

12<sup>th</sup> October 2004

**HEDGE MARKETS AND VERTICAL INTEGRATION IN  
THE NEW ZEALAND ELECTRICITY SECTOR**

**A Report for Contact Energy**

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## **EXECUTIVE SUMMARY**

### **Allegations Levelled at the New Zealand Electricity Market**

The New Zealand electricity market is subject to risks that electricity spot prices can rise to very high levels, or become very volatile, in years when lake levels are low (“dry years”). To hedge against this risk companies can sign hedge contracts which specify the future price at which electricity will be bought or sold. The development of liquid hedge markets, in which companies can be sure of obtaining hedge contracts at objectively transparent prices, is therefore held by some commentators to be critical for the successful operation of the New Zealand electricity market more generally.

However development of liquid hedge markets in New Zealand has been very slow. Rather than trade in hedge contracts, electricity generators and retailers have chosen a strategy of “vertical integration”; i.e. to merge into unified generation and retail companies that deal directly with consumers. Vertical integration provides an alternative to hedging by contract, since, to the extent that the generation output of the integrated company matches its retail sales, the company does not need to participate in the wholesale market and is therefore shielded from volatility in wholesale prices. As a result of vertical integration, the bulk of market share in the generation and retail sectors is made up by five vertically integrated generator/retailers.

The vertically integrated structure of the industry has attracted a lot of criticism. Critics claim that vertically integration impedes the development of liquid hedge markets, making it more difficult for large industrial consumers, or retailers (or generators) that are not vertically integrated, to obtain hedges. Some even claim that this is part of a deliberate strategy of “foreclosure”. (Foreclosure occurs if, for example, vertically integrated companies use market power in the generation sector to price rival retailers out of the market, by offering poor contract terms for generation output. Foreclosure is also alleged to occur in the opposite direction, from the retail sector to the generation sector.) These critics also argue that vertical integration, by impeding the hedge market, discourages investment in generation capacity and energy conservation.

Thus, several commentators and agencies have proposed measures aimed at limiting vertical integration and/or promoting markets for hedging contracts.

### **Economic Reasons for Vertical Integration**

Firms adopt vertically integration for many reasons, some of which involve the search for, and promotion of, economic efficiency. In particular, vertical integration may provide benefits in terms of sharing risks that would otherwise be costly to hedge by contract. The possibility that vertical integration reduces costs indicates it may be a solution to a problem, rather the cause of one.

Vertical integration can also be motivated by a desire to practice foreclosure, but market conditions do not always make foreclosure possible. To appraise the effects of vertical integration, it is therefore necessary to appraise, firstly, whether conditions in New Zealand electricity markets or in electricity markets in general impede the development of hedge markets (which may make vertical integration an efficient alternative to hedging by contract) and, secondly, whether foreclosure is infeasible or unprofitable (either of which rules it out).

### **Economic Conditions and Hedging in the NZ Electricity Market**

Some conditions in the New Zealand electricity market are conducive to hedging. Liquid hedge markets require a significant amount of re-contracting by traders to generate the necessary volume of trade. A market into which new information arrives frequently and randomly is likely to be good for liquidity, since it will provoke many traders to rebalance their portfolios. In New Zealand, changes in hydrology conditions seem to fulfil the liquidity condition that information should arrive frequently and on a reasonably random basis. However, the electricity market in New Zealand also faces a number of impediments to the development of liquid hedge markets:

- Historically, some companies appear to have underestimated their exposure to hydrology risks and have not taken the necessary steps to hedge their risk;
- Only a small number of companies in any electricity industry, and in New Zealand in particular, need to hedge a physical position, meaning fewer players need to trade, which in turn reduces the opportunities for market makers;<sup>1</sup>
- The involvement of consumers in the hedging market is limited by the difference between their pattern of consumption, which varies considerably over time, and the standard baseload contracts that a hedging market would typically offer;
- Speculators rarely have any specific advantage or superior information which might induce them to trade actively in the market;
- Credit risks are not easily or cheaply managed (in the light of recent high profile defaults in electricity markets in other countries);
- Volume risks are significant and can impose substantial costs if electricity companies adopt a position in “firm” forward contracts, as opposed to option contracts (a derivative contract which hedges volume risk, but which is always less liquid than contracts for the underlying product);
- The New Zealand electricity industry has not yet developed contracts known as “Financial Transmission Rights” (FTRs) for hedging the “basis risk” of variation

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<sup>1</sup> Market makers may be loosely defined as “arbitrageurs”, although they may also undertake other functions such as speculating.

between prices at two different nodes (due to variable transmission constraints). Traders need protection against basis risk since electricity is generated and consumed in different places. Hedge contracts for the price at a single node may therefore still be subject to basis risk;

- Government intervention in spot markets, or other forms of potential regulatory intervention, acts as a disincentive to hedging. The government's reserve generation scheme is likely to exacerbate this problem.
- Development towards standardised contracts in New Zealand has been limited.

These impediments to liquid hedge markets imply that, (1) the slow development of liquid hedging markets may not be due to vertical integration, but also that, (2) vertical integration is likely to be an efficient response to conditions unsuited to the development of liquid hedging markets.

### **The Potential for Foreclosure**

Before giving vertical integration a clean bill of health, however, it is also necessary to check whether market conditions would make foreclosure both feasible and profitable. The key condition for foreclosure to be feasible is that market power must exist in the "foreclosing" sector. Recent Commerce Commission studies indicate that this is not the case for the retail sector, so we can effectively rule out the possibility of foreclosure of the generation sector. However, some degree of market power exists in most generation sectors; several studies have shown that generators can potentially exert market power when capacity is very stretched without the need for market power or collusion, and it is not possible to rule out such behaviour in New Zealand.

To appraise an allegation that generators are foreclosing the retail sector, it is therefore necessary to consider whether foreclosure is a profitable strategy in the case concerned. The general conditions under which foreclosure may be deemed to be unprofitable are difficult to establish in practice, and allegations of foreclosure, where foreclosure is feasible, must therefore be analysed on a case-by-case basis. The Commerce Commission investigated allegations of foreclosure relating to the high spot prices during the dry winter of 2001. The allegations were rejected. Electricity prices in New Zealand also appear to be below long-run marginal cost of production, indicating that generators do not appear to have been guilty of sustained "over-pricing". We therefore conclude that foreclosure does not appear to be a major problem for the industry.

### **Investment Incentives in Generation And Energy Conservation**

The allegation that vertical integration, or at least the lack of liquid hedge markets, impedes investment in generation capacity is based on the premise that potential new entrants will not invest unless they can stabilise their earnings over the next two or three years. The typical horizon of standardised "Electricity Forward Agreements" (EFAs) does not exceed

two years in any electricity market, so liquid markets cannot contribute to hedging beyond that time. However in practice generators are usually concerned with a time horizon of fifteen to twenty years, or even more. In the UK and the US, independent generators have relied less on short-term EFAs and more on long-term “Power-Purchase Agreements” (PPAs) covering the financing period or the economic life of the plant. Recently, investors have become wary of the risks associated even with PPAs, and vertical integration has become the preferred model for financing investment (largely for lack of any other).

The argument that vertical integration reduces the incentive for investment in energy conservation also appears to be flawed. The incentives for investment in energy conservation depend on the relative costs of generation and conservation, and the mark-ups applied to the wholesale and retail price. In certain circumstances, vertically integration may actually increase the efficiency of the decision to invest in energy conservation.

### **Proposed Remedies**

A number of proposals have been suggested in response to the allegations against vertical integration. Given that vertical integration appears to be an efficient response to conditions unsuited to the development of liquid hedge markets, and that vertical integration does not appear to be motivated by market power considerations, these policy responses run the risk of reducing the efficiency of the electricity sector.

We do not therefore support a compulsory contracting scheme, which we believe would be impractical, costly, and unnecessary. Such schemes would hinder the ability of vertically integrated companies to compete and would expose them to considerable regulatory risk, credit risk and basis risk (at least, for as long as FTRs remain undeveloped). Given our finding that there is little evidence of foreclosure, we are also unable to support various proposals to separate generation from retailing – proposals which range from full ownership separation to separate regulatory accounting requirements. Ownership separation would negate the substantial efficiency gains from vertical integration, whilst separate accounting requirements are costly to implement and provide information that is potentially misleading; it would be advisable only if frequent investigations into foreclosure were expected, which does not appear to be the case. Likewise, compulsory disclosure of hedge trading information is likely to unload large amounts of complex information into the market with little apparent purpose. Finally, whilst we can see good grounds for ensuring equal access to key data in order to reduce information asymmetries in trading markets, we have found that the most important trading information – on hydrology conditions, “spill” and planned outages – is made available to the public through existing systems anyway.

Although our findings do not support these direct measures to prevent or undo vertical integration, we have found areas where the electricity market could be reformed in ways that would make it easier for smaller companies to participate in the industry.

First, the prevalence of basis risk is a key driver for vertical integration, and also makes electricity companies less willing to offer hedges to customers situated in areas where the

company does not possess generation. In some cases, this problem reduces the competitiveness or liquidity of the market for hedges; in some cases, it may eliminate liquidity altogether. Extending the availability of Financial Transmission Rights (FTRs) would improve the ability of electricity companies to hedge against basis risk, thereby fostering a more widespread and competitive market in hedging contracts (and reducing, at least, the efficiency advantages for vertical integration over hedge contracts).

Second, we note the frequently voiced concern over investment incentives, but cannot find any link with vertical integration. Indeed, in some electricity markets (such as the UK), vertically integrated companies are viewed as a more likely source of investment than independent power producers. The current lack of investment is understandable, given that average electricity prices have not yet reached the level of new entrant costs. However, the New Zealand government has already shown, through the reserve energy scheme, that it is willing to intervene in electricity markets in order to limit price rises. The scheme rewards investment in selected generators, but if the scheme is successful in reducing dry-year prices it is likely to “crowd out” other investment in new generation, as well as reducing the incentive to obtain hedge contracts.

In order to achieve price stability without adversely affecting investment incentives, any reduction in dry-year revenues must be offset by an increase in wet-year revenues. Designing a fully developed alternative to the reserve energy scheme lies outside the scope of this study. However, we would recommend a review of its purpose, coverage and design, for instance to see whether a different scheme, such as a universal system of capacity contracts (Contracts for Differences), would offer better prospects for higher and more efficient investment, whilst reducing the variation in prices to consumers between wet and dry years.

Thus, our findings do not support measures for compulsory hedging or that are intended to force the break-up of vertically integrated companies, but we can see a need to address problems of market design that drive investors towards vertical integration as an efficient solution.

## 1. INTRODUCTION

### 1.1. Overview

Contact Energy asked NERA to undertake a study of vertical integration in the electricity generation and electricity retail sectors in New Zealand and to discuss its effects, if any, on liquidity in the market for “hedges” (i.e. for forward electricity contracts). Contact Energy’s request was motivated by recent commentary from various sources suggesting that vertical integration has contributed to the slow development of hedge markets in New Zealand and has stifled competition in the retail sector. This study has several strands of investigation, which we set out below.

### 1.2. Instructions from Contact Energy

Contact Energy asked NERA to address the following questions in particular:

Is vertical integration between generation and retail a problem, per se, in electricity markets?

- If yes, what changes to market structure and design would the consultant recommend to rectify such problems?<sup>2</sup>

Are there specific features of an electricity market (physical characteristics, market structure, or market design) that may cause vertical integration to be a problem in certain instances?

- If yes, what changes would the consultant recommend to rectify such problems?

Are there other features of New Zealand’s market that are frustrating the development of liquid hedge markets?

- If yes, what changes would the consultant recommend to rectify such problems?

The structure of this report broadly follows the outline implicit in these questions.

### 1.3. Appraisal Criteria

To appraise the effects of vertical integration and policy measures, we use three criteria. *Economic efficiency* is the prime consideration, but we also appraise the effects of vertical integration on *competition* and the *liquidity* of hedging markets.

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<sup>2</sup> The consultant would need to demonstrate, in general terms, that the benefits of such changes would likely outweigh the costs of the changes themselves.

We analyse economic efficiency in terms of the maximisation of “social welfare” (the sum of producer and consumer surplus). A key aspect of this analysis is the impact of “missing markets”, i.e. the implications for producers, traders and consumers of electricity of the lack of contract markets for hedging fluctuations in electricity price levels (at one node) and differentials (between two nodes).

Competition is often considered synonymous with economic efficiency, but over the years a number of specific practices or structural features that are considered anti-competitive have been identified in the field of competition policy. Some of these practices and structural features are associated with vertical integration and so they provide a shorthand checklist of potential problems.

Liquidity is also a component of efficient markets, but the conditions for the creation of liquid hedging markets also provide a useful checklist for examining the state of the New Zealand electricity market. For instance, for such markets to emerge, traders must have access to a liquid underlying commodity market, meaning a “trading hub” where they can sell substantial volumes without shifting prices to “distress” levels. In a competitive energy market, the ability to buy and sell in a particular market requires that producers, retailers and consumers can access the transmission network on terms that are known and predictable. In a nodal spot market, that means that traders must be able to predict – or else to hedge – the differences between spot prices at separate nodes, in order to overcome “basis risk”. These conditions provide a basic checklist of industry conditions needed to permit a liquid market to develop. Even in these conditions, however, hedging markets will only be liquid if traders face the kind of risks that require frequent trading in risk sharing contracts.

#### **1.4. Report structure**

The remainder of this report is set out as follows:

- In Section 2 we set out the key characteristics of the New Zealand electricity market;
- In Section 3 we outline the problems that commentators have attributed to vertical integration;
- In Section 4 we discuss the drivers for vertical integration and assess the underlying economic conditions implicit in the allegations against vertical integration;
- In section 5 we analyse the potential development of hedge markets in New Zealand;
- In Section 6 we analyse the potential for foreclosure in wholesale markets;
- In section 7 we analyse the potential for hedge markets to hinder investment in generation and energy conservation;
- In Section 8 we conclude and offer recommendations.

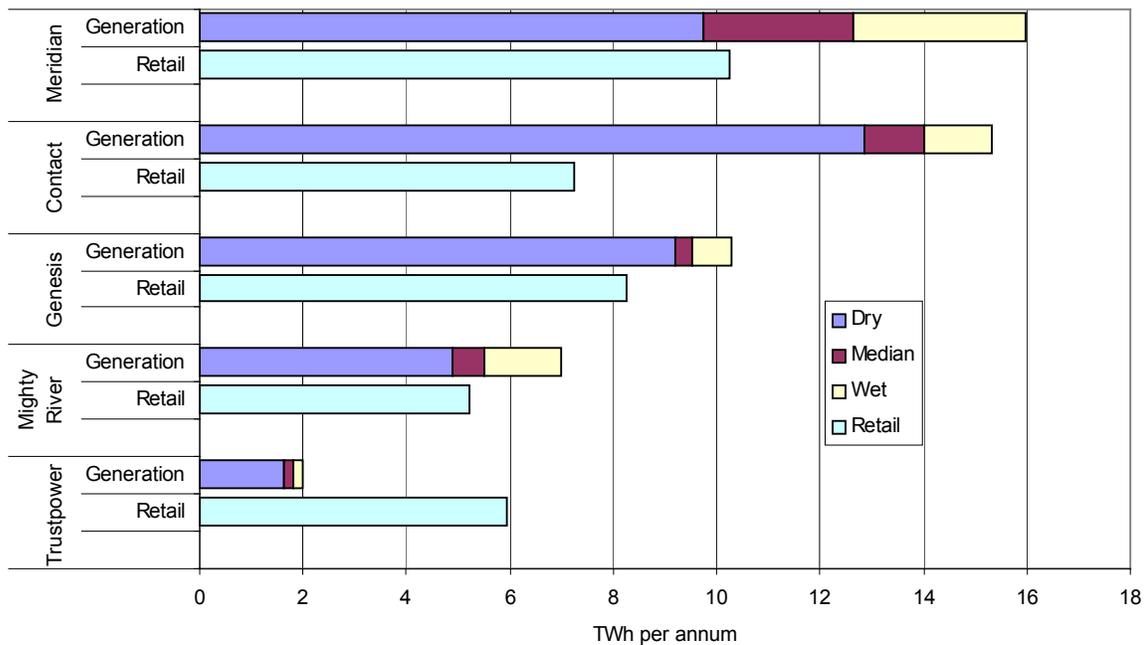
## 2. KEY CHARACTERISTICS OF THE NEW ZEALAND SYSTEM

### 2.1. Ownership Structure

Five vertically integrated generator/retailers own the bulk of New Zealand’s generation capacity and retail market share. Three of these vertically integrated companies, Meridian, Genesis and Mighty River Power, are State-Owned Enterprises (SOEs), while two, Contact Energy and Trustpower, are privately owned and are listed on the New Zealand Stock Exchange. Between them, these five companies account for 96% of New Zealand’s generation capacity, and 97% of its retail customers.<sup>3</sup> Outside the five main vertically integrated generator/retailers, there are a number of smaller operations, typically using cogeneration facilities to service large industrial and/or retail customers.

The generation and retail energy balance for the five vertically integrated generator/retailers is shown in Figure 2.1.

**Figure 2.1**  
**Energy Balance of Vertically Integrated Generator/Retailers**



Source: Farrier Swier Consulting and Concept Consulting, *Transmission Contract Structure & Counterparties, Report to the Electricity Commission*, 25 May 2004, Annexure 1, p. 4 (replicated with data provided by Contact Energy)

<sup>3</sup> New Zealand Electricity Market, *Market Report 01.01.03 – 31.12.03*, p. 2.

