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making a case for dynamic electricity pricing

California has an energy problem: one quarter of its electricity-generating capacity is used for fewer than 100 hours each year. This capacity sits idle for all but the hottest days in summer, when air conditioning drives peak loads. And each year the costly peaks grow higher – partly because most Californians, who pay a flat rate for their electricity, have no financial incentive to shift their electricity use away from these peaks. This may be changing, however. Matt Burgess plugs into dynamic electricity pricing.

Spurred by the 2000/01 electricity crisis, electricity suppliers and regulators proposed a response to California's peaking problem: dynamic peak pricing. This pricing method was designed to encourage consumers to shift their load out of the peak period on days of especially high demand.

Dynamic pricing is structured as follows. Each day can be one of two kinds: 'normal' or 'critical'. On normal days, dynamic-pricing customers pay a peak rate of 22 cents per kWh between 2pm and 7pm, and a low off-peak rate of 9 cents. Occasionally, on days where very high demand is forecast, the electricity authority declares a 'critical day'. Consumers are informed of a critical day by an automated telephone call no later than 5pm the day before. On critical days, consumers continue to pay 9 cents off-peak, but their peak rate skyrockets to 59 cents.

There were many questions about dynamic pricing. But the most important was whether consumers would respond.

To test this, 2500 residential and small business customers were supplied with smart meters and enrolled in the Statewide Pricing Pilot – a controlled experiment with about one-third of customers paying standard flat rates for their electricity and the remaining two-thirds subject



to dynamic pricing. A range of dynamic prices was used (including the rates outlined above); the flat-rate customers paid 13 cents at all times on all days. The effect of the dynamic prices on behaviour was measured, with some of the flat-rate customers acting as a control. The experiment lasted 18 months.

It don't pay to be cool

So did consumers respond to dynamic pricing? Absolutely – in the summer months. Residential users' electricity

consumption fell by 13% on average on critical days during the peak, and by 7% on 'normal' peak days. Small business customers also responded, with the heaviest users reducing their 'critical peak' consumption by 9% and lighter users by 6%. Response rates varied quite substantially amongst consumers: those who lived in the hot interior areas of California and had air conditioning reduced their critical peak consumption by about double the rate of those who lived in cooler areas (15% versus 7%).

A major issue was whether consumers would develop a tolerance to dynamic pricing and ultimately stop responding. The pilot tested for this in two ways: first, by declaring up to three consecutive critical days; and second, by testing customer responses for two summers. Customer response was found to *not* fall away over consecutive critical days – and in some cases it increased. Responses also persisted over the two summers. Interestingly, responses to standard time-of-use pricing (in which a constant peak price was charged every weekday) faded over time. Consumers who paid this pricing shifted their peak consumption in the first summer, but not in the second.

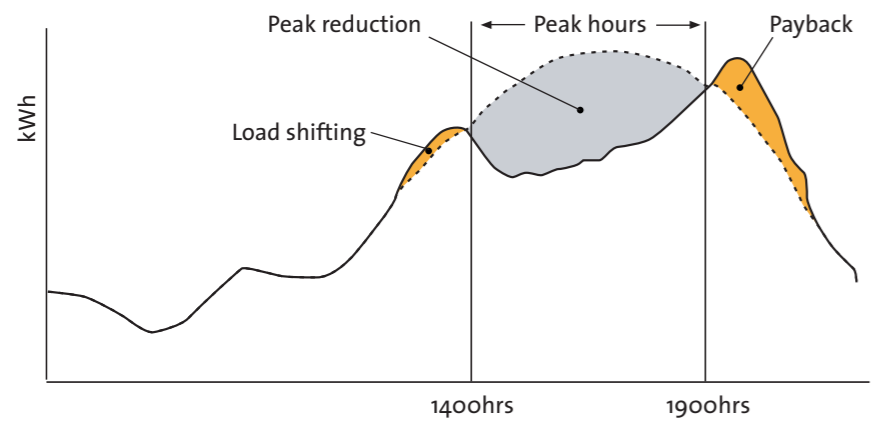
The experiment also tested the effect of enabling technologies, which

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Figure 1: Consumption moves away from the costly peak towards higher off-peak usage (load shifting)



from page 1

automate the response of appliances (air conditioning in particular). The effects were dramatic: customers with enabling technologies reduced their consumption by 27% during the critical peak. Around 60% of this response was attributable to the enabling technology; the remainder to behavioural changes.

And it was apparent that pricing, not information, drives customer responses. Flat-rate customers who were not part of the control group received 'critical day' information, just as the dynamic-pricing customers did. But this information alone wasn't enough – customers needed price incentives before changing their behaviour. In fact, in some areas these information-only customers actually *increased* their consumption during critical peaks. So prices matter.

