand's Electricity Industry", August 2000

<sup>31</sup> As noted earlier, the SCI governs the board's decision-making under s5 of the SOE Act, so these SCI provisions have some legal force. Transpower's 2003/04 SCI was significantly changed. In relation to grid security, it provided that "Transpower will work with regulatory agencies to ensure that risks to security of supply assessed by Transpower are highlighted; and provide transmission services at the standard of quality and security agreed with grid users or required by regulatory agencies". The notion of customers making trade-off decisions was deleted

33. In reality, the management of real time security of supply was largely unchanged with the introduction of the market. Transpower still determined the amount of reserve that was required and entered into contracts with generators and consumers to provide reserve services<sup>32</sup>. Prices for reserves were published every half hour and participation by interruptible demand increased significantly<sup>33</sup>. Common quality standards (including security) on the grid were also determined by Transpower.

#### *Seasonal security of supply*

34. In 1995, the Government issued a policy statement on dry year risk. While it had no legal force, it advised the industry and public at large that with the formation of Contact Energy and an external wholesale market in 1996:
- ECNZ would cease to manage on a central basis. ECNZ and Contact would meet dry year risks to a standard established in contracts with wholesale buyers. Neither company would have any implicit obligation to supply or protect wholesale buyers if they do not have appropriate contractual arrangements;
  - Spot prices for electricity would be uncapped, pointing out that in dry periods spot prices could be expected to rise to very high levels;
  - Wholesale buyers could manage this volatility by contracting with generators, developing demand-side management strategies or arranging back-up generation;
  - Wholesale buyers should take a prudent approach to managing their exposure to dry year risk;
  - The Government would not step in to protect wholesale buyers who chose not to take out adequate protection. Such action by the Government would in fact increase the likelihood of future supply shortages by undermining the incentives on buyers and sellers to put in place effective insurance mechanisms.

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<sup>32</sup> For example, spinning reserve and back-up generation to provide frequency and voltage control

<sup>33</sup> This paragraph is taken from Turner + Murray (1997a) at p11, section 3.3

35. In 1998 and 2000, the Government issued further policy statements in relation to electricity supply risk. The 1998 version accompanied the further break up of ECNZ into three competing SOEs. The 2000 version accompanied the Government's decisions on the recommendations of the 1999/2000 Ministerial Inquiry into Electricity. Both policy statements reiterated that:

- Responsibility for managing dry year and other supply risks rested with market participants;
- The Government would not step in to protect buyers and sellers who failed to provide adequate protection;
- Spot prices were uncapped and could rise to very high levels in a shortage;
- A range of mechanisms was available to market participants to provide protection.

*Longer term security of supply*

36. Legislation during this period did not impose any obligations on generators, Transpower or retailers in relation to longer term security of supply. Responsibility for security continued to rest with market participants. The policy objective was that each party would put in place protection mechanisms that reflected their respective risk profiles and the value of non-supply, with an overall outcome that would, over time, be lower cost than a centralised uniform approach.

*2001 shortage*

37. In hydroelectric terms, 2001 was the worst drought experienced in the previous 71 years for the first seven month period of each year<sup>34</sup>. It was worse than the shortage in 1992<sup>35</sup>. It was also very cold. In June-July, demand was 5.8% higher than the same period in the previous year<sup>36</sup>. The dry sequence started in March<sup>37</sup>. Spot prices increased dramatically<sup>38</sup>. However, most of the load was on variable quantity tariffs and hence there were no direct financial incentives for many customers to respond<sup>39</sup>. A 10% nation-wide conservation campaign ran from late July until mid September. Some demand exchange arrangements were put in place. The industry also agreed a protocol for common quality standards to be reduced to enhance energy transfers<sup>40</sup>. No compulsory physical rationing was required<sup>41</sup>.

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<sup>34</sup> Infratil (2001). 22% lower than mean: Cabinet Paper (2001) at para 12

### *Government's response*

38. The main conclusions of an officials' review of the 2001 shortage were that<sup>42</sup>:
- The electricity price spot market worked much as expected during winter 2001, with very high prices signalling an increasingly tight supply situation and record demand;
  - The market would have worked better if the reforms specified in the Government Policy Statement of the day had been fully implemented (such as improved information disclosure, demand-side participation in the market, and mechanisms to invest in the grid to relieve transmission constraints);
  - Some major retailers and large users were seriously under-hedged against dry-year spot prices. Although hedges were available, several years of surplus generating capacity and record low spot prices affected buyers' assessments about investing in hedges;
  - As a consequence of experience in 2001, increased awareness of dry-year risk is likely to result in better risk management. More sophisticated (and liquid) hedge and contracting arrangements are likely to emerge. An insurance mechanism to cover transmission losses and constraints would be desirable; and
  - New Zealand is facing the need to build new generation capacity in the next few years to meet rising demand. This means that wholesale market prices on average are likely to trend towards long run marginal cost (LRMC) which is set by the cost of new generating capacity. This will also lead to upwards pressure on retail prices, as retail margins adjust back to long-term averages.