Figure 2.1 shows that some companies have a closer match of generation capacity to load than others, although the energy balance varies significantly between wet and dry years in some cases, notably Meridian and Mighty River Power in particular. Four vertically integrated players are predominantly net generators, whilst Trustpower has a retail load significantly larger than its generation output.

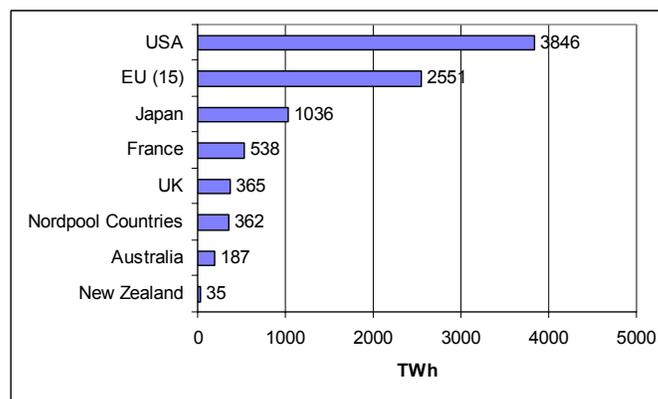
The vertically integrated structure of the five main generator/retailers evolved out of the Electricity Industry Reform Act, 1998, which required the separation of lines businesses from generation and retail. The Act led to a series of rapid divestments, as integrated distribution/retail companies were required to sell off their retail businesses. These businesses were generally bought up by the large generators. Contact Energy, for instance, acquired nine retail businesses in 1998. Other independent retailers have since been bought up by the generating companies or have folded.<sup>4</sup>

The New Zealand experience of consolidation and vertical integration is common to many deregulated electricity markets. A recent survey shows that 60% of senior executives in deregulated electricity markets around the world believe that both the generation and retail sectors in their country or region would consolidate into 4-6 large players, if that hasn't occurred already. The survey also found that, "survey responses from both sectors indicat[ed] that 'almost all major players' would be vertically integrated within five years".<sup>5</sup>

## 2.2. Market Size

The New Zealand electricity market produces around 35-40 TWh per year, which makes it extremely small by comparison with other deregulated electricity markets. (See Figure 2.2.)

**Figure 2.2: Generation Output (TWh)**



Source: IEA Monthly Electricity Survey - June 2004

<sup>4</sup> See Hansen (2004), *Improving Hedge Market Arrangements*, (Paper for the 6<sup>th</sup> Annual National Power New Zealand Conference, 30 March – 2 April 2004), p 14-15.

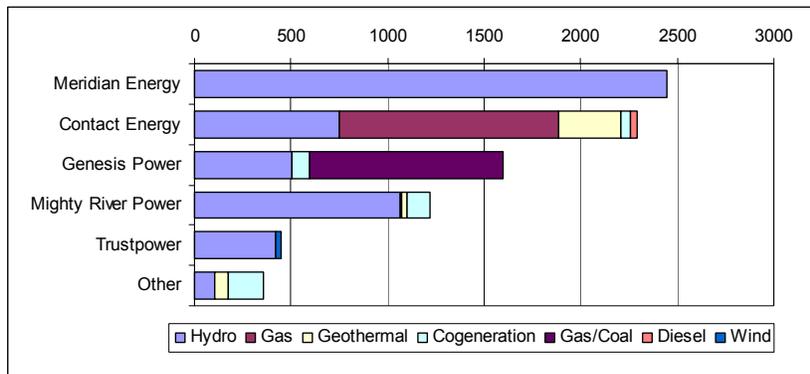
<sup>5</sup> Cap Gemini, *2004 Complete Survey Report. Deregulation: Meeting the delivery and sustainability challenges?*, 2004, p. 6.

The New Zealand market is also small in terms of the number of players. While it is common to see only 4-6 players in the generation and retail sectors, we understand there are only a dozen or so industrial firms likely to be large enough to require hedge contracts.<sup>6</sup> The number of customers needing to hedge a physical position is therefore small by world standards.

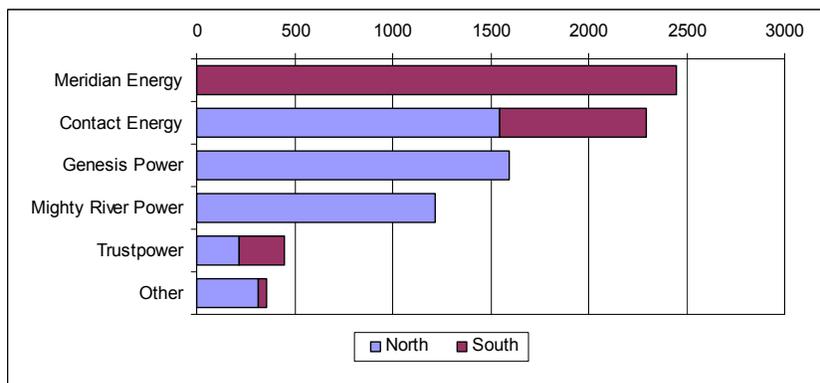
### 2.3. Generation Portfolios

The five vertically integrated generator/retailers differ in terms of their portfolio of generation technologies and locations, as shown in Figure 2.3 and Figure 2.4.

**Figure 2.3**  
**Generation Capacity (MW), Fuel Type**



**Figure 2.4**  
**Generation Capacity (MW), North Island/South Island**



Source: New Zealand Electricity Market, Market Report 01.01.03 – 31.12.03.

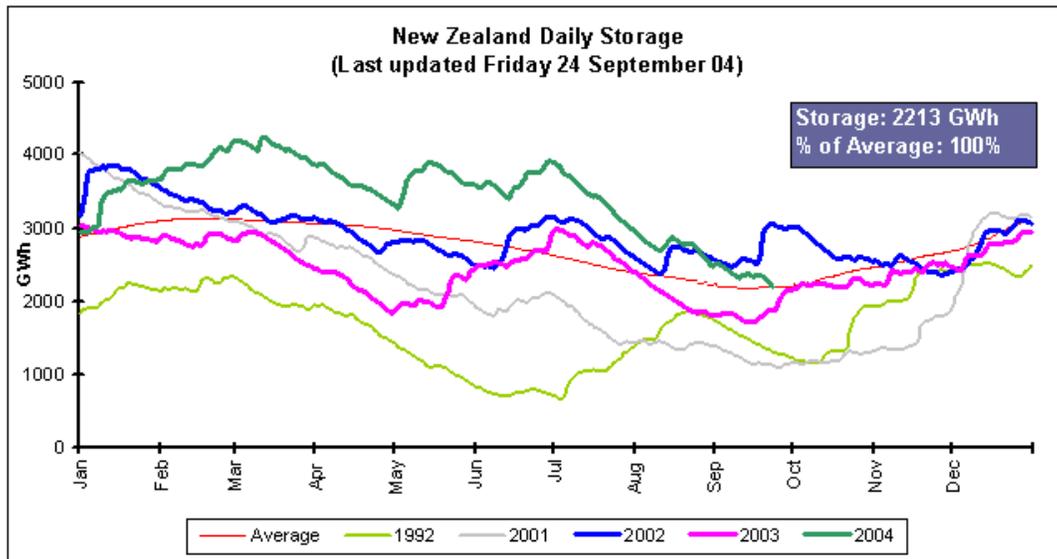
<sup>6</sup> Information provided by Contact Energy shows that only 12 companies consume more than 100 GWh per annum.

Figure 2.3 and Figure 2.4 demonstrate the variation in fuel type and location in the generation sector. Meridian’s generation capacity, for instance, is entirely hydro-based and located entirely in the south island. Mighty River Power’s generation portfolio is also predominantly hydro-based, but is based entirely in the north island. Contact Energy, by contrast, has a fairly even distribution of generation capacity across the north and south island, and across hydro, gas and geothermal technologies. Genesis is the only generator to have any significant coal-burning generation capacity.

**2.4. Dry-Year Risk**

Since much of New Zealand’s electricity capacity is hydro-based, the generation sector is prone to occasional shortages due to low inflows of water in dry years. In these dry years, the shortage of water for generation causes spot prices to rise and forward contract prices react by rising from the time when traders begin to anticipate a dry year. Figure 2.5 shows how the level of water in New Zealand’s hydro reservoirs has varied within and between years.

**Figure 2.5**  
**Annual Hydrology Conditions**



Source: [www.comitfree.co.nz](http://www.comitfree.co.nz).

The availability of water over the annual cycle, and hence the likely level of electricity prices, depends mainly on precipitation (snow and rain) during the winter period (April-September), although the level of water in reservoirs depends on inflows, which are delayed (in the South Island at least) until the snow melts from around October. Traders can therefore form views about future prices by looking at precipitation levels from April and lake storage levels from October, among other information.

Forward prices depend on expectations about future conditions, which may vary as the year progresses and traders acquire more information about lake inflows. By January/February traders may have changed their minds several times about whether inflows will be high or low. If they anticipate low inflows, they will also anticipate high spot prices over the winter/spring period. In such conditions, they will raise prices, both for forward contracts for delivery in that quarter, and for immediate supplies of electricity generated using water that could otherwise be held in storage until later in the year. On the other hand, if traders anticipate that water supplies will be adequate, with high inflows from September, they will also anticipate low prices in the last quarter of the year and will offer forward contracts and immediate supplies of hydro-generation at low prices now.

Figure 2.5 also highlights the unpredictability of prices. For instance, lake storage levels in 2001 started the year well above average, but fell to levels well below average from around March and remained below average until the end of the year. This contrasts with the situation in 2003, when storage levels were close to average at the beginning of the year, then dropped to well below average before recovering again from around mid-May.

Hence, variations in forward prices and forecast output, which determine the risks facing traders and generators, depend largely on the historical information about precipitation and expected inflows, which may change over the course of several months. This pattern of risk will have implications for the volume of trade in hedging contracts at different times of the year, as a key motivation is the need for traders to adjust their contract portfolios when their expected future situation changes. If constantly changing information about precipitation causes traders to revise their forecasts repeatedly, they may enter the market for forward contracts on numerous occasions, sometimes buying and sometimes selling. However, if the information entering the market about precipitation serves only to confirm earlier forecasts, traders may have little reason to revise their contract portfolios, and the volume of trade will be lower. As a result, the randomness of precipitation patterns may have an equivalent random effect on trading volumes and market liquidity.

Hydro risk is not the only source of new information entering the market and affecting future prices. Variations in fuel costs (principally coal and gas), in plant availability (closures, maintenance outages or new construction) and in demand (especially major industries opening or closing plant) will all affect traders' views concerning the future spot value of water and hence today's value of forward contracts and spot sales. However, in the context of New Zealand, variation in hydro conditions appears to be the main source of price fluctuations between years.

## **2.5. Locational Price Variability**

Wholesale prices in New Zealand can also vary across nodes. New Zealand adopted a nodal spot market in October 1996. Nodal pricing is designed to reflect the difference in marginal costs of balancing generation and demand at different nodes given the constraints in the transmission system. Nodal pricing gives rise to differences in short-term prices and

differences in the volatility of short-term prices between different nodes, reflecting generation and load characteristics at each transmission-constrained node. The potential for variation in the difference between spot prices at different nodes is known as “basis risk”. Figure 2.6 shows the extent of price variation at selected nodes in different transmission constrained regions.

**Figure 2.6:**  
**Monthly Average Spot Prices (\$/MWh) at Key Nodes, 1998-2004<sup>7</sup>**

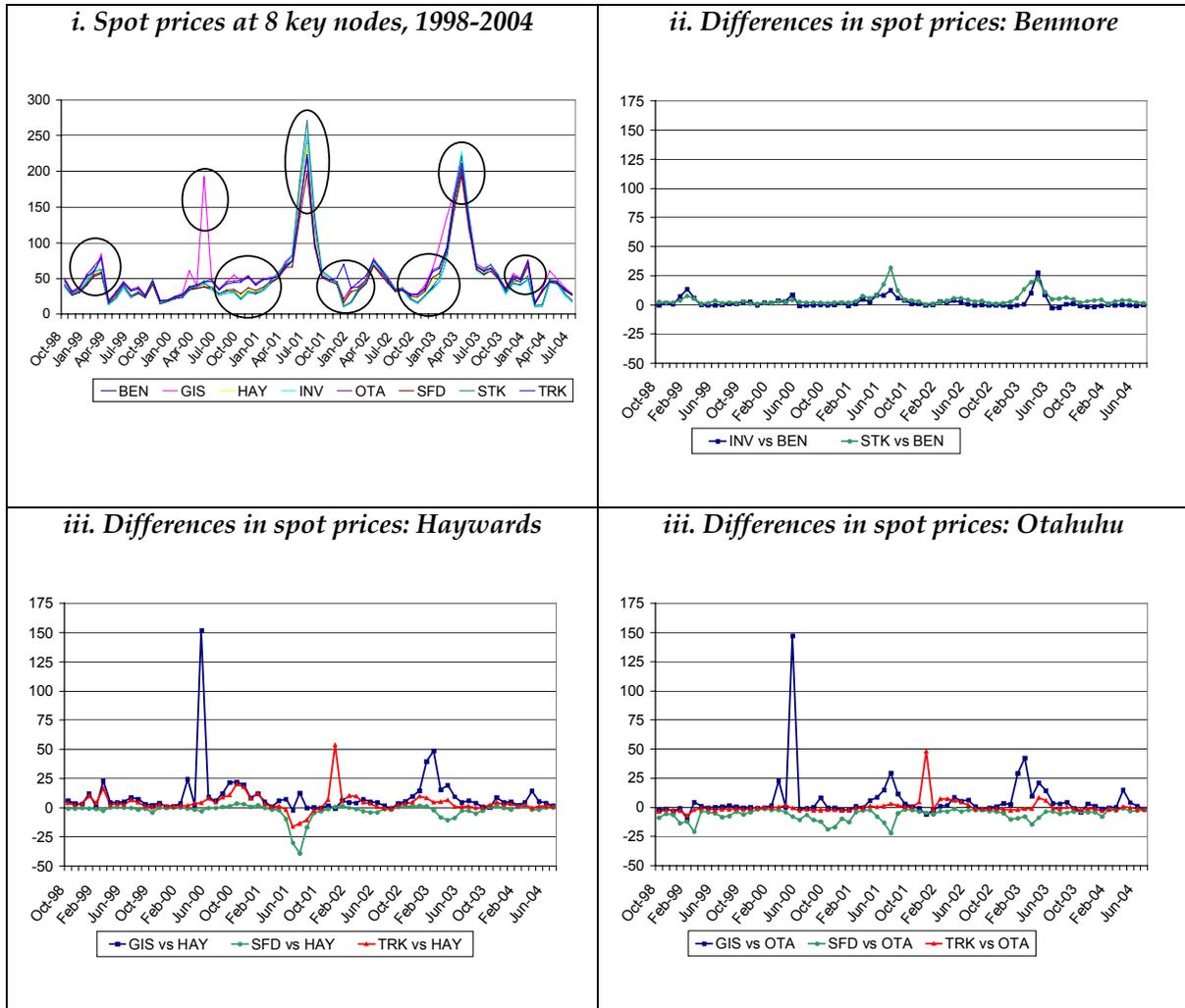


Figure 2.6(i) shows the wide variation in spot prices at different nodes, even in off-peak periods. Figure 2.6(ii), (iii) and (iv) show the differences between spot prices at key nodes. Monthly average nodal prices differ regularly by up to \$25/MWh, with extreme differences

<sup>7</sup> Codes for the nodes used in the graphs are as follows: BEN=Benmore, GIS=Gisborne, HAY=Haywards, INV=Invercargill, OTA=Otahuhu, SFD=Stratford, STK=Stoke, TRK=Tarukenga. Source: NERA, Contact Energy.

of \$50/MWh or more on occasion. On a half-hourly basis, differences can range up to of thousands of dollars per MWh, due to transmission constraints. These variations in prices even arise relative to the major nodes at Haywards, Otahuhu, and Benmore.<sup>8</sup>

Basis risk is the risk that a generator receives (or a customer pays) a spot market price that varies differently from the (“basis”) price against which hedges are available. In a nodal spot market like New Zealand’s, financial contracts known as Financial Transmission Rights (FTRs) offer one means of hedging basis risk (as does intra-regional vertical integration). Initiatives to introduce FTRs have been under consideration in New Zealand since at least 1992, but progress has been limited, partly because the industry has not settled into a stable position, but more critically because of unresolved issues over ownership and allocation of the market settlement surpluses accruing to FTRs.<sup>9</sup> The issue attracted a lot of attention in 2002,<sup>10</sup> and the Government issued a Policy Statement in December 2002. This statement confirmed a set of principles for an FTR market, including that FTR surpluses should be passed through to end-users via the distribution companies (rather than retailers). The Electricity Commission has indicated it intends to engage in an estimated 13-week consultation process on FTRs, although it is not clear when this will happen.<sup>11</sup>

## 2.6. Conclusion

The New Zealand electricity market contains five large vertically integrated generator/retailers, plus a (diminishing) number of smaller companies. Similar industry structures are apparent in other deregulated electricity markets. However, the New Zealand market is very small by world standards. Only a dozen or so industrial firms are likely to be large enough to require hedge contracts and, to date, only 7 or so have actively sought hedge contracts.<sup>12</sup> The five generator/retailers hold a variety of generation portfolios across the North and South Island and across fuel types. The generation market is largely hydro-based, so hydrology conditions appear to be the key determinant of wholesale prices. Information on dry-year risks emerges gradually over the year as inflow accumulates, but lake storage levels fluctuate significantly over the course of the year. Wholesale prices in New Zealand are also subject to considerable basis price risk (i.e. variation between regions), due to transmission constraints. Initiatives to implement FTRs to deal with basis risk are under discussion.