But summer air-conditioning is not a mirror for winter heating. Consumers were much less willing to turn down their heaters in winter peak periods: the winter response in critical peaks was about one-third that of summer. And, overall, electricity consumption across an entire year was unchanged.

Consumer responses were positively correlated with income, education, electricity use, and number of bedrooms. They were negatively correlated with the number of persons per household, the use of electric cooking, the existence of multiple families in one home, and (especially) participation in low-income assistance programmes.

Surprise! Surprise!

The experiment had a number of surprises. The first was that customers responded at all, after 25 years of demand-side management in California's electricity market and with electricity being only a small proportion of most peoples' budgets. Second, in spite of the rates' complexity, consumers understood and could respond to them. As the study's authors note, 'never underestimate the value of fridge magnets'. Third, and perhaps most surprisingly, customers liked the rates. Most customers saved money under dynamic pricing, and a high proportion of pilot participants viewed dynamic pricing in a positive way. When given an opportunity to continue on a time-varying rate at the end of the pilot, 65% of consumers chose to do this – even when they had to pay an additional \$2 to \$3 extra per month for the advanced metering.

The business case for advanced metering

Using information from California's pricing pilot, electricity suppliers could develop a business case for the rollout of the advanced metering that's required for dynamic pricing. In addition to bringing benefits from dynamic pricing, advanced metering comes with the (surprisingly large) benefit of eliminating costly meter reading – in fact this is its primary benefit!

For PG&E, one of the utilities participating in the pilot, the business case for advanced metering stacks up. The cost of advanced metering is estimated at \$2.2 billion; its

operating-cost savings (mostly from avoided meter-reading costs) at \$2.0 billion.¹ While this leaves a gap of \$241 million, dynamic pricing and the resulting reduction in peak load has been estimated to produce \$338 million in reduced transmission and generating capacity costs. PG&E has recently been given permission to begin rolling out this technology on an opt-in basis later this year. It anticipates signing up one-third of customers with air conditioning, and one-twentieth (5%) of those without.

Applying the lessons downunder

The pricing pilot and the subsequent business case for advanced metering produced important lessons. First, dynamic pricing works: pricing information can be communicated to the mass market in a way that consumers can understand and respond to. Second, prices matter: without financial incentives, consumers are unwilling to make adjustments. Third, consumers like this kind of pricing. Fourth – in California at least – the infrastructure required for dynamic pricing is worth the cost.

Because the effectiveness of dynamic pricing is so dependent on air conditioning, its benefits for cooler countries like New Zealand (where the electricity load peaks in winter, and energy capacity rather than peaking is an issue) remain uncertain. Nevertheless, a New Zealand business case for advanced metering can be readily tested using the data set compiled from the pricing pilot, which is available for research from the California Energy Commission² and, because of its richness, can be readily adapted to local conditions.

¹ Both figures from: A Faruqui and R Earle. 2006. 'Demand Response And Advanced Metering' Regulation Spring pp24-7.

² For details, contact ISCR.

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Going Once! Going Twice! EXTENDED! online auction rules & bidder behaviour

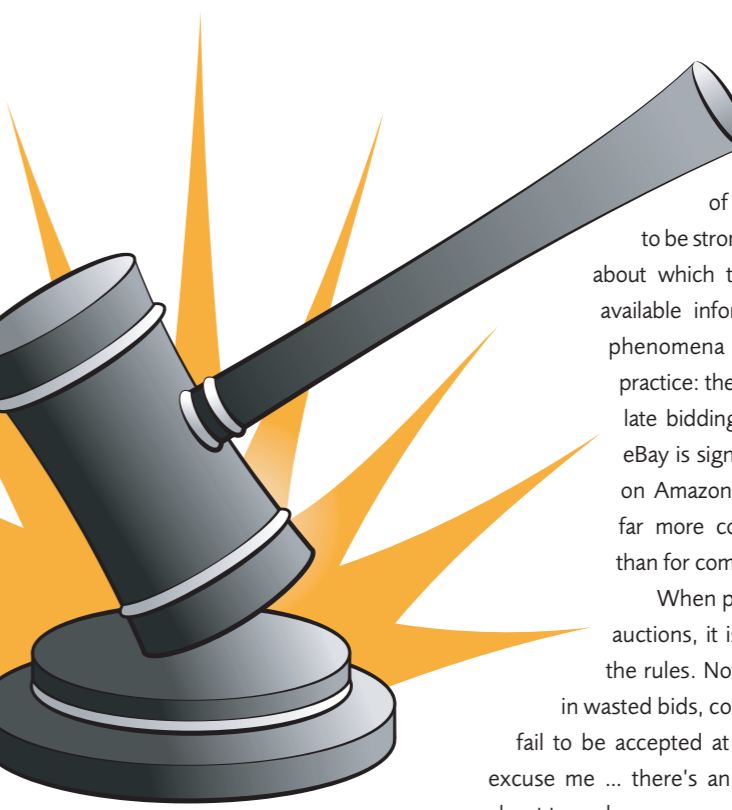
Websites such as Trade Me and eBay allow users to buy and sell goods via online auctions. But they have different rules for dealing with late bids. Do such differences matter for bidder behaviour and auction outcomes – and, if so, why? René Le Prou investigates.