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<sup>35</sup> Only one other year, 1971, had similar total inflows – Infratil (2001)

<sup>36</sup> Cabinet Paper (2001) at para 12

<sup>37</sup> Morrison & Co (2003a), p21, section 2.1.3

<sup>38</sup> A 10-fold increase compared to previous years (from 4c to 40c/kWh). On Energy exited the market: Cabinet Paper (2001) at para 13

<sup>39</sup> Morrison & Co (2003a), p25, section 2.1.5

<sup>40</sup> Concept Consulting (2004) [Emergency Provisions], Appendix 2

<sup>41</sup> Morrison & Co (2003a), section 2.1.1

<sup>42</sup> [http://www.med.govt.nz/ers/electric/chronology/chronology-01.html#P237\\_31023](http://www.med.govt.nz/ers/electric/chronology/chronology-01.html#P237_31023) – summarising the 2001 Winter Review findings

39. A range of options and mechanisms were considered, including earlier disclosure of spot offers, separation of retail and generation and compulsory hedge offers. The Government accepted officials' advice that the market would self-correct, with an appropriate warning from the Government.

#### *2003 shortage*

40. The dry year sequence in 2003 started in January<sup>43</sup>. The first five months were similar to 2001, building an accumulated deficit of 2,000-2,500 GWh. Average monthly spot prices reached \$200 MWh<sup>44</sup>. The 2003 low inflows were compounded by a significant reduction in the available natural gas from the Maui field<sup>45</sup>.
41. A shortage taskforce was established by the industry's Grid Security Committee, which developed a nation-wide conservation plan, a fuel disclosure programme, protocols to reduce local transmission quality to increase energy transfers, and arrangements to coordinate generation outages<sup>46</sup>.

#### *Government's response*

42. Back in October 2002, Ministers had started to consider options for addressing security of supply issues relating to the provision of new generation to meet demand growth, and the transition to new fuel sources with the depletion of the Maui gas field<sup>47</sup>. In February 2003, Cabinet established a group of Ministers to consider and develop the Government's policy and response on infrastructure issues<sup>48</sup>.
43. The extreme dry period starting in January 2003, following so closely after the 2001 event, significantly heightened the Government's sense of unease. As the Minister of Energy emphasises in a paper to Cabinet, "[s]ecurity of electricity supply has become a serious concern to the Government and the wider community, and the lack of secure supply poses a significant risk to New Zealand's sustainable economic growth"<sup>49</sup>.

<sup>43</sup> Morrison & Co (2003a) at p21, section 2.1.3

<sup>44</sup> Morrison & Co (2003a) at p24, section 2.1.5

<sup>45</sup> Morrison & Co (2003b) at p4

<sup>46</sup> Concept Consulting (2004a) at p49, Appendix 2

<sup>47</sup> In Early October 2002: Cabinet reference, EDC (02) 11

<sup>48</sup> Cabinet reference CAB Min (03) 5/14)

<sup>49</sup> Cabinet Paper (2003)

44. With the failure in May 2003 of the industry's self-governance proposal to achieve the required levels support<sup>50</sup>, the Government appointed the Electricity Governance Board (EGB) under the Electricity Act<sup>51</sup>, and announced its intention to introduce legislation transforming the EGB into an Electricity Commission. The Commission, would, among other things, would be responsible for managing "the sector such that electricity demand can be met in a 1 in 60 dry year without the need for national conservation campaigns. This standard would have avoided conservation campaigns in 1992 and 2001 – and, so far, this year"<sup>52</sup>.
45. The Government considered that, since it was formed, "the market – the industry – has been deemed responsible for managing dry year risk. It has not done that to our satisfaction"<sup>53</sup>. "Infrastructure Ministers have concluded that the current policy settings for electricity are unlikely to ensure an acceptable level of supply security"<sup>54</sup>.

Tony Baldwin

May 2005

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<sup>50</sup> Votes in favour of the proposed rules: 5% in the consumer class, 66.2% in the trader class, and 53.2% in the transporter class

<sup>51</sup> Part 15, Electricity Act prior to the 2004 Amendment Act

<sup>52</sup> Speech notes from the Minister of Energy, May 2003

<sup>53</sup> Speech notes from the Minister of Energy, May 2003

<sup>54</sup> Cabinet Paper (2003), para 2