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<sup>8</sup> The fact that price variation is significant even at these nodes is important, since the compulsory hedging scheme suggested by Small (2002) suggests that compulsory hedges could be offered at three reference nodes such as these (Small, *Hedge Markets for Electric Power in New Zealand*, March 2002, p. 27). Our analysis here suggests that the basis risk imposed on generator/retailers by such a scheme would be significant.

<sup>9</sup> Read (2002), *Financial Transmission Rights for New Zealand: Issues and Alternatives*, EGR Consulting Ltd, May 2002, pp. 21-24.

<sup>10</sup> This is discussed in Read (2002).

<sup>11</sup> Electricity Commission, *Transmission Consultation Process, paper prepared for the Electricity Commission by M-co*, June 2004, p. 16.

<sup>12</sup> Source: Communication from Contact Energy.

### **3. ALLEGATIONS AGAINST VERTICAL INTEGRATION**

Commentators have suggested a number of adverse consequences of vertical integration for the operation of New Zealand's generation, retail and hedge markets. In this section we outline the main allegations that have been levelled against vertical integration.

#### **3.1. Allegation 1: Vertical Integration Impedes Hedge Markets**

Several commentators in New Zealand have alleged that vertical integration impedes the development of hedge contract markets. One version of this allegation states that vertical integration simply reduces the need for generators and retailers to offer hedge contracts:

*"Rather than buy hedge contracts, retailers in New Zealand have vertically integrated with generators to reduce price risks by obtaining generation at the cost of supply ... Vertical integration reduces liquidity because it removes trades from the hedge market."*<sup>13</sup>

A less benign version (not so closely related to vertical integration) holds that generators may actively withhold hedge contracts from the market in order to exploit market power:

*"Large consumers complain they are not always able to obtain reasonably priced hedges, that hedges are sometimes not available at any price, and that generators exploit force majeure terms to avoid penalty payments for non-supply."*<sup>14</sup>

Regardless of the motive, the alleged effect is the same: the prices of hedge contracts are higher than they would otherwise be in the absence of vertical integration, and liquidity in secondary markets for hedge contracts is lower.<sup>15</sup> This illiquidity in secondary markets is attributed both to the reduction in *initial* contract sales by vertically integrated generator/retailers (who have less need to hedge) and to the reduction in activity in *secondary* markets (since vertically integrated generator/retailers have less need to rebalance their portfolios).<sup>16</sup>

According to the authors of these allegations, the lack of liquidity in the secondary market has two secondary effects:

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<sup>13</sup> Hansen (2004), p. 7.

<sup>14</sup> Hansen (2004), p. 8.

<sup>15</sup> The lack of liquidity in secondary markets is reflected in the paucity of trading in standardised contracts over available trading platforms, as the bulk of secondary trading is for non-standardised over-the-counter (OTC) contracts.

<sup>16</sup> For example, Hansen (2004), p. 7, refers to the fact that generator/retailers "typically manage their portfolios by ensuring there is sufficient generation to meet their retail commitments" (rather than by rebalancing their portfolios in secondary hedge markets).

- The usual process of *price discovery* is impaired, so that firms have less confidence that prices represent the true opportunity cost of hedging risk. Critics claim that this problem is exacerbated by the non-transparency of vertical integration as a hedging mechanism;<sup>17</sup>
- The lack of market depth may mean that prices are not independent of quantities bid or offered.<sup>18</sup>

A related argument concerns the alleged lack of “cross-hedging” between generators to hedge their exposure to contracted supply requirements in dry-years. Cross-hedging would diversify generators’ risk by allowing hydro generators to call on thermal generation in dry years, and vice versa. This cross-hedging would then enable hydro generators to offer a larger proportion of their generation capacity in hedges to retail customers, without falling foul of dry-year risk (for instance). The most frequently cited example is the case of Meridian and Genesis. It has been suggested that Meridian could (and should) have hedged more of its South Island hydro-risk by contracting with Genesis to supply coal-fired generation from Huntly in dry years.<sup>19</sup> However, such contracts did not materialise. The link between this problem and *vertical integration* is not clear, but it merits investigation as a possible cause of *illiquidity* in hedging markets.

### 3.2. Allegation 2: Foreclosure of the Retail Market

Critics allege that the vertically integrated structure of the industry creates barriers to entry in the retail sector. For example:

*“[The retail sector] is subject to economic conditions that strongly militate against effective competition. Most importantly, the very limited availability of hedge cover raises an insurmountable barrier to entry except by a small-scale operator.”<sup>20</sup>*

*“There is also considerable suspicion [that vertically integrated generator/retailers] are raising barriers to entry to the retail market by overcharging independent retailers (i.e., their competitors) for contracts, and offering terms that are unattractive from a risk management perspective.”<sup>21</sup>*

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<sup>17</sup> Hansen (2004), p. 7.

<sup>18</sup> Hansen (2004), p. 6, describes this as a general problem relating to illiquid markets.

<sup>19</sup> Small (2002), p. 6 outlines the cross-hedging argument in detail.

<sup>20</sup> Small (2002), p. 7.

<sup>21</sup> Hansen (2004), p. 9.

Small concludes that “[r]etailing would be a highly contestable activity if there were sufficient hedges available at competitive prices” and that “scarce supply of hedges is currently a barrier to entry in retailing”.<sup>22</sup>

As we discuss in section 6.2, a pre-condition for foreclosure in the retail sector is that market power must exist in the generation sector. Several commentators have alleged that market power is exercised in generation, especially in dry-years:

*“Consumers argue that, when the probability of hydro and thermal fuel shortages becomes significant, net generators exercise temporary market power in the spot market.”<sup>23</sup>*

A variant of the market power allegation concerns local market power due to transmission constraints that inhibit the ability of generators to compete in certain locations.<sup>24</sup>

### **3.3. Allegation 3: Foreclosure of the Generation Market**

Critics of the current structure allege that the vertically integrated nature of the industry may also hinder entry into the generation sector. Small (2002) for instance, writes:

*“Given the vertical integration of existing generators, it is important that the generation and retailing markets are considered jointly. If either one of these markets were monopolised, the resulting market power could be leveraged into the other. Thus while current concerns may centre on the ability of competing retailers to enter that market, it is not inconceivable that the location of the competitive constraint could shift to the generation sector at some future date.”<sup>25</sup>*

Thus, Small anticipates the problem of foreclosure shifting, potentially, to the generation sector, albeit for reasons that are not specified.

### **3.4. Allegation 4: Vertical Integration Discourages Efficient Investment**

Leaving aside allegations of foreclosure, some documents imply that vertical integration, by reducing liquidity, harms incentives for independent generators to enter the market and to invest in capacity. This allegation depends on the finding that vertical integration is a substitute for and reduces the volume of hedging, so that the market is less liquid. It also assumes that the existence of a liquid market for hedges provides a stronger incentive for

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<sup>22</sup> Small (2004), p. 9.

<sup>23</sup> Hansen (2004), p. 8.

<sup>24</sup> Small (2002), p. 15-16.

<sup>25</sup> Small (2002), p. 8.

independent generators to enter the market. A related allegation might apply to investment in energy conservation.

We consider these arguments as a single allegation that vertical integration discourages efficient investment (in one case, investment in generation capacity, in the other, investment in energy conservation).

### **3.5. Increased Risk of “Political Capture”**

Critics allege that the lack of a liquid hedge market (caused by vertical integration) increases the risk of political intervention in the market, particularly in times of high and/or volatile spot prices. Hansen implies that a more liquid hedge market would reduce lobbying incentives and reduce pressure on government to respond to political pressure with opportunistic interventions.<sup>26</sup> Hansen also claims that a hedge market has become even more crucial since the introduction of the government’s reserve generation policy, which amounts to a “socialised insurance” scheme.<sup>27</sup> However, the potential for lobbying to reduce prices in dry years would contribute towards the lack of contracts for peak supplies, if the government offers lower cost “insurance”. This problem may therefore contribute to the lack of liquidity, but is not caused by it. Neither is it caused by vertical integration, nor specific to industries with vertical integration. We do not therefore analysis this allegation any further, although we return to this problem and its consequences for contract markets in framing our recommendations.

### **3.6. Conclusion**

Recent documents contain wide-ranging allegations against the electricity industry in New Zealand, but some of the problems they identify are *consequences* of inefficient markets, of insufficient competition or of a lack of illiquidity, rather than their *causes*. We have identified four principal allegations relating to the trend towards vertical integration:

- (1) Vertical integration impedes the development of liquid “hedge” markets;
- (2) Vertically integrated companies withhold contracts to foreclose the retail market;
- (3) Vertically integrated companies withhold contracts to foreclose the generation sector;
- (4) Vertical integration discourages efficient investment in generation and energy conservation.

In the following sections, we analyse the motivations for vertical integration and then consider each of these allegations in light of this analysis.

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<sup>26</sup> See for example, Hansen (2004), p. 10-11.

<sup>27</sup> Hansen (2004), p. 18, uses this description.

## **4. ECONOMIC DRIVERS FOR VERTICAL INTEGRATION**

The first allegation set out above, in section 3.1, describes vertical integration in the New Zealand electricity generation and retail markets as an alternative to, and hence a hindrance to, the development of liquid markets in hedging contracts. However, some industries with vertical integration nevertheless support liquid contract markets (the oil industry being a well known example), so it is not obvious that vertical integration substitutes for liquid markets. Moreover, the observation that vertical integration may provide an alternative to liquid hedge markets does not provide sufficient grounds to prohibit or constrain the degree of vertical integration, as it may represent a better alternative.

### **4.1. The Relative Merits of Liquidity and Vertical Integration**

The creation of liquid hedging markets is not an end in itself for economic policy or for consumers of electricity (even though it might be considered highly desirable by certain power traders). Such markets are only desirable from the consumer's point of view if they enhance the efficiency of production, trading and consumption of electricity and so help to drive down prices through competition. Such markets would not be desirable if their creation threatened to reduce efficiency and raise prices.

A company can achieve the effect of vertical integration by owning businesses in a separate parts of the supply chain, or, possibly, by signing a long-term contract with another company operating in a separate part of the supply chain. Vertical integration is extremely common and companies adopt it sometimes to increase their efficiency, or at least to provide the most efficient solution to economic problems. It would be against consumers' interests to promote measures that encouraged liquid markets by reducing vertical integration, if the efficiency gains from more liquid trading were outweighed by the loss of efficiency from vertical integration.

However, vertical integration does not always increase efficiency. In theory, companies may wish to become vertically integrated to increase their market power in ways that have adverse consequences for efficiency and prices. It is therefore necessary to examine the motivation for and effects of vertical integration, before deciding whether regulatory interventions to restrict vertical integration would be beneficial for efficiency, competition or liquidity.

In this section we identify a set of drivers for vertical integration – both beneficial and not beneficial – that provide an analytical framework for assessing both the causes and effects of vertical integration. We consider three broad motivations for vertical integration: (1) efficiency, (2) market power, and (3) other drivers that we characterise as “governance issues”.

## 4.2. Efficiency-Related Drivers

Vertical integration can benefit economic efficiency (the sum of producer and consumer surplus<sup>28</sup>) by reducing costs and facilitating investment. We identify three possible efficiency drivers for vertical integration, by ownership or contract, as follows:

i. **Risk sharing**

Vertical integration allows different businesses to share risks, especially when those risks are negatively correlated. In the current context, market prices for electricity are positively related to the profits and cash flows of generators, but negatively related to the profits and cashflows of retailers (at least in the short term, before retailers are able to adjust prices). Generators and retailers can “share” (and thereby reduce) these risks by combining into one enterprise, which would then have more stable profits and cash flows.<sup>29</sup>

ii. **Avoiding opportunistic treatment of irreversible investments (“hold-up”)**

“Hold-up” occurs when an investment is dependent on one specific buyer or seller, usually because of the high switching costs of dealing with other potential buyers or sellers. The classic examples concern a coalmine delivering coal to a nearby power station, or a power station selling power to a network company (although third party access removes or reduces the bargaining power of the network company). In both cases, the potential seller will be unwilling to make irreversible investments, if the buyer can later refuse to take its output at a price high enough to cover all the costs. Vertical integration provides a solution to this bargaining problem.

iii. **Elimination of double margins**

Vertical integration can increase efficiency if there is a degree of market power in two businesses within one supply chain, e.g. in the generation and retail sectors. In such conditions, vertical integration produces an efficiency gain by eliminating the monopolistic mark-up imposed by the generator on the retailer.

In certain circumstances, vertical integration via ownership offers greater efficiency than vertical integration by contract. This will be the case where it is difficult to write “complete” contracts (i.e. contracts where each party’s obligations can be clearly defined for all contingencies) and/or contracting incurs high transactions costs (because contracts are

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<sup>28</sup> Throughout this report, when referring to “efficiency”, we mean economic efficiency as defined here (as opposed to partial definitions of efficiency, such as “technical efficiency” or “fuel efficiency”).

<sup>29</sup> Some theories of the cost of capital – such as the Capital Asset Pricing Model – imply that “non-systematic” risks do not raise the cost of capital for individual companies and that shareholders can share or diversify such risks by holding shares in many companies. These theories imply that individual companies need not protect their profits against such risks. However, companies frequently do take such measures and the rationale can be found in the desire to stabilise cash flows, to avoid the high transactions costs of financing the wide fluctuations in cash flow (and, ultimately, a possible bankruptcy) that such risks can cause.

difficult to negotiate, design or enforce, or because information is not available to both parties on an equal basis). In these conditions, the benefits of vertical integration are likely to be captured more efficiently through combined ownership than through contracting.<sup>30</sup>

In recent years, the global electricity sector has suffered from a number of large-scale defaults caused partly by changes in the regulated rules of the electricity market, and partly by the behaviour of individual trading companies. These costs incurred by these defaults have caused investors to downgrade both the debt rating of “merchant generators” (those without any guaranteed outlet for their output) and the value of generators’ long-term contracts with external counterparties. A trend towards vertical integration may be the result therefore of companies seeking an alternative way to arrange production and delivery to consumers that is less prone to default and the credit risk of other companies. Linking generation to retailers offers one possible solution, since the management of consumers’ credit risk is a core activity of a retail business and, in any case, default by an individual consumer usually has less impact on total revenues than default by a wholesale customer. Reducing generators’ credit risk is likely to improve the terms on which investors are prepared to supply capital, to reduce the cost of investment and to enhance the companies’ ability to invest in new generation plant. We discuss the impact of credit risk on market liquidity in section 5.4.

Recent developments in global electricity markets therefore provide one reason why vertical integration can enhance efficiency and promote competition (and consumers’ interests), even if it does not enhance the liquidity of markets for electricity contracts. It would therefore be unwise to restrict vertical integration in all cases.

### **4.3. Market-Power Motives for Vertical Integration**

Not all companies become vertically integrated solely to increase their efficiency. The theory and practice of competition policy has identified several reasons why companies might merge along the supply chain in ways that are anti-competitive and harm efficiency. The problems discussed (or found) in merger cases are as follows:

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<sup>30</sup> Companies may choose a mix of joint ownership and contracting, depending upon the relative efficiency of each. In Australia, when reviewing a case brought by the Australian Gas Light Company (AGL) against the Australian Competition and Consumer Commission (ACCC) in regard to AGL’s acquisition of shares in a generation business, the Loy Yang A Power Station, a Federal Judge observed “AGL therefore concluded that its interests in Victoria would best be served by vertical integration in immediate and peak generation but that base load price risk would best be controlled through hedging contracts. This preference was said to be a function of the ready availability of appropriate contracts for base load capacity in Victoria and of the fact that plants with intermediate and peaking capacity use technology with a very short ramp up period and therefore better respond to sudden spikes in the pool price.” The judge concurred with this view. (Federal Court of Australia, *Australian Gas Light Company (ACN 052 167 405) v Australian Competition & Consumer Commission (No 3) [2003] FCA 1525*, p. 71, paragraph 192 and page 81, paragraph 214.)

i. **Foreclosure**

Foreclosure is a recognised (if only potential) problem arising from some attempts at vertical integration. In these cases, a company that possesses market power in one “core” sector extends its market power into another “related” part of the supply chain, with the aim of foreclosing the related sector, i.e. discouraging competitors from entering the related sector, marginalizing them, or forcing them to leave the sector. Companies engaging in foreclosure do so by offering their “core service” on worse terms to their rivals in the “related” sector than would be the case in the absence of vertical integration. However, not all vertically integrated companies can engage in foreclosure, as discussed below.

ii. **Collusion**

Vertical integration can increase the ability of firms to collude, by improving the visibility of pricing. This case relies on the need for oligopolists to “police” any tacit or explicit collusion, by punishing companies that reduce their prices to gain market share. It assumes that retail prices are more visible than wholesale prices, so that producers expand into the retail activity in order to coordinate their activities more effectively. However, in electricity markets retail prices (if encapsulated in private contracts) tend to be less visible than wholesale prices or offers (especially if a power pool publishes its prices and offers). This argument does not therefore hold much water in the New Zealand electricity market.

iii. **Regulatory bypass**

Vertical integration may be driven by a desire to minimise regulatory scrutiny, since internal trading between merged vertical entities cannot be observed easily. However, in New Zealand, there is no direct regulation of electricity generation and retail activities, other than through general competition law. It is therefore hard to see what regulatory scrutiny a company can avoid through vertical integration (particularly since vertical integration appears to have attracted more regulatory scrutiny, instead of deflecting it).

In summary, not all cases of vertical integration will enhance efficiency. We have not seen any allegations suggesting that vertical integration in the New Zealand electricity industry has strengthened collusion between either generators or retailers, and regulatory by-pass does not seem to offer a strong motivation in New Zealand. We have found allegations of tactics designed to foreclose the retail and/or the generation sectors. However, the strength of these anti-competitive motives for vertical integration depends crucially upon conditions in the industry concerned. We discuss whether these conditions hold in the New Zealand electricity industry in section 6.

#### 4.4. “Governance” Motives for Vertical Integration

A final set of possible drivers applies to all takeovers generally, rather than to vertical integration per se, but such motives may have driven some vertical merger activity in the New Zealand electricity market. Occasionally, mergers eliminate inefficiency in the management of the firm and/or in capital markets (i.e. the means of corporate governance), rather than increasing the efficiency of operations (as discussed in section 4.2).

i. **Inefficient Managers**

One firm may take over another, if it can create value by replacing inefficient management with more efficient management. Such moves increase economic efficiency overall. In practice, such mergers are most successful when the management of a firm understands the business it is acquiring, which favours mergers within, rather than between, industries (i.e. horizontal and vertical integration, rather than conglomerates).

ii. **Undervalued businesses**

If capital markets are inefficient, firms may be undervalued. “Entrepreneurial” acquisitions capture the unrecognised value, thereby increasing the efficiency of equity valuation and the market for corporate control more generally.

iii. **Poor management control and public ownership**

The arguments so far relate to companies that try to maximise profits, even if they do so in the context of imperfect capital markets. However, lax control over managers, due to imperfections in capital markets, can also permit mergers that decrease efficiency, but which serve the interests of the managers of the company (rather than its shareholders). In principle, capital market discipline should eventually put a stop to such “empire-building”, through a takeover of type (i). However, it may take some time before anyone recognises inefficient firms as a takeover target. Moreover, public ownership is a special case, where capital market discipline is lacking entirely (except through a threat of privatisation). Public ownership of generation and/or retail activities may contribute towards expansion for reasons other than “empire-building”, but also unrelated to efficiency. Access to government guarantees can lower the cost of capital for state-owned companies, encouraging them to value businesses more highly than the private sector and so to acquire more businesses. Such acquisitions are different from “entrepreneurial” acquisitions, in that they do not correct an imperfection in capital markets, but rather extend one.<sup>31</sup>

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<sup>31</sup> In 2004, prompted by the European Commission, the French government took steps to remove the government guarantees provided to Electricité de France, which were held to be a form of state assistance that distorted competition.

Many firms claim that a takeover will release untapped value in the firm being acquired, but in practice it is hard to monitor the truth of such claims. In the New Zealand electricity sector, private generation companies have acquired publicly owned retail businesses (perhaps with the aim of managing them more efficiently), but state-owned generation companies have also expanded into the retail business. Thus, some mergers reduce public ownership, whilst some increase it. We can therefore only note at this point that public ownership may have encouraged vertical integration, but that the effects on efficiency are unknown and probably impossible to measure.

#### 4.5. Summary

This section has listed the possible drivers for vertical integration. The list shows that vertical integration may be motivated by factors that have positive impact on efficiency. In particular, obstacles to risk management via hedging in the electricity sector may lead companies to adopt vertical integration as an efficient alternative. The possibility that vertical integration is the most efficient method of risk hedging implies that it would be unwise to prohibit vertical integration in all cases, solely in order to promote more liquid markets, because the non-integrated methods of risk hedging might be less efficient.

In relation to Allegation (1), therefore, it may be true that vertical integration reduces or impedes the development of liquid markets, but it may also offer greater efficiency and benefits to consumers. The reduction in liquid markets therefore provides no reason *per se* to prevent or restrict the degree of vertical integration. Indeed, vertical integration may be an efficient response to other problems that hinder the development of liquid hedging markets. We consider further the state of the New Zealand electricity market and the potential for liquid hedging markets in section 5.

Vertical integration can have negative consequences for efficiency, if companies integrate to increase their market power, or because of lax governance. It is difficult to identify cases of lax governance, but the methods by which vertically integrated companies exert greater market power are well known and open to scrutiny. Allegations (2) and (3) accuse companies to using vertical integration to “foreclose” certain activities, but the conditions necessary to allow and encourage foreclosure are reasonably well defined. We consider whether the New Zealand electricity market offers such conditions in section 6.

## 5. POTENTIAL FOR ELECTRICITY HEDGES IN NEW ZEALAND

Allegation (1) assumes that vertical integration represents an undesirable alternative to liquid markets in electricity hedges and that hedging markets would develop in the absence of vertical integration. However, we explained in section 4 how vertical integration may not only increase efficiency, but may even be a more efficient way of hedging than contracting. In this section, we outline the requirements for liquid hedge markets, before identifying potential impediments to liquidity in electricity markets in general and in New Zealand in particular. These impediments provide evidence that vertical integration may be a more efficient solution to the problem of hedging than contracting.

A liquid market can be defined in many ways, but one key factor is the volume of trade. Substantial trading volume is important for ensuring markets have desirable properties such as reliable price discovery and market depth. However the importance of hedge markets for price discovery should not be overstated. Hedge markets generally only cover the short-term forward market, out to a maximum of about two years.<sup>32</sup> In the UK, the US and elsewhere, investors in power stations have preferred to use bespoke long-term power-purchase agreements (PPAs), rather than electricity forward agreements (EFAs), to hedge their project finance risks. A liquid forward market therefore only offers limited benefits in terms of price discovery.

To see if conditions in the New Zealand market are conducive to trading, we begin by analysing the determinants of trading volume. We then consider the number of traders in the market and the potential for market makers and speculators to enter the market. Finally, we consider the impact of government intervention to manage dry-year risks and its impact on trading volumes and the number of traders. At various points we compare conditions in New Zealand with those in the Nord Pool market, which does have a very liquid market in hedge contracts, in order to identify areas of similarity and difference.

### 5.1. Market Information, Risk and Re-contracting

A key requirement for liquidity is a large volume of trading in secondary markets, which requires that traders must frequently rebalance their portfolios, or “re-contract”. Traders will re-contract when they receive new information that requires them to rebalance their portfolio in order to pursue a certain strategy (for example, remaining perfectly hedged), or to revise their strategy altogether. A key determinant of trading volume will therefore be the manner and frequency with which new information becomes available.

If traders wish to maintain a hedged position at all times, they will only trade more than once if their forecast physical position has changed, compared with what they expected. If

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<sup>32</sup> This is the case in the UK and for the existing platform for standardised hedge contracts in New Zealand, [www.energyhedge.co.nz](http://www.energyhedge.co.nz).

the situation is stable, so that no new information enters the market, traders seeking a hedged portfolio can sign contracts for all their net surpluses at a single point in time and will not have to trade again. Trading volume will therefore depend on the rate at which new information enters the market and its effect on each trader's supply and demand. Box 1 provides a simple model of hedging and traders' response to new information.

**Box 1**  
**Information and Re-contracting**

We can express the considerations in section 5.1 in terms of the following equations. The expected net surplus of physical output for any portfolio can be defined as follows:

$$(1) \quad E^{(t)}[S_{i,t+1}(\Phi_t)] = E^{(t)}[G_{i,t+1}(\Phi_t)] - E^{(t)}[D_{i,t+1}(\Phi_t)]$$

where,  $E^{(t)}$  indicates an expectation held at time  $t$  ( $t$  may be a half hour period or any longer period);

$[S_{i,t+1}]$  is the level of physical surplus (generation output less demand) in period  $t+1$  for company  $i$ ;

$[G_{i,t+1}]$  is physical generation output for company  $i$  in period  $t+1$ ;

$[D_{i,t+1}]$  is physical demand for the output of company  $i$  in period  $t+1$ ;

$\Phi_t$  is the set of information available in period  $t$ .

A simple hedging strategy where a company's trading position (using financial hedges) exactly offsets its expected physical surplus can be defined as follows:

$$(2) \quad F^{(t)}_{i,t+1} = -E^{(t)}[S_{i,t+1}(\Phi_t)]$$

where  $F^{(t)}_{i,t+1}$  is the forward trading position for period  $t+1$  of company  $i$  at time  $t$ .

The volume of trade,  $V_{it}$ , in response to new information is:

$$(3) \quad V_{it} = F^{(t)}_{i,t+1} - F^{(t-1)}_{i,t+1} = E^{(t-1)}[S_{i,t+1}(\Phi_{t-1})] - E^{(t)}[S_{i,t+1}(\Phi_t)]$$

From equation (3), the amount of re-contracting is positively related to the frequency with which  $\Phi_t$  changes and the sensitivity of  $S_{it}$  to changes in  $\Phi_t$ . (If trades incur fees and other costs, traders may only re-balance their portfolio when  $S_{it}$  changes significantly.)

## 5.2. Changes in Information and the Volume of Trade

The observation that trading depends on new information provides a criterion by which we can examine whether conditions in the New Zealand electricity sector are conducive to liquid markets. Below, we discuss how information enters the market in relation to fundamental market conditions: hydrology, fuel costs, outages and demand.

### 5.2.1. Hydrological conditions

As discussed in section 2.4, information on hydrology conditions arrives at frequent intervals as reports on precipitation and lake levels. There may be a degree of serial correlation in such information, which enables traders to fix their views from early on in the season, but experience from 2001 shows that precipitation can follow a highly random pattern, sometimes suggesting that a wet year is in store and sometimes a dry year.

The Commerce Commission noted in its analysis of the effective collapse of On Energy in 2001 that, even as late as May 2001, Meridian could have reduced losses it was later to incur had it correctly forecast hydrological conditions.<sup>33</sup> However the Commission concluded that, “Meridian appears to have been genuinely surprised by events as they unfolded... Although both South and North Island storage levels were dropping through a period when autumn inflows usually top up the lakes for winter, weather patterns are volatile and could have improved lake conditions”.<sup>34</sup>

Thus it appears that hydrology information can be both random and significant for traders’ positions, causing traders’ views to change over time, and requiring frequent re-contracting. These conditions also apply in Nord Pool, where more than 50% of the total generation capacity is hydro-based.<sup>35</sup> The Nord Pool financial hedge market is 2.6 times total consumption.<sup>36</sup>

Hydrology data arrives in a steady stream and is random, which is good for liquidity. However there may also be a learning curve in terms of the ability of firms to quantify and value risks, which may partially explain the slow development of hedge markets in New Zealand. Delays in learning may explain On Energy’s failure to take up hedge contracts in the year prior to the winter of 2001, given the Commerce Commission’s conclusion that the hedge prices offered to On Energy “reflected reasonable expectations of future supply

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<sup>33</sup> The Commission was referring to the fact that in May 2001 Meridian could have made greater efforts to conserve water, and thereby have avoided later becoming a net retailer when spot prices were high. (Commerce Commission (2002a), *Termination report – investigation into On Energy’s exit from electricity retailing*, November 2002, p. 28, paragraph 104).

<sup>34</sup> Commerce Commission (2002a), p. 28, paragraph 104.

<sup>35</sup> Nord Pool Annual Report 2003, p. 10

<sup>36</sup> Hansen (2004), p. 19.

conditions”.<sup>37</sup> The New Zealand market is relatively new. In comparison, Nord Pool extends back to 1971, when it was formed as Samkjøringen, an industry cooperative in Norway. The long experience of trading amid hydrological risks helps to ensure that traders manage risks effectively, and New Zealand may have to acquire a similar track record before trading volumes increase substantially.

However, the mixed thermal/hydro system in New Zealand provides natural hedging opportunities for vertically integrated generator/retailers that reduce the requirement for contracting and re-contracting. The operation of this natural hedge is described in detail in Appendix A, but the basic line of argument is as follows.

Hydro generators that are obliged to sell electricity (to wholesale or retail customers) in excess of their dry year output run the risk of having to buy power at dry-year prices. This risk will discourage risk-averse hydro generators from acquiring wholesale and retail customers in excess of their dry-year output, unless they can obtain hedges from thermal generators.<sup>38</sup> If thermal generators provide firm hedges for the demand in excess of the hydro generator’s dry-year output, they have two ways to meet their obligation: (1) in a dry-year, by generating more from their own plant, at its marginal cost; (2) in a wet-year, by buying from hydro generators at the low wet-year spot price. Since (1) the marginal cost of thermal generation and (2) the wet-year spot price are both relatively low and comparable, the thermal generator would be broadly indifferent between them. As a result of following this strategy, neither the hydro generators nor the thermal generator would need to adjust their contract portfolio as hydrology forecasts change. This result indicates that dry-year risk will not necessarily promote a significant amount of re-contracting.

The natural hedge offered by the substitution of thermal costs for the wet-year spot price applies to perfectly correlated dry year risks. In practice dry-year risk is not uniform across the country, and each dam will have its own risks that may be more or less correlated with the risk faced by other dams. Electricity companies may need to hedge these individual hydrology risks, in which case changing hydrology information is likely to spur some re-contracting. Norway, for example, stretches roughly 1500km from North to South (like New Zealand). Its hydro capacity is widely dispersed and experiences a variety of hydrological conditions in different regions. This variation in conditions would increase the propensity of generators to hedge and re-contract in respect of uncorrelated dry-year risks across the country.

In New Zealand’s case, hydro capacity is concentrated in particular regions, with the result that much of its dry-year risk is highly correlated. There are significant differences between

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<sup>37</sup> Commerce Commission (2002a), p. 18, paragraph 77. Another possible explanation is that On Energy simply chose to adopt a risky strategy, or that On Energy was hoping that the Government might intervene in response to high spot prices. We discuss this latter possibility in section 5.6.

<sup>38</sup> Indeed, Figure 2.1 in section 2.1 shows that the two hydro-only companies, Meridian and Mighty River Power, have a retail load more or less equal to their dry-year output.

the North Island and South Island, but companies concentrated within one island would be able to take advantage the natural hedge available from the “dry-year thermal cost/wet-year spot price” substitution. This natural hedge may explain (1) why the volume of re-contracting is limited and (2) why cross-hedging between hydro companies and thermal companies is not as common as one might expect.

### **5.2.2. Fuel supply conditions**

Information about fuel supplies and fuel costs may also spur some re-contracting response. However given the hydrology-based system in New Zealand, the short-term impact of fluctuating fuel costs on trading in the secondary market is likely to be limited. The expected total volume of thermal generation depends on hydrological conditions, and only the balance between coal and gas-fired production might be affected by relative fuel costs.

### **5.2.3. Outages**

Outages, i.e. periods when generation capacity is unavailable for production, affect the expected balance of supply and demand for individual traders and might therefore be expected to influence trading. However, in practice, the impact of outages depends on whether they are anticipated (planned) or forced (unplanned).

Planned outages have an impact on future supply and demand, and therefore the announcement of a planned outage may spur some rebalancing of traders’ portfolios. However, any imbalance in the information available to potential traders on planned outages is likely to discourage liquidity, as speculators and other traders lacking specific knowledge may not be able to profit from their activities. Fortunately, New Zealand has a voluntary system of notification for planned outages, the Planned Outage Co-ordination Process, which operates on an open access basis through the Transpower website.

Information on unplanned outages, however, may have no significant effect on the price of hedging contracts, unless the outage is likely to be prolonged (e.g. as in the case of a major plant fault). Generally, information on forced or unplanned outages reaches the market too late to allow any last minute re-contracting, and traders do not usually expect such outages to last long enough to affect supply and demand in future periods covered by hedging contracts. As a result, it is difficult to obtain hedging contracts to manage the risk of unplanned outages, and internal hedging is likely to be more efficient than contracting for this purpose. Evidence to support this hypothesis comes from the Commerce Commission’s decision on NGC’s sale of the Taranaki Combined Cycle (TCC) plant:

*“One of NGC’s reasons for selling TCC is the risk to which it is exposed when unplanned outages occur at TCC. Without a substantial generation portfolio, an unplanned outage at TCC cannot be covered by other plant, exposing NGC to spot prices in relation to the electricity hedges it has written against TCC’s output. While NGC has been able to obtain cover for planned outages, it has been unable to insure*

*the risk of unplanned outages, leaving it exposed to the spot market when it is out for unplanned repairs.”<sup>39</sup> (emphasis added)*

The desire for internal hedging of unplanned outages leads to diversification of risks via *horizontal* mergers in the generation sector, rather than vertical integration. However, vertical integration may provide other opportunities to use interruptible contracts with consumers as a way to manage a company’s balance of supply and demand.

#### 5.2.4. Demand conditions

Changes in information about demand conditions are likely to have only a small effect on the amount of re-contracting and liquidity over time. The rate of demand growth is fairly predictable, although demand in New Zealand does react to hydrological conditions (and prices) in any given season. Demand conditions for a *particular* company can of course change, as it gains and loses customers, but organic growth of this type tends to be rather slow (and the acquisition of a retail business usually brings a portfolio of customers and contracts). Thus, random demand shocks are unlikely to be a major source of re-contracting in New Zealand.

Individual large consumers often have more variable demand than diversified retail companies and would therefore, in principle, be more interested in adjusting their hedging position from time to time. However, standard hedging contracts only cover baseload supplies (or possibly a roughly defined “peak” period, such as daylight hours). These standard contracts not only leave industrial customers exposed to price variation for the non-baseload parts of their demand, but also mean that changes in demand forecasts may not merit any re-contracting for a portfolio consisting of baseload hedging contracts. Industrial consumers worried about price risk and variation in their demand are therefore more likely to sign retail contracts which contain a fixed price for actual consumption (and other non-standard terms and payments).

The same observations apply in Nord Pool, although the effect of demand shocks may be greater. Per capita electricity consumption in Norway is the largest in the world and, because Norwegian consumers use electricity for heating, demand varies significantly according to winter weather conditions. A cold winter will lead to much higher demand, faster draw-down of hydro resources, and a higher chance of a shortage. Traders may therefore alter their hedge positions a number of times as information about seasonal weather conditions accumulates.

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<sup>39</sup> Commerce Commission (2003), *Decision 491, Contact Energy Limited and Natural Gas Corporation Holdings Limited*, Feb 2003, p. 10, paragraph 58-59. The Commission does not attempt to explain why NGC was unable to insure against unplanned outages.

### 5.2.5. Conclusion on information flows

Changes in relative fuel prices will have a limited effect on the New Zealand electricity market. Planned outages may lead to some re-contracting, but unplanned outages happen too quickly, and variations in demand happen too slowly, to provide a major source of liquidity. Information about hydrology appears to contain the degree of random variation required to promote re-contracting, as new information arrives frequently and should cause traders to rebalance their hedge positions; however, in a mixed hydro/thermal system, the amount of re-contracting may not be very large, given the ability of thermal production to offer a hedge against variation in hydro output. Thus, the fundamental characteristics of the New Zealand electricity sector contain only a small number of key spurs to frequent re-contracting, and hence to a high volume of trade. It should therefore be unsurprising that a hedge market has failed to develop. Furthermore, it may be unrealistic to expect a hedge market to develop in the future, unless speculators enter the market and multiply the volume of trade resulting from changes in fundamental conditions.

### 5.3. Size of the Market

A key determinant of liquidity in markets is the number of traders participating. In electricity, the number of traders is limited by the fact that the supply chain is short<sup>40</sup> and the number of players needing to hedge a physical position is small, even if there is no vertical integration. In New Zealand there only a few industrial customers that consume sufficient electricity to support a requirement for hedge trading,<sup>41</sup> and only a few generators and retailers.<sup>42</sup> This contrasts with the Norwegian electricity market, out of which Nord Pool evolved, which has over 250 companies engaged in generation and/or retail.<sup>43</sup> Hedge market liquidity in New Zealand is therefore dependent on the entry of market makers and speculative traders.

Market makers are traders who stand ready to buy or sell at publicly quoted bid and ask prices, and make profits by exploiting small arbitrage opportunities created by frequent re-contracting. Market makers may try to maintain a zero “open position” (net balance), or they may be linked to a speculative business (see discussion below). Due to low margins and high operating leverage, arbitrage businesses require large volumes of trading to be

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<sup>40</sup> This contrasts with the agriculture sector for instance, where principal risk may be traded between many parts of the supply chain, such that many parts of the supply chain may require some form of hedge against price/output/exchange rate risks.

<sup>41</sup> See discussion of market size in section 2.2.

<sup>42</sup> As discussed in section 2.2, it is common in most countries for the generation and retail sector to be concentrated in 4-6 key players. The key difference in the New Zealand case however is the small number of large industrial electricity consumers.

<sup>43</sup> Ministry of Petroleum and Energy, *The Energy Sector and Water Resources in Norway*, 2002, p. 81. As discussed in section 5.8, this industry structure persists primarily because of municipal ownership.

viable. However the New Zealand market is small and may not support the fixed costs of such operations.

Hansen has suggested that the Electricity Commission should subsidise market maker start-ups.<sup>44</sup> However if the required economies of scale in market making do not exist in New Zealand, then subsidising market makers would be inefficient. In any case, if market making were efficient then the efficiency gains should be capable of capture by the exchange provider without recourse to government funds. Nord Pool, for instance, pays a fee to market makers to promote liquidity, but does so out of its own funds, not from government subsidy, indicating that the benefits to Nord Pool in terms of liquidity and trade volume must outweigh the costs.<sup>45</sup>

Another source of liquidity is the entry of speculators, i.e. traders prepared to take open positions on financial electricity contracts. (In terms of Box 1, speculators are prepared to adopt a trading position, F, which does not match their expected physical position, S-D, in the expectation that they can close it later at a more favourable price.) Speculators are likely to adjust their trading position in response to new information. However speculators must believe they have better information, or that they can make better use of information, than other traders so that they can better anticipate whether prices will rise or fall. They may not have access to the necessary information if they lack a major position in the physical market, which would discourage their entry.

Information on hydrology and other electricity market conditions is published via M-Co's information system, Comit, and companies are required to publish information on "spill",<sup>46</sup> but it remains likely that generators and retailers will have an informational advantage over external parties in relation to both hydrology and planned outages.

The Commerce Commission has also noted the informational difficulties faced by speculators, as well as other potential obstacles to entry:

*"In principle, an external party, such as a merchant bank, could compete by offering contracts independent of back-to-back contracts or own-generation ... Such a participant would need extremely deep pockets to avoid the situation that On Energy found itself in, and probably an ability to write long-term contracts to ensure that over the longer-term it is able to make a suitable margin to compensate for the risks. Given the potential for extreme prices over reasonably lengthy periods and the*

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<sup>44</sup> Hansen, p. 19-20

<sup>45</sup> Hansen also refers to the Nord Pool case, but neglects to point out that the payments to Nord Pool market makers actually come from Nord Pool itself (Hansen, p. 19-20). Details of the Nord Pool arrangement can be found in Nord Pool's Market Maker Agreement, available at [www.nordpool.no](http://www.nordpool.no).

<sup>46</sup> The industry developed the Hydro Spill Disclosure Arrangements and Rules in response to an explicit threat of government regulation. (<http://www.med.govt.nz/ers/electric/package2000/summary.html>)

*difficulties in estimating the risks, it could be extremely difficult for a merchant bank to provide contracts at competitive levels.*"<sup>47</sup> (Emphasis added).

Speculators from outside the industry may emerge as the risks become better understood. However, as discussed later in section 5.6, any expectation of Government intervention in the spot market creates new risks and is likely to discourage speculators from entering the market.

In summary, the small number of players hinders the development of electricity hedge markets. The establishment of market making businesses would not be efficient if the New Zealand market is too small to support the fixed costs of such businesses. Private exchange operators may find it profitable to contribute to the fixed costs of market making operations, but we can see no reason why such contributions should be funded by taxpayers. The entry of speculative traders is likely to be inhibited by the informational asymmetries in relation to participants with a physical electricity position, at least for some time. There are also other problems related to new entry by speculators, including economies of scale, credit risk problems, and expectations of government intervention in the spot market.

#### **5.4. Credit Risk and Volume Risk**

Volatility in market conditions is necessary to create demand for re-contracting, but if volatile market conditions create wide fluctuations in prices, the margin calls associated with hedge contracts may restrict the volume of trading, as outlined in Box 2.

The need to provide credit for large margin calls can prevent companies from trading, either because they have insufficient capital to provide the margins (and so are prevented for trading any more), or because they restrict their trades to limit the risk of a sudden rise in required margins. Too much market volatility can therefore actually reduce liquidity, as companies are simply unable to finance a large portfolio of contracts. For instance, in the UK, a large rise in the prices of gas and electricity during 2003 seems to have reduced trading in contracts of longer duration (6 months) and increased reliance on the daily market, as companies have tried to reduce the volume of outstanding contracts and margin calls. Similarly, Nord Pool hedge contract volumes fell by 47% from 2002 to 2003 as hydro reservoir levels remained extremely low and prices became extremely volatile.<sup>48</sup> Vertical integration provides one solution to this problem, since credit risk issues do not arise for internal trading with an integrated company.

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<sup>47</sup> Commerce Commission (2003), p. 23, paragraph 141.

<sup>48</sup> Nord Pool Annual Report 2003, p. 10.

**Box 2**  
**Margin Calls to Manage Credit Risk**

When two companies agree a contract, say for 100 MWh at a current forward price of \$30/MWh, each company is exposed to the risk that the other party will default on the contract. To offer some protection against this risk, one party may require the other to lodge an “initial margin”, i.e. to provide some cash or credit sufficient to cover the risk of default. An exchange is likely to require a margin from both buyers and sellers, but in an OTC transaction it may be that only the less creditworthy party puts up a margin. In general the initial margin requirement could range anywhere from 0% to 100% of the future liability, depending on the perceived level of credit risk.

In addition, companies may be liable to pay (or receive) a “variation margin” if the forward price should move away from the strike price. If, for instance, the forward price rises to \$35/MWh, the buyer may be exposed to a further \$5/MWh on default. The seller would then be required to pay \$500, i.e. the \$5/MWh difference on a 100 MWh contract, to cover this liability. If the price doubled to \$60/MWh, the additional margin requirement would be \$3000 (=  $(\$60 - \$30)/\text{MWh} \times 100 \text{ MWh}$ ).

Margin requirements impose a cost on contracting parties, i.e. the cost of providing additional capital, or the fee for a letter of credit. These costs represent the cost of credit risk and can be substantial, particularly if market prices are volatile. Since the default of TXU and the collapse of Enron, independent generators in the UK have had to put up initial margins amounting to 100% of the potential liability in some cases in order to obtain hedge contracts.

As discussed in section 4.2, vertical integration can also reduce overall credit risk for generators and retailers, which may be critical given some recent high profile defaults. When generators become vertically integrated with retail businesses, they replace sales to wholesale traders with sales to retail customers (consumers). The credit risk imposed by retail customers is highly diversified and can be managed by a variety of methods (e.g. pre-payment meters).

For a vertically integrated company, sales to retail customers are subject to volume risk (as customers switch between retailers). However the rate at which customers switch and retail companies lose sales volume tends to be slow. In contrast, generators may find it difficult to maintain a steady volume of sales in the wholesale market if the market is illiquid to start with. Moreover, switching costs allow retailers to adjust retail prices more slowly than wholesale prices. Ultimately, the observed tendency towards vertical integration (and, as we shall see in section 6, the absence of obvious anti-competitive motives) implies that

generator companies believe that the benefits of obtaining a retail market offset the disadvantages.<sup>49</sup>

Vertical integration therefore reduces both the need to trade hedge contracts (and incur margin costs) and reduces companies' credit risk overall. Reduced credit risk is likely to improve the terms on which investors are prepared to supply capital, thereby reducing the cost of investment and enhancing generators' ability to invest in new generation plant or expanded retailing businesses.<sup>50</sup>

In New Zealand, the predominance of government ownership (and vertical integration) may give the impression that credit risk is not a serious problem. However, it may become serious if New Zealand adopts compulsory measures aimed at increasing the volume of trade between the vertically integrated companies and new entrants in the generation and retail sectors.

## **5.5. Basis Risk (Nodal Spot Prices)**

Basis risk is the risk that differences in prices at different nodes may vary unpredictably over time depending on transmission constraints. A hedging contract might stabilise prices for a retailer serving consumers at one node, but still leave the counterparty to the contract (a generator producing electricity at another node) exposed to basis risk. The presence of basis risk prevents the development of standardised hedging contracts at a few major centres (sometimes called "hubs").

The basis risk inherent in nodal spot prices can be hedged if the market or the transmission company<sup>51</sup> issues derivatives known as "Financial Transmission Rights" (FTRs), which pay the holder an amount equal to the difference in price between two nodes. Armed with an FTR for the price difference between node A and node B, a generator producing at node A can sign a hedging contract referring to the price at node B without taking on basis risk.

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<sup>49</sup> In any case, even if companies want to lock in sales revenue in wholesale contracts, they are likely to arrange long-term hedges through bespoke power-purchase agreements (PPAs) rather than electricity forward agreements (EFAs). Experience in the UK has shown that, while EFAs might be suitable for terms out to two years, PPAs are preferred for longer term arrangements.

<sup>50</sup> New investment in generation is likely to enhance competition, even if such investment is undertaken by the vertically integrated generator/retailers rather than by new entrants. The Commerce Commission noted this in its decision on Contact Energy's acquisition of the Taranaki Combined Cycle generation plant: "The Commission has concluded that de novo large scale entry [into generation] is unlikely to occur. However, capacity expansion is likely to provide some competitive discipline over the longer term as generators compete to provide the next plant on the system" (Commerce Commission (2003), p. 23, paragraph 142).

<sup>51</sup> The identity of the issuer of FTRs is not important, as long as the issuing authority is creditworthy. In practice, the issuer would need to offset the risks of issuing FTRs by having access to the financial surplus accruing to the market, due to the difference in price between node A and node B. Thus, whoever issues the FTRs would also need to receive the market surplus, either directly or via an agreement with the market settlement system.

Nord Pool operates a zonal price system, where prices are uniform within large zones.<sup>52</sup> Electricity traders face locational price risk only for importing and exporting electricity between zones. With this market structure it is simpler to establish standardised hedge contracts since prices vary little within a zone.<sup>53</sup> In the year 2000, Nord Pool replaced physical contracts for the Denmark-Norway link with FTRs, in order to bring Denmark into the system; these FTRs now offer a hedge against basis risk arising from differences between Denmark's thermal system and Norway's hydro system.<sup>54</sup>

If the industry agreements and infrastructure for FTRs are not in place, then electricity companies will adopt alternative means of hedging against basis risk, which could include:

- Horizontal integration across nodes, which diversifies the nodal price risks (but may be limited as an option by the Commerce Act)
- Vertical integration at a nodal point, which avoids exposure to basis risk altogether.

Alternatively, generators may simply be unwilling to offer hedging contracts for certain transmission-constrained regions.

Limits on horizontal integration and the absence of FTRs are likely to encourage companies to adopt a vertical integration response. Intra-regional vertical integration is therefore an efficient response to the lack of development in hedging against transmission constraint risk.

## 5.6. Dry-Year Risk

Dry-year risk may lead to an expectation of government intervention. Such expectations are likely to reduce the incentive for contracting and re-contracting in hedge markets, and therefore liquidity, if retailers believe they are effectively insured against significant price rises. Uncertainty about government behaviour also reduces the incentive to speculate and hence the potential volume of trading for speculative purposes.

Unfortunately, as noted in section 3.5, the disincentives to hedge trading caused by "socialised" insurance are likely to have increased with the establishment of the Electricity Commission and the reserve generation policy. Until the operation of the scheme is so well understood that it is entirely predictable, it represents an "information asymmetry" (where some parties know better than others about factors affecting future prices), which is likely to discourage speculators and market makers from entering the market. Nord Pool, meanwhile, has survived a number of dry years recently and, although they provoke much public discussion, the government has so far declined to intervene.

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<sup>52</sup> There are seven zones in total, three in Norway, two in Denmark, one in Finland and one in Sweden.

<sup>53</sup> Although zonal pricing introduces other inefficiencies, since locational price signals are not as narrowly defined.

<sup>54</sup> Power in Europe, *Open Access to the Skagerrak Link Planned For 2001*, 10 July 2000.

## 5.7. Contract Standardisation

Most commodity markets begin with over-the-counter (OTC) contracts, designed to meet the needs of the individual contracting parties. Such contracts do not promote a liquid market until they become standardised through concerted action by traders and exchanges. This is problematic in electricity hedge markets, where consumption profiles can vary according to time, location and security of supply.

The vast bulk of New Zealand electricity hedging operates via OTC contracting at present. Evidence from Nord Pool indicates that contracts can be standardised, since Nord Pool contracts are either standardised exchange-traded contracts, or OTC contracts that adopt a standard form for settlement purposes.<sup>55</sup> However Nord Pool has been in operation since 1971, and therefore has undergone a longer development towards standardised contracts.

## 5.8. Conclusion

We have identified a number of potential requirements for, and obstacles to, the development of liquid hedging markets in the New Zealand electricity sector. We set these out in Table 5.1.

**Table 5.1**  
**Conditions for Liquid Hedge Markets**

Condition	Does condition hold in:	
	NZ?	Nord Pool?
Information flows tend to create need for re-contracting	Perhaps	Yes
Consumers understand & quantify hydrology risks well	Not yet	Yes
Information on planned outages is widely reported	Yes	Yes
Short-term outage risks can be hedged by contract	No	No
Many parts of the supply chain carrying principal risk	No	No
Large number of players (opportunity for market makers)	No	Yes
Speculators believe they have superior information	Unlikely	Possibly
Credit risks can be easily and cheaply managed	Not for new entrants	Mostly State owned*
Volume risks significantly greater in retail than wholesale	No	No
Contracts available for hedging locational price risk	No	Yes (some)
Government intervention perceived as unlikely	No	Yes
Contracts have been standardised	No	Yes

*Source: NERA analysis. \*The industry in Norway in particular (and Nord Pool in general) is largely owned by state and municipal companies. Moreover, the volume of new entry has been very small so far.*

Table 5.1 shows that, unlike Nord Pool, the New Zealand electricity market contains a significant number of obstacles to the development of a liquid market for hedging contracts.

<sup>55</sup> See document, "The Nordic Power Market", p. 24-25, downloadable from the following website: <http://www.nordpool.no/information/index.html>.

There are also historical factors that have supported the development of liquid hedge markets in Scandinavia. Nord Pool evolved out of Norwegian market deregulation in 1991. As discussed in section 5.3, Norway has an extremely splintered market structure, which persists due to the municipal ownership structure of the retail sector in particular. In such circumstances, the development of hedge markets is a necessary alternative to vertical integration, even if it is not as efficient.

In New Zealand's circumstances, vertical integration appears to be an efficient response to adverse conditions, rather than a major impediment to hedge markets as has been alleged.

However, it still remains to be seen whether vertical integration could have been motivated by market power considerations, as alleged in Allegations (2) and (3). We examine these allegations in the following section.

## **6. ANALYSIS OF THE FORECLOSURE ALLEGATIONS**

### **6.1. Introduction**

Foreclosure occurs when a firm uses its market power in one sector (the “core” sector) to reduce competition and to increase its profit in another, potentially more competitive, sector (the “related” sector).

Allegation (2) reflects statements that vertically integrated generator/retailers used their market power in generation to make it more difficult for their non-integrated rivals in the retail sector to compete or to drive them out of the market altogether and to make it more difficult for potential new entrants to enter the market. Conversely, Allegation (3) implies that vertically integrated generator/retailers can exert market power in the retail sector to reduce competition in the generation sector.

It is well established that foreclosure can only occur in certain conditions, when it is both feasible and profitable. In this section we analyse these “feasibility conditions” and “profitability conditions”. We also analyse a recent Commerce Commission investigation into allegations of foreclosure of the retail sector by vertically integrated generator/retailers, which found no evidence of such foreclosure. We conclude that at least some of the conditions necessary for foreclosure to be both feasible and profitable do not hold in the New Zealand electricity sector.

### **6.2. Feasibility Conditions for Foreclosure**

The most essential condition necessary for foreclosure is that market power must exist in the “core” sector. If the generation sector is fully competitive, then it is futile for a vertically integrated generator to withhold generation or hedging contracts (or to offer unreasonable terms for such contracts), since its non-integrated rivals in the retail sector could simply shift to an alternative source of generation or hedging contracts. Similarly, unless retailers have market power over the wholesale market, it is futile for any one of them to refuse to purchase generation or hedging contracts, as generators would find an alternative outlet for their production.

The ability of a single company to exercise market power depends on several structural conditions. Alternatively, a group of companies, each with a small market share, may be able to exercise market power through some form of collusion. We consider these possibilities below.

### 6.2.1. Generation sector

In electricity generation, the exercise of market power may not require high market concentration or any form of collusion. Paul Joskow, a Professor of Economics at MIT, has summarised the conditions:<sup>56</sup>

*“There are good reasons to believe that the attributes of electricity supply and demand - non-storability, very low (zero) short-run demand elasticity, capacity constraints, and (in California) a large fraction of demand being satisfied in the spot market - create opportunities for suppliers [i.e. providers of energy] acting unilaterally to withhold output from the market profitably to drive up prices when demand is high. Collusion is not necessary for firms to exercise market power under these conditions”.*<sup>57</sup>

In other words, if the generation sector is running at close to full capacity, then a marginal generator is likely to be able to raise spot prices above its own short-run marginal cost of production. This problem can appear in any market, but seems to be particularly relevant to electricity spot markets with a capacity constraint. However, it is not so apparent in hedge markets, or in energy-constrained hydro sectors. Moreover, the conditions listed by Joskow are not sufficient to determine anticompetitive behaviour at all times, or in all markets, and Joskow recommends that analysis of the generation sector “should include both an analysis of price/marginal cost margins and a companion analysis of supplier behaviour”.<sup>58</sup> This behaviour-based approach matches competition policy for electricity generation in several jurisdictions, not just in New Zealand, but also in Europe.<sup>59</sup>

Joskow’s analysis shows that the generation sector in New Zealand (and other countries) may face conditions that make the exercise of market power feasible at some times. However, the response to this observation can only take one of two forms: either the problem is universal, inevitable and undesirable – which implies that electricity markets should never be created; or else electricity markets work relatively well at most times and market power is only occasionally a problem. Only the latter response is consistent with current policy in New Zealand and other deregulated electricity market. Accordingly, any analysis of market power hangs on the potential profitability of exercising market power and the actual behaviour of generation companies in specific cases.

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<sup>56</sup> Other authors have also identified these conditions. See for example, Green, Richard J. and Newbery, David M., *Competition in the British Spot Market*, Journal of Political Economy, 1992, vol. 100, no. 5, pp. 929-953, and Klemperer, Paul D. and Meyer, Margaret A., *Supply Function Equilibria in Oligopoly under Uncertainty*, Econometrica 57, November 1989, pp. 1243-1277.

<sup>57</sup> Joskow and Kahn (2002). Joskow, P. and Edward Kahn, *A Quantitative Analysis of Pricing Behaviour in California’s Wholesale Electricity Market During Summer 2000: The Final Word*, The Energy Journal, 23:4, 2002. Also available at: [http://econ-www.mit.edu/faculty/download\\_pdf.php?id=548](http://econ-www.mit.edu/faculty/download_pdf.php?id=548).

<sup>58</sup> Joskow and Kahn (2002), p. 3.

<sup>59</sup> European competition law requires competition authorities to find an “abuse of dominant position”, not just a state of dominance.

Analysis of generator behaviour needs to take account of real world phenomena. For instance, price increases may be due to market power or to shortages, and generators should not be penalised for the latter. Price increases due to dry-year shortages are to be expected in the normal operation of competitive markets for hydro generation, and are necessary to encourage new investment in capacity. Furthermore, when checking for foreclosure of the retail market, it is not sufficient to note that a generator charges a higher price to rival retailers *than to its retail affiliate*. The lower price for the affiliate might reflect the efficiencies due to vertical integration that caused the company to integrate in the first place. What matters is whether the generator is charging a higher price to its rivals *than it would if it were not vertically integrated*. Behavioural analysis therefore needs to distinguish between price differentials due to market power and price differentials that reflect efficiency.

### 6.2.2. Retail sector

The retail sector is sometimes held to be a source of market power. New Zealand, like many countries, has a history of integrated regional monopolies, which – following several structural reforms – have now become regional incumbent retailers that face competition from each other and from independent retailers. Switching costs can deter customers from choosing other retailers, which lends the regional customer base of these incumbents a degree of stability. However, in practice companies do take customers from one another<sup>60</sup> and switching costs tend to decline over time, as customers become more familiar with the process.

The presence of switching costs gives some value to retail businesses in the form of relatively stable volumes and prices and, possibly, the opportunity to earn a margin over the wholesale price of electricity. However, the (limited) market power the retail sector may hold over consumers is not sufficient to make foreclosure of generation feasible in the wholesale market. To be able to foreclose the generation sector, the retailer would need to have market power as a buyer in the wholesale market (as well as a stable retail market). Otherwise, any attempt by a retailer to offer a generator worse terms would simply cause the generator to turn to other retailers.

The Commerce Commission looked at the state of the retail market in 2002, in the context of Genesis' acquisition of Energy Online and concluded that, "existing competition will alleviate any concerns of unilateral power being exercised by the merged entity".<sup>61</sup> The Commission also listed the factors that it considers as being conducive to collusion: high market concentration; undifferentiated product base; slow new entry into the market; lack of fringe competitors; price-inelastic demand curve; poor competition record in the industry; presence of excess capacity; and the presence of industry associations. After examining

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<sup>60</sup> The Commerce Commission found evidence of a price war in Wellington in 2000/01. Commerce Commission (2002a), p. 33, paragraph 127.

<sup>61</sup> Commerce Commission (2002b), *Decision 476, Genesis Power Limited and Energy Online Limited*, Oct 2002, p. 22, paragraph 116.

these factors in the electricity retail market, the Commission concluded that, "...the market is not particularly likely to be susceptible to collusion, even after the acquisition."<sup>62</sup> Although the Commerce Commission's analysis related to the market for consumer sales, the Commission's conclusion on market power provides a strong indication that retailer market power is even less likely to arise in the wholesale market.

Thus, in the New Zealand electricity wholesale market, the retail sector does not appear to possess the market power needed to make foreclosure of the generation sector a feasible strategy.

**6.2.3. Long-term prices**

Wholesale prices in New Zealand are low by world standards, and may have to rise.

Table 6.1 shows average annual spot prices in a number of electricity markets around the world. The average price in New Zealand over the last 5 years has not been high by international standards. Prices in Australia may have been lower on average, as have prices in Nord Pool, but in the latter case prices have been rising recently. The average price in New Zealand is buoyed by the inclusion of two dry years out of five; if the price in either 2001 or 2003 had been more like prices in the other years, the average would have been around NZ\$45/MWh, close to the bottom of the range.

**Table 6.1**  
**Average Annual Electricity Spot Prices in NZ\$/MWh**

	1999	2000	2001	2002	2003	Average
Australia	45.3	55.3	40.4	37.0	34.0	42.4
Netherlands	45.6	97.4	71.1	61.1	90.2	73.1
New Zealand	34.9	34.4	79.0	39.7	82.6	54.1
Nord Pool	27.1	25.7	49.3	54.2	70.5	45.4
Spain	70.6	78.8	81.9	92.9	72.5	79.3
United Kingdom	75.2	78.6	65.7	49.3	51.6	64.1
US - PJM	64.3	67.3	87.2	68.0	70.9	71.5

*Source: Prices from relevant country power pool; Exchange rates from the Federal Reserve Board.*

Even the relatively high average price seen in New Zealand over the last five years is below the level required in the long run. Table 6.2 shows the costs of building and operating a new gas-fired power station in New Zealand (based on international data for construction and operating costs and an estimate of the local gas price).

<sup>62</sup> Commerce Commission (2002b), p. 21, paragraph 112.

**Table 6.2**  
**New Entrant Cost for New Zealand Electricity Market**

	Unit	Low gas price	Medium gas price	High gas price
Operating Thermal Efficiency	%		52%	
Capital cost per kW	\$/kW		1,060	
Gas price	\$/GJ	5.00	6.00	7.00
Initial Load Factor	%		80%	
Load factor decline	%		0.0%	
Operating costs	\$/kW/year		52.2	
Real rate of return	%		10.50%	
Lifetime (<=30)	Years		15	
Price decline	%/year		0.0%	
Lag	Years		2.0	
Variable cost mark-up	c/KWh		0.44	
Initial price (2004)	\$/MWh	67.3	73.8	80.3

Source: NERA/Contact Energy<sup>63,64</sup>

Combining these costs with a forecast of output based on an 80% load factor implies that baseload (100% load factor) prices would have to rise to at least NZ\$67/MWh to encourage investment in new gas-fired plant (more if the gas price is above \$5/GJ, or if New Zealand imposes a charge on emissions of carbon dioxide, as in Europe from 2005). In recent years, prices in New Zealand have averaged around NZ\$40/MWh in wet years and NZ\$80/MWh in dry years, implying that dry years would have to occur more frequently than wet years (or to result in much higher prices) before prices reached the new entrant level. By this standard, wholesale prices certainly do not appear to have been “excessive”, and in fact are likely to have to rise above current levels in future in order to encourage new investment in generation capacity.

Thus, it would appear that any exercise of market power by generators has so far been limited or short-lived. Prices may have been above short-run marginal costs on occasion (as in any market), but they still lie some way below long-run marginal costs, i.e. the cost of new entry.

<sup>63</sup> Our calculation of new entrant costs excludes carbon emission charges, due to be introduced in 2008.

<sup>64</sup> This is above the range of NZ\$40–60/MWh presented by East Harbour Management Services Limited in its report for the Ministry of Economic Development (East Harbour Management Services Limited, *Costs of Fossil Fuel Generating Plant, Report to Ministry of Economic Development*, May 2002, p. 8). However East Harbour’s figures rely on a gas price of just \$3/GJ. For a gas price of \$5/GJ East Harbour’s estimate is \$63/MWh, close to our low estimate of long-run marginal costs.

#### 6.2.4. Conclusion on feasibility of foreclosure

In summary, the feasibility conditions for foreclosure appear to apply in the generation sector, although such conditions are probably endemic to all electricity markets and represent a constant imperfection that policy makers and competition authorities must accept as the price of operating a competitive market, in preference to imposing a strict regulatory regime. The extent of this imperfection must be small in New Zealand, given that electricity prices have still not reached or surpassed new entry costs on average. Nevertheless, in response to Allegation (2), the existence of these imperfections makes it advisable to analyse whether foreclosure of retailing by generators is a profitable strategy on a case-by-case basis, as discussed below.

The position of the retailing sector is different. The imperfections identified in the generation side of a wholesale electricity market do not apply to the retail (buyers') side. The Commerce Commission concluded that conditions are not conducive to collusion among retailers. Therefore, attempts by retailers to foreclose the generation sector appear to be infeasible. Hence, Allegation (3) appears to be unsustainable on economic grounds and can be rejected at this point.

### 6.3. Profitability Conditions

In addition to meeting the feasibility conditions, foreclosure must be profitable, if firms are to adopt it. There is a very large economic literature on the profitability of foreclosure, and we discuss here two well-established conditions under which foreclosure will *not* be profitable: (1) if there is only one monopoly profit; and (2) if rivals have lower costs.

i. *There is only "one monopoly profit"*<sup>65</sup>

In certain conditions, there will only be one monopoly profit that market participants can extract from the industry. In this case, a vertically integrated firm with monopoly or market power in one sector (e.g. generation) would have no incentive to extend its market power into the more competitive sector (e.g. retailing). However the conditions required for the "one monopoly profit" hypothesis are quite restrictive:

- The competitive sector must be perfectly competitive; and
- Outputs from the foreclosing sector are supplied in fixed coefficients with outputs from the foreclosed sector.

Generation and retail are linked one-for-one, but it is not clear that either the generation or retail sectors are perfectly competitive. Although there are competitive constraints in the

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<sup>65</sup> This non-profitability foreclosure condition originates from R.H. Bork, *The Antitrust Paradox: A Policy at War with Itself*, (Free Press, 1995). The original theory has been refined and has entered into the common framework for competition policy.

medium term, we cannot rely on the “one monopoly profit” condition to rule out the possibility of foreclosure.

ii. *When rivals in the competitive sector produce at lower cost*

If a rival in the competitive sector can provide a service more efficiently than the vertically integrated firm, then it will not be in the interests of the vertically integrated firm to foreclose the rival from the market. Instead, it will be more profitable for the (potentially) foreclosing firm to contract with the (potentially) foreclosed firm to provide the service more cheaply. Such an outcome will be possible if bargaining between the vertically integrated firm and its rival is efficient.

In practice, whether such outcomes would be profitable will vary from case to case, so the profitability of foreclosure must be assessed by examining actual behaviour. Fortunately, the Commerce Commission has examined recent behaviour in the New Zealand electricity sector and its conclusions provide valuable insights into the potential for foreclosure of the retail activity.

#### **6.4. Commerce Commission Investigation into Electricity Sector Behaviour**

In 2002, the Commerce Commission investigated the withdrawal of retailer On Energy from the electricity market and the sale of its retail business to Genesis and Meridian during the winter of 2001, a time when spot prices increased dramatically due to lake levels falling very low.

##### **6.4.1. Hedge offers at the time**

The Commission analysed the possibility that vertically integrated generator/retailers had foreclosed the retail sector in both hedge and spot markets. As a net retailer with no contractual cover during that period, On Energy incurred unsustainable losses when it was forced to buy at high spot prices, but could not raise its prices in the retail market without losing significant market share. On Energy had attempted to purchase hedge cover from around mid-2000, but alleged that “hedges were unreasonably priced, relative to terms and conditions that it had previously been able to secure”, and that “the increase in hedge prices reflected a use of market power”.<sup>66</sup>

The Commission investigated the hedge offers made to On Energy against a background of the changing hydrological conditions, and concluded that:

*“...hedge prices, prior and during winter 2001, reflected reasonable expectations of future supply conditions ... there is no evidence to suggest that any player had a substantial degree of market power in offering hedges. The refusal to supply hedges at*

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<sup>66</sup> Commerce Commission (2002a), p. 16, paragraph 67.

*low prices, or supply hedges at all when a dry winter was imminent, was not indicative of market power, or a use of market power, since this is consistent with behaviour in competitive markets.”<sup>67</sup>*

This statement implies that generators did not in fact use hedging contracts as a means to foreclose the retail market to On Energy.

#### **6.4.2. Behaviour in the spot market**

The Commission also investigated the behaviour of Meridian and Genesis in relation to spot prices leading up to and during the winter of 2001. In Meridian’s case, the Commission concluded that, “Meridian’s offer strategy during winter did not reflect a use of market power”.<sup>68</sup>

In Genesis’ case the analysis was more complicated. The Commission concluded firstly that, “Where possible, Genesis used [what market power it had] to increase the level of spot electricity prices”. However to prove a breach of the Commerce Act, it had to be shown that Genesis took advantage of its market power “for the purpose of eliminating On Energy”.<sup>69</sup> In other words, the Commerce Commission’s investigation was aimed precisely at showing whether foreclosure of the retail market was a profitable strategy for Genesis.

#### **6.4.3. Profitability of foreclosure (1): predation to force exit**

The Commerce Commission considered in depth whether it would have been profitable for Genesis to foreclose the retail sector by acting in a predatory manner, so that On Energy exited from the market. The economics of the retail business, and hence the profitability of foreclosure, do not depend on wholesale spot prices alone, but on the margin between wholesale spot prices and retail prices. On Energy was selling to its customers at a retail price *below* the wholesale spot price (which was the source of On Energy’s financial problems). At the time, Genesis was prepared to take on On Energy’s customers at similar retail prices. This behaviour might be considered foreclosure (i.e. selling wholesale power to its own retail subsidiary at a low price, and to On Energy at a high price), though in this case the behaviour took the form of possible predatory pricing, and that was the basis for the complaint under investigation.

To demonstrate predatory pricing, the Commission had to show that Genesis ultimately found it more profitable to engage in predatory behaviour against On Energy than to

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<sup>67</sup> Commerce Commission (2002a), p. 18, paragraph 77.

<sup>68</sup> Commerce Commission (2002a), p. 28, paragraph 109.

<sup>69</sup> Commerce Commission (2002a), p. 31, paragraph 117.

continue supplying On Energy at high spot prices.<sup>70</sup> In other words, for foreclosure to be profitable, Genesis must have expected that it would be able to recover its loss on retail sales by increasing its future retail prices by more than it would otherwise be able to, once On Energy had been eliminated. However the Commission concluded:

*“Competition for customers in the North Island ... had been strong and there was no clear indication competition would be less strong following the exit of On Energy. Hence, the prospect of recouping losses made on retail customers was unlikely”.*<sup>71</sup>

The Commission therefore found that predatory pricing, and therefore foreclosure, were not profitable strategies in these conditions. Retail businesses lost money by selling to customers at retail prices below wholesale prices, but the losses were a temporary, random event, not an anti-competitive strategy.

#### **6.4.4. Profitability of foreclosure (2): predation for merger**

In the end, On Energy was unable to continue in business independently and sold its retailing activities to Genesis and Meridian. The sale of an existing business is a different type of exit from the market, which brings to bear factors that the Commerce Commission did not consider explicitly.

Incumbent retailers (i.e. those with an established customer base) have an advantage over retailers trying to enter a market by attracting customers away from their current suppliers. Switching from one retailer to another incurs switching costs – time, effort and money spent making contact between retailer and customer, investigating competing offers and arranging the transfer of the account. These costs are not large relative to the total cost of electricity and may decline over time as customers become more used to competition in the electricity sector. However, switching costs provide a small buffer which allows incumbent retailers to raise their margins slightly, by charging higher prices than their competitors, without losing all their customers.

This increased margin is not a monopoly profit (since the incumbent retailer does not have a monopoly over its customers), but an economic rent associated with the historical fact that it already has customers. An incumbent retail business therefore has a value to its owner (even before allowing for any economies of scope with other businesses or under vertical integration). A new retailer that manages to acquire customers is in the same position. In either case, the retailer possesses an asset in its customer base, which it can sell to other companies for a price. Indeed, the Commerce Commission has noted elsewhere that

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<sup>70</sup> For every customer that switched from On Energy to Genesis, Genesis incurred an opportunity cost as it was “swapping sales in the wholesale market at high spot prices for sales to customers at lower prices” (Commerce Commission (2002a), p. 3, paragraph 6).

<sup>71</sup> Commerce Commission (2002a), p. 33, paragraph 129.

retailers may adopt a strategy of acquiring customers when conditions are favourable and then sell them to others:

*"Any decrease in service quality or increase in retail prices by an incumbent would likely result in a new entrant adopting a similar business model to EOL, exploiting such actions to enter the market and quickly gain a block of customers with the aim of eventually selling the customers to one of the larger retailers."<sup>72</sup>*

The actions of the generators might have been considered a form of predation intended to squeeze On Energy's margins, in order to reduce the value of the business, so that they could acquire its customer base for less.

In practice, such an allegation would be hard to support. In the first place, the actions of Genesis and Meridian were consistent with other, non-foreclosing behaviour, i.e. selling at a high wholesale price in preference to a low retail price. Second, it is unlikely that this strategy of predation would have been profitable. The new owner would have wished to restore the full margin after taking over the customer base. This strategy would only be profitable if losses due to predation were more than offset by a fall in the cost of acquiring the retail business. However, knowing that the new owner would restore the margin, the current owner would be able to hold out for an acquisition price equal to the business's full value. Moreover, no individual company could have guaranteed to offset the losses due to predation by becoming the future owner of the retail business; competition from other companies would have bid up the price and reduced the probability of winning a bidding war for the retailer.

Thus, even if the Commerce Commission did not consider the problem, it is unlikely that any generator would benefit from predatory pricing used as a means to encouraging a retailer to sell its customer base (rather than giving up its customers).

## 6.5. Conclusion on Foreclosure

In this section, we have examined possible forms of behaviour by vertically integrated companies that would amount to foreclosure. The wholesale (i.e. purchasing) side of the retail electricity sector is too competitive to allow retailers to exercise market power, and so foreclosure of the generation market is not feasible. The wholesale market for generation in New Zealand faces conditions, as enumerated by Joskow, which make the exercise of market power possible in some times and places. However, these conditions apply in all electricity markets and, if they were considered unduly anti-competitive, policy makers ought to abandon any attempt to create competitive markets in electricity generation. The continued existence of these markets depends on (and illustrates) the willingness of competition

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<sup>72</sup> Commerce Commission (2002b), p. 24, paragraph 133.

authorities and governments to tolerate some short-term imperfections in preference to the problems that would be created in generation by widespread regulation and monopoly.

In any case, the feasibility of foreclosure in some circumstances does not necessarily mean that foreclosure will be profitable. The conditions under which foreclosure is unprofitable are sufficiently demanding that one cannot reach a general conclusion about the proclivity for foreclosure, but must examine the circumstances of each case. The Commerce Commission examined such a case in 2002 and found that foreclosure of the retail market would not have been profitable because the retailer was providing the service more cheaply than the generator could have done. As a result, the generator would not have acted in a manner calculated to make the retailer exit the market.

Overall, therefore, foreclosure remains a theoretical construct that appears to have little direct relevance to behaviour in the electricity sector.

## 7. INVESTMENT INCENTIVES

The preceding sections have discussed how real obstacles (such as the lack of financial transmission rights) may prevent the development of a liquid market in hedging contracts, but also how vertical integration offers a possible way around these obstacles. It is therefore important to analyse whether the solution of vertical integration creates any additional problems. This section discusses the impact of vertical integration on incentives for investment in generation capacity and energy conservation, in response to Allegation (4).

### 7.1. Arguments Presented by Commentators

Small and Hansen both argue that vertical integration, by hindering the development of hedge markets, might create additional barriers to entry in generation. Small refers to abstract or potential problems, rather than actual problems, but Hansen refers explicitly to barriers to entry into the generation market created by the lack of a proper functioning hedge market:

*“High contract prices signal to prospective generators that it would be profitable to enter the market with dry year capacity, funded by option contracts. But this hasn’t occurred in New Zealand. There are many possible reasons [why this hasn’t occurred], but lack of liquidity and transparency in the hedge market may have been a contributory factor – new entrants will not want to issue hedges if it is costly to liquidate them at a later stage if their circumstances change. And customers will not want to buy those contracts if suppliers can default on their forward commitments”.*<sup>73</sup>

These arguments relating to liquidation of contracts are a little hard to follow. We interpret Hansen to mean that merchant generators will not wish to sign contracts if they cannot easily undo them (e.g. offset their contract sales by a contract purchase) when their plant is temporarily unavailable. (Generators can liquidate their position in the long-term by selling out their interest in the company.) However, in New Zealand, generators can easily “liquidate” contract positions through the nodal spot market; the additional stability offered by a short-term contracts market (as would be required to deal with unplanned outages) would be very limited or absent.<sup>74</sup> (See section 5.2.)

Similarly, we believe Hansen means that customers may be more reluctant to sign contracts with merchant generators, if they fear that they will not be able to replace the contract on reasonable terms if and when the generator defaults. We have encountered this credit risk problem in discussions of the contract market in the UK, but note that the fear of default

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<sup>73</sup> Hansen (2004), pp. 8.

<sup>74</sup> Similar concerns have arisen in our discussions with traders in the electricity market of England and Wales, but the New Electricity Trading Arrangements offer no equivalent of the nodal spot market as an outlet or source for power at market prices. Instead, traders fear having to close out their contract positions at “distress prices” in contract markets, or else at imbalance prices which were deliberately designed to be punitive.

applies even if market prices are transparent and liquid, since the exposure arises from variation in market prices. In the UK, generators must provide credit cover for the value of their contract *sales* sufficient to cover the buyer's cost of a replacement contract (at today's market price) in the event of default. The need to offer such credit limits generators' ability to trade. However, although this problem may provide an alternative explanation of the lack of liquidity, it is not *caused* by vertical integration or by a lack of liquidity.

Hansen also alleges that "lack of long-term contracting raises the risk that inefficient plants are built ahead of more efficient ones, that capacity expansion follows 'boom and bust' cycles and that investors face higher funding costs because of their exposure to spot market prices".<sup>75</sup> However, long-term contracting through project-specific "power purchase agreements" does not contribute to the liquidity of standard contract markets. Hansen's point may be a fair one, but it is unrelated to considerations of vertical integration and market liquidity.

Thus, it is difficult to link vertical integration to investment incentives via its effect on market liquidity. Below, therefore, we consider the more direct effects of vertical integration on investment incentives in generation and energy conservation.

## **7.2. Incentives for Investment in Generation Capacity**

### **7.2.1. Market signals for "merchant generators"**

In any electricity market, different price signals serve different functions. The price put on real-time physical sales of electricity (or, in some markets, imbalances between net production and net contracts) provides the ultimate incentive for traders to possess generation capacity. The price of real-time/imbalance power is set by centrally administered rules in New Zealand and in every other electricity market. The incentive to invest depends on whether these rules produce prices that are sufficiently high at times of real (or anticipated) shortage.

Markets for hedging contracts – more formally known as forward and futures contracts – serve a different, but related function, which is to signal the market's current expectation of the future value of electricity (and hence of generation capacity). By quoting prices now for electricity delivered in the future, traders disseminate their forecasts and, through the trading process, arrive at a consensus view. The ability to see these prices is a substitute for forecasting prices oneself. The availability of a liquid hedging market, with publicly quoted prices, therefore provides an information system that allows a wider range of investors to view specialist traders' forecasts of future prices.

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<sup>75</sup> Hansen (2004), p. 10.

Hedging contracts allow generators to stabilise their future profits by fixing a price in advance (as long as they also stabilise their future costs). It is not at all clear, however, that markets for standard hedging contracts strengthen the incentive for investment, or spread the incentive over a wider range of investors. Liquid forward markets for energy commodities do not normally extend more than 2 or 3 years into the future, not least because information about the market beyond that time horizon does not change frequently enough to promote frequent re-contracting. (See section 5.1.)

Investments in generation capacity take 2 or 3 years to bring to fruition (meaning that they are unable to capture forward contract prices) and entail a commitment for 20 years (or even longer in the case of hydro plants<sup>76</sup>). Thus, investors in generation capacity who are prepared to take on market risk – the so-called “merchant generators” – need to take a much longer term view of electricity market prices than that offered by forward markets.

### **7.2.2. Project finance model and power purchase agreements**

One model of investment in generation uses long-term “Power Purchase Agreements” to provide a fixed revenue stream sufficient to pay for the debt financing of the project – the so-called “project finance” model. As discussed in the introduction to section 5, the preponderance of PPA contracts appears to lessen the importance of price discovery in hedge contract markets.

The “project finance” model was very common in the UK during the 1990s, but in practice many of the projects relied on a contract between the generator and the retail arm of a distribution company. Thus, an independent new entrant may have run the generation plant, but the contract passed market risk to an established retailer in a form of vertical integration.

In recent years, both the “merchant generation” and “project finance” models have encountered severe problems that have greatly reduced willingness to invest. Growing competition and market reforms led to a fall in electricity prices in the US and Europe, which has (at least temporarily) made investors wary of the risks associated with merchant generation. The project finance model has also become less popular, because certain high level defaults (by Enron in 2001 and TXU Europe in 2002) showed that the revenues from a Power Purchase Agreement were not as secure as investors had previously thought. Lower prices in electricity markets naturally discouraged investment, but investment by independent generation companies has also suffered from a worsening in their debt ratings.

In these conditions, investment by independent generators encounters a number of problems. Vertically integrated companies may offer a more reliable source of investment in generation capacity. Their retail businesses provide revenues that vary less than wholesale

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<sup>76</sup> Nord Pool for many years operated a market in 10-year contracts, but even 10 years is a short period compared to investment timescales in a hydro system.

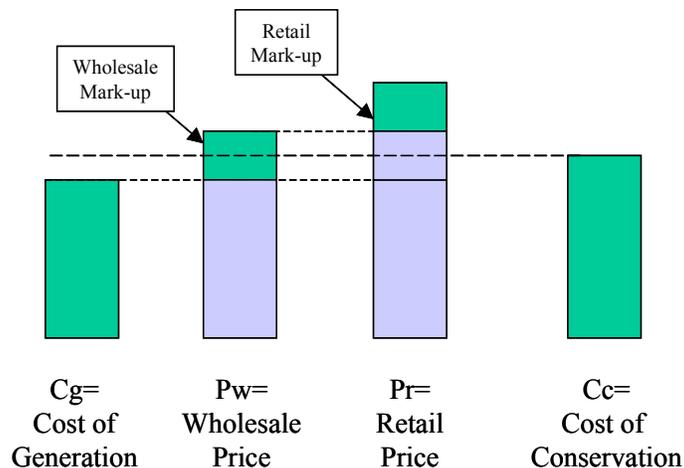
prices and that are not so prone to the risk of major default. Moreover, many integrated companies can finance investment using their own capital, because their balance sheets are relatively strong (for a variety of reasons connected with their history, such as recent programmes of asset divestment). Hence, given the problems facing independent generators, vertical integration may actually have a positive effect on investment in generation.

### 7.3. Investment in Energy Conservation

The incentive for investment in energy conservation depends on what the investor can save by not consuming energy. Figure 7.1 provides a schematic version of the argument that vertical integration weakens incentives for a retailer to promote energy conservation. In the case shown here, the retail price of electricity ( $P_r$ ) is made up of a cost of generation ( $C_g$ ), a wholesale mark-up and a retail mark-up. If the retailer is independent, then for every unit of energy it saves, it will lose the retail mark-up (the difference between the wholesale price,  $P_w$ , and the retail price,  $P_r$ ). In the example shown here, the cost of conserving energy ( $C_c$ ) is low enough to provide an overall saving relative to  $P_r$  that is sufficient both to compensate the retailer for this loss of profit, and to give the consumer an incentive to opt for energy conservation rather than energy consumption.

The concern about vertical integration derives from the thought that a vertically integrated generator-retailer has two mark-ups to lose, both the retail mark-up *and* the wholesale mark-up (the difference between the cost of generation,  $C_g$ , and the wholesale price,  $P_w$ ). This expansion of the company weakens the incentive for the company to promote energy conservation. In the example given below, a vertically integrated company would not promote energy conservation, as the potential gain to be shared between the company and the consumer ( $P_r - C_c$ ) is less than the potential loss to the company ( $P_r - C_g$ ).

**Figure 7.1**  
**The Economics of Energy Conservation**



This argument relies on a number of assumptions, such as the existence of a mark-up in both the wholesale and retail sectors. However, it also ignores the overall comparison of costs. In this case, the cost of conserving energy,  $C_c$ , is higher than the cost of generating it,  $C_g$ . In such conditions, energy conservation is inefficient. If the vertically integrated company (which knows the true cost of generation) does not promote energy conservation, then it is acting more efficiently than an independent retailer that does promote energy conservation.<sup>77</sup>

#### **7.4. Conclusion**

The existence of liquid markets for contracts running 2-3 years out provides little extra incentive for investment by independent generators. Moreover, when considering both generation and energy conservation in current market conditions, vertical integration may actually promote more efficient investment decisions, rather than hinder them.

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<sup>77</sup> This analysis assumes that all costs, including environmental costs, are included in  $C_g$  and  $C_c$ . Advocates of energy conservation may maintain that the cost of generation is understated, due to the omission of environmental costs – known in economics as an “externality”. If so, the independent retailer’s approach might, by chance, be more efficient. However, this result is not certain and restricting industry structure to correct for an externality (instead of making generators pay environmental costs) is a haphazard approach that is unlikely to be efficient.

## **8. CONCLUSIONS AND RECOMMENDATIONS**

In this report we have analysed the potential impact of vertical integration on hedge markets and market power. In this section we summarise our conclusions.

### **8.1. Assessment of the New Zealand Electricity Market**

Vertical integration may be driven by a variety of factors, some of which are motivated by (and result in) efficiency gains. In New Zealand, vertical integration appears to provide efficiency gains through risk sharing, since it enables companies to hedge risks without incurring the costs associated with contracting. In particular, contracting costs may be high due to credit risks, volume risks, the lack of a means of hedging basis risk, and the lack of standardised contracts. Given these costs, and other impediments to the development of liquid markets such as the small market size and the likelihood of government intervention, vertical integration appears to be an efficient response to adverse conditions.

Vertical integration may conceivably be driven by the desire to foreclose either the retail sector or the generation sector. However, our analysis showed that foreclosure of the generation sector is not likely to be feasible, given that retail businesses do not hold sufficient market power over the wholesale market. We also showed that, while the potential for foreclosure of the retail sector exists, there has been no evidence of foreclosure in the behaviour of vertically integrated generator/retailers. The Commerce Commission concluded that vertically integrated players were able to provide retailing services more cheaply by selling through their non-integrated rivals, so foreclosure was not a profitable strategy in a recent dry year.

We also discussed how the existence of hedging contracts is likely to provide little additional incentive for investment in generation, and that vertical integration need not have a negative impact on investment in energy conservation.

In the light of these findings, we consider various policy suggestions.

### **8.2. Compulsory Contracting**

It has been proposed that generators should be required to offer a certain proportion of their potential output via hedge contracts. Such a proposal would require a large number of judgements to define the obligation and would hinder the affected companies from acting in a competitive manner. It might expose the affected companies to substantial credit risk and require that they trade at times when prices are unfavourable; the proposal offers no compensation for this curtailment of trading rights. In the absence of an FTR market, compulsory contracting is also likely to impose basis risk on companies, and may actually increase the incentive to vertically integrate within a given transmission constrained area. Given the situation in the electricity market in New Zealand (and, indeed, in many other countries), vertical integration appears to be an efficient response to adverse conditions. *De*

*facto* separation of generation and retail businesses via forced contracting is likely to prevent the achievement of these efficiencies. The proposal would have to hold out the promise of substantial gains in other areas to offset this cost to the economy.

However, there is no guarantee that imposing such obligations would promote a more liquid market than at present, since it would not address the obstacles to creation of a vibrant secondary market in electricity hedges. Thus, the benefits of such an obligation remain highly doubtful. If compulsory hedging did not lead to a liquid market, it would merely transfer certain benefits from vertically integrated companies to others, without fostering greater efficiency overall.

The scheme would also face a number of practical difficulties. It would require someone to make many fundamental assumptions about the volumes that each company should offer, the point of sale (or nodal reference price) in the hedging contract and the auction reservation prices. These assumptions would be assessed within a bureaucratic framework rather than a commercial one, raising significant practical and administrative difficulties.

In the UK, regulation has been moving in the opposite direction from New Zealand, i.e. UK regulation has been shifting from a more regulated to a less regulated position. When the UK regulator, Ofgem (Office of Gas and Electricity Markets), first allowed generators to acquire retail businesses, it imposed a condition on the retail licence, known as the “Restriction on self-supply”, under which, “certain retailers were prevented from entering into any new electricity contracts with their generation affiliate”.<sup>78</sup> This restriction was intended to force vertically integrated companies to sell and buy wholesale supplies through the contract market. In 2003, Ofgem concluded that wholesale markets were sufficiently competitive to allow the removal of the restriction. Ofgem also concluded that the condition was too difficult to monitor and enforce. The condition was removed in the first half of 2004.

Given the conclusions of the Commerce Commission on the state of competition in the New Zealand electricity market, it is hard to see why New Zealand would impose the type of restrictions on vertical integration that Ofgem has just decided to remove.

### **8.3. Separation of Generation from Retail**

Compulsory separation of the generation and retail functions could range from full ownership separation at one extreme, to separate regulatory accounting requirements at the other. Other options include separation of the legal trading entity and/or governance structure (e.g. separate management, and/or separate Board representation), and “blind auctions”.

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<sup>78</sup> Ofgem, *Restriction on self-supply, Final Proposals*”, October 2003.

These solutions are designed to force the upstream and downstream parts of the business to act independently, and thereby minimise the feasibility and likelihood of concerted actions to foreclose rivals out of the market. However our analysis indicates that foreclosure is not an overriding problem. Compulsory separation of ownership therefore seems inappropriate and would deny firms many of the benefits achieved by vertical integration. Likewise, imposing separate governance or legal structures imposes costs and may restrict the ability of vertically integrated firms to hedge their price and volume risks internally, which was precisely the benefit that motivated vertical integration in the first instance. Blind auctions would also reduce the ability for firms to benefit from the economies of scope created by vertical integration.

Separate regulatory accounting would be intended to facilitate closer monitoring of discriminatory pricing. However, separate accounting is likely to impose significant monitoring and compliance costs, and the rigidities and approximations in such accounts may actually exacerbate problems. For instance, it is not clear that accounting rules would allow vertically integrated companies to share their economies of scope with their retail affiliates without appearing to discriminate against rivals.<sup>79</sup> Foreclosure has not been a problem so far. Only if frequent foreclosure investigations were expected would it be appropriate to impose separate accounting requirements on the industry.

An alternative to separate regulatory accounting is disclosure of hedge contract information. In theory, this would enable monitoring of the terms and conditions of hedge contracts and hedging positions. The problem with disclosure of hedge contracting is that companies can potentially trade thousands of contracts per year, many on terms that are not standardised.<sup>80</sup> Regular disclosure would unload large amounts of complex information onto the market with little apparent purpose. It seems reasonable that the information should be available if requested (for instance, during a Commerce Commission investigation), but there seems little value in regular publication.

#### **8.4. Dealing with Information Asymmetries**

As in any financial market, the market for hedging contracts may require controls over the use of information to prevent insider trading. For instance, information on hydrology and planned outages seems to be important for re-contracting. Lack of access to such information may prevent the emergence of financial market makers and speculators. These considerations may lead to the creation of “Chinese walls” in some financial markets, which require that information from one part of a business is not transferred to another part, except by making it available to the public.

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<sup>79</sup> In section 6.2.1 we noted that behavioural tests for foreclosure needed to distinguish between efficient price differentials between rivals and downstream affiliates (i.e. those that reflect economies of scale), and price differentials reflecting market power.

<sup>80</sup> We recently had the opportunity to view the hedge contract book of a generator in the UK. The generator carried out 4700 trades in 2003 in relation to a 500 MW plant.

In New Zealand, most of the key information that could be used as “inside information”, namely hydrology information, “spill” and planned outages, is all made publicly available either as soon as it occurs (in the case of hydrology) or well in advance (in the case of planned outages). The only additional requirement might be an obligation on generator businesses to update such published information before they inform any trading affiliates.

Nord Pool operates rules of this type and so do several financial markets. However, contract exchanges lay down such rules (or are forced to apply them by financial regulators) as a condition of membership, to promote their commercial interests, i.e. electricity contract trading, rather than to meet Government policy objectives. The purpose of these rules is to convince exchange members that trading is fair (no insider trading or information advantages) and so to attract more business. Financial regulators sometimes intervene to protect the interests of small consumers who are active in (or whose funds are invested in) the financial market itself. Financial regulators do not normally intervene in financial markets to protect the interests of consumers of underlying products, or to increase efficiency in physical production.

If someone sets up a contract exchange in New Zealand, they might follow Nord Pool’s lead by adopting similar rules on information disclosure, but until then government imposition of similar requirements would be intrusive and unnecessary.

## **8.5. Conclusion**

Overall, the New Zealand electricity market is working as well as in most countries. The residual problem of potential market power at peak times is noted everywhere, although it generally applies in thermal systems with generation capacity constraints, rather than energy-constrained hydro systems. There are many obstacles to the creation of a liquid market and, given those obstacles, vertical integration is one efficient alternative. In this circumstance, it would risk a great loss in efficiency to attempt to restrict vertical integration purely to encourage greater hedge contracting, when, in any case, other obstacles may prevent the development of a liquid hedge market.

Although our findings do not support the direct measures proposed by various commentators to prevent or undo vertical integration, we have found areas where the electricity market could be reformed in ways that would make it easier for smaller companies to participate in the industry.

### **8.5.1. FTRs and Basis Risk**

First, the prevalence of *basis risk* is a key driver for vertical integration and also makes electricity companies less willing to offer hedges to customers situated in areas where the company does not own generation capacity. In some cases this problem reduces the competitiveness or liquidity of the market for hedge contracts; in some cases it may eliminate liquidity altogether. Extending the availability of Financial Transmission Rights

would improve the ability of electricity companies to hedge against basis risk, thereby fostering a more widespread and competitive market in hedging contracts (and reducing, at least, the efficiency advantages for vertical integration over hedge contracts). We note that significant work has been done on the development of FTRs, and that, in particular, a Government Policy Statement in December 2002 appears to have gone some way to resolving the central issue over the allocation of surpluses.<sup>81</sup> However, we still foresee some problems. Since proposals to develop FTRs have been under discussion in New Zealand for at least 14 years,<sup>82</sup> it seems possible that implementation problems will persist for some time.

### 8.5.2. Investment incentives and price stability

Second, we note the frequently voiced concern over *investment incentives*. As discussed in section 7, we have not found that vertical integration is a disincentive to investment. Indeed in some markets (such as the UK), vertically integrated companies are viewed as more likely to invest than independent power producers.

At the same time, there is undoubtedly a concern about price levels in dry years, and the stability of prices overall. These concerns are not necessarily compatible with the concern with new investment incentives. Indeed, the current lack of investment is understandable given that average electricity prices have not yet reached the level of new entrant costs. However, through the dry-year reserve scheme, the New Zealand government has already shown itself to be willing to limit price rises. The scheme rewards investment in selected generators, but if the reserve energy scheme is successful in reducing dry-year prices, it is likely to “crowd out” other investment in new generation, as well as reducing the incentive to obtain hedge contracts.

A system of capacity or hedging obligations might provide stronger incentives, if retailers were obliged to show that they had secured hedging contracts and if the penalty for not having sufficient hedges reflected the unit cost of capacity.<sup>83</sup> However, such schemes have not proven successful at removing price volatility. A legitimate concern about price volatility stems from the risk of political responses to high prices, which capacity obligations have not managed to avoid.

In order to achieve price stability without adversely affecting investment incentives, any reduction in dry-year revenues must be offset by an increase in wet-year revenues. To achieve this transfer of revenue between years without distorting spot market incentives, it would be necessary to leave spot prices unfettered by controls. To achieve stable revenues

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<sup>81</sup> Government Policy Statement on Electricity Financial Transmission Rights, 11 December 2002, <http://www.med.govt.nz/ers/electric/ptr/gps/final.html>.

<sup>82</sup> See Read, (2002), p. 21-24 for a discussion of the history of the development of FTR products.

<sup>83</sup> Hanson suggests that a similar “exemption” should apply to the current dry-year reserve scheme, to encourage hedging by consumers. However, the ability to avoid the cost of socialised insurance will not be sufficient to encourage consumers to pay for new generation capacity. (Hansen (2004), p.18)

(and hence stable total costs to customers), generators acting in a purely competitive market would need to sign Contracts for Differences (CFDs) in the form of options with a high strike price. Such options would be “out-of-the-money” in wet years when the spot price is low. Then, when spot prices rose to high levels, the CFD would be “in-the-money” and customers would receive a rebate on a fixed volume of contracts by way of compensation. At the same time, they would pay the spot price for physical offtake, which would encourage efficient consumption decisions at the margin. If a capacity payments scheme is considered desirable to mitigate the effects of high dry-year prices, a scheme with characteristics similar to “out-of-the-money CFD options” might provide the most efficient solution.

It is not within the scope of this report to design a fully developed alternative to the reserve energy scheme. However, we would recommend a review of the purpose, coverage and design of the reserve energy scheme to analyse whether, for instance, a different scheme would offer better prospects for price stabilisation between wet and dry years without discouraging efficient investment.

### **8.5.3. Final conclusion**

Our findings do not support measures for compulsory hedging or that are intended to force the break-up of vertically integrated companies. However, we can see a need to reform aspects of the market that currently drive investors towards vertical integration as an efficient solution to market problems. Vertical integration appears to be an efficient response to problems of market design. Any proposals to improve the operation of electricity markets should be focused on these market design problems.

**APPENDIX A. A NATURAL HYDRO/THERMAL HEDGE**

As discussed in section 5.2.1, a mixed/thermal market provides a natural hedge against variable hydrological conditions. We can illustrate this feature using Figure A.1.

**Figure A.1**  
**Mixed Hydro/Thermal Market**

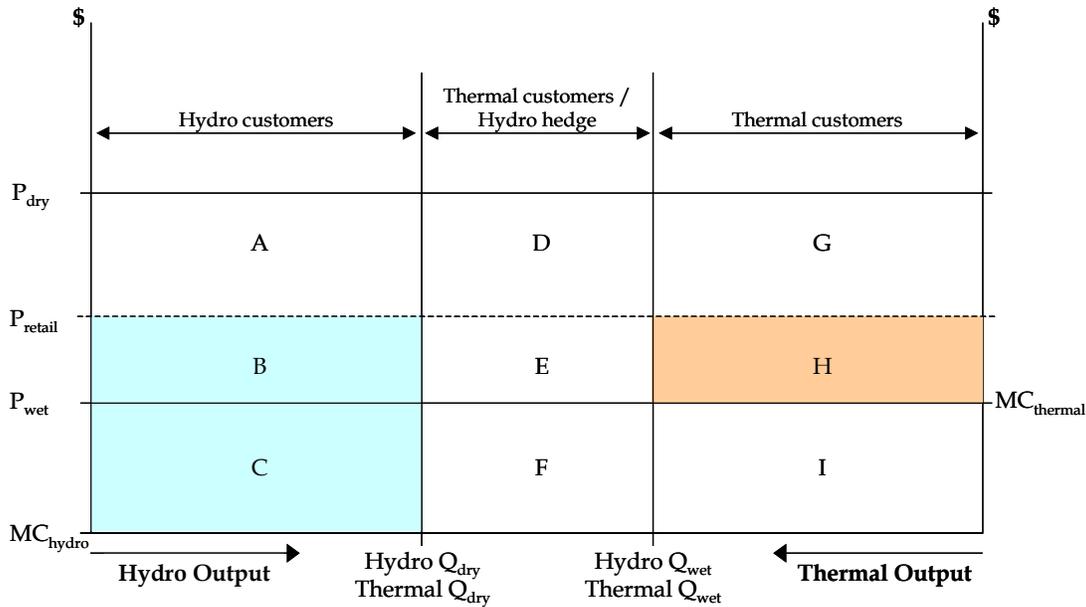


Figure A.1 shows annual output and prices in a two-firm vertically integrated market, where one firm generates using thermal fuels and the other using hydro resources.

In a wet year the hydro generator (whose production is shown *from left to right*) produces the volume “Hydro  $Q_{wet}$ ” and sells at a spot price  $P_{wet}$ , which is set by the marginal cost (MC) of the thermal generator. (The marginal cost of the hydro generator is assumed to be zero.) The thermal generator (whose production is shown *from right to left*) produces the volume “Thermal  $Q_{wet}$ ” and sells at the same spot price,  $P_{wet}$ .

In a dry year the hydro generator is only able to produce the volume “Hydro  $Q_{dry}$ ”, so the thermal generator provides the additional output required to meet demand and generates “Thermal  $Q_{dry}$ ” (reading from the axis on the right). The spot price in a dry year,  $P_{dry}$ , is set by the marginal cost of peaking plant or load shedding (value of lost load, or “VOLL”), at a much higher level. We assume that retail prices are fixed at a level equal to  $P_{retail}$ , which reflects the average spot price, weighted by the respective probabilities of a wet and dry year.

Now consider the distribution of ownership of the retail customer base, whose total consumption is represented by the total width of the figure (hydro production plus thermal

production). If the hydro generator takes on customers (at fixed prices) up to its dry year output and the thermal generator takes on customers (at fixed prices) up to its wet year output, neither will face any price or volume risk in relation to these customers. For these customers, the hydro generator will earn profits equal to B+C (highlighted) in all years, while the thermal generator will earn profits equal to H (highlighted) in all years.

However the situation is different for the retail customers in the middle block. There are two possibilities for these customers:

- (i) If the hydro generator serves customers beyond its dry-year capacity (i.e. the customers in the middle block), then the hydro company will make profits equal to E+F in a wet year, and losses equal to -D in a dry year. To remove this variation in its profits, the hydro company would want to pass the risk back to the thermal company, for instance, by buying a hedge for the customers in the middle block at  $P_{\text{retail}}$ .
- (ii) If the thermal company directly serves customers beyond its wet-year output (i.e. the customers in the middle block), either through direct ownership or through a contract with the hydro company, the thermal company will make profits equal to E in all years. In a dry year, the company produces at marginal cost ( $=P_{\text{wet}}$ ), and sells at the retail/contract price of  $P_{\text{retail}}$ . In a wet year, the profit is the same since firstly, the retail/contract price is unchanged, and secondly, the thermal company's marginal cost is unchanged since it can simply buy from the spot market at  $P_{\text{wet}}$ .

Thus, a risk-averse hydro company will want to serve customers up to its dry year capacity, but will want to lay off the risk of serving any customers in excess of its dry year capacity. A risk-averse thermal company will want to serve customers up to its dry year output, either through direct ownership or through a hedge contract with the hydro generator. Most importantly however, note that there is no risk associated with hydrology conditions for either company. In particular, the spot price provides a natural against for the thermal company in relation to the customers in excess of the hydro company's dry year output (i.e. those in the middle block).