Online auction websites use different rules for the end of an auction. The world's largest online auction site eBay opts for a fixed end-time, ensuring that an auction will indeed end at that time. Others such as Amazon and New Zealand's most popular online auction site Trade Me use an auto-extend feature – which means that auctions are automatically extended past the scheduled end-time until two minutes have passed without a bid.

According to the Trade Me website, 'auto-extend prevents buyers being outbid in the closing stages of an auction and as a result sellers gain the maximum price for their auction'. On eBay auctions, however, buyers can be outbid right at the end of an auction: such last-minute bidding is known as 'sniping'. But sniping is risky – those who engage in it may not be able to get their bid in on time.¹

Do these differences in rules lead to different bidding strategies? It seems so. Out of 240 randomly-selected eBay auctions that occurred between October 1999 and January 2000, 89 had bids placed in the last minute – and 29 were placed in the last 10 seconds, despite the risk of being 'shut out'. By contrast, only one of 240 Amazon auctions had a last-minute bid placed on it.²

What factors might cause late bidding to be an optimal strategy on eBay, but not on Amazon? First, snipers are able to incorporate more information into their bidding decisions. Second, sniping can help 'crowd-out' competing bids. In auto-extend auctions such as those on Trade Me and Amazon, such factors are less important: an auction simply extends if last-minute bids are placed, allowing



an incremental bidder to respond. However, other advantages of sniping would seem to apply equally as well to Amazon as they do to eBay. For example, regardless of auction-end rules, sniping pre-empts 'shell' bidding, where the seller places dishonest bids; and it avoids price wars with inexperienced bidders who bid incrementally so that they remain the highest bidder throughout the auction.

One might expect that bidder response to auction-end rules, and hence the attraction of sniping, would depend on the characteristics both of bidders and of the goods being auctioned. For example, experienced bidders should be more drawn than inexperienced bidders to the advantages of sniping on eBay, as the latter are more likely to be concerned about being shut out. But since the auto-extend feature protects against shut-out, there is less reason for experience-based differences in

bidding strategy to arise on Amazon. Also, the informational advantages of sniping would seem to be stronger for auction items about which there is less readily-available information. Both these phenomena are observed in practice: the correlation between late bidding and experience on eBay is significantly greater than on Amazon, and late bidding is far more common for antiques than for computers.³

When participating in online auctions, it is important to know the rules. Not doing so can result in wasted bids, costly bids, or bids that fail to be accepted at all. Now ... if you'll excuse me ... there's an eBay auction that's about to end.

¹ Unsurprisingly, a market has developed for computer software that will place bids on behalf of the user at the latest possible stage of an auction, hence improving the chance of a bid being successful.

² See A E Roth & A Ockenfels. 2002. 'Last-Minute Bidding and the Rules for Ending Second-Price Auctions: Evidence from eBay and Amazon Auctions on the Internet' *American Economic Review* 92(4) pp1093-1103.

³ One needs to be a little careful here, as differences between eBay and Amazon could simply reflect bidder self-selection – that is, fundamental differences in the characteristics of buyers and sellers on the two sites. However, controlled experiments in which participants are randomly assigned to eBay and Amazon auction-end rules yield the same results. See: D Ariely, A Ockenfels & A E Roth. 2002. *An Experimental Analysis of Ending Rules in Internet Auctions* CESifo Working Paper No 987.

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Taking it from the top

ISCR chair Richard Bentley gives his perspective on what ISCR is all about.

In June 2006 I inherited the mantle of ISCR board chairman from our first chairman Adrian Orr. It therefore seems an opportune time to provide a reminder of what ISCR is, what it does, and how it does it.

ISCR – which was established in February 1998 – is a charitable trust that funds research into the organisation and regulation of markets, industries and firms. Membership is open to all who wish to support top-quality research in these areas.

To ensure this 'quality' goal, and to provide a focus for the overall programme, all ISCR research is carried out under the auspices of a research group based at Victoria University of Wellington.

The research undertaken by this group has three particular features.

First, it aims to meet the highest standards of academic rigour and scholarship. This is achieved by making extensive use of academics who are experts in their respective fields and by encouraging publication both in the academic press and through a variety of other means. The widely distributed *ISCR Competition and Regulation Times* is an excellent example of this, and so are the many public seminars run throughout the course of each year. Plus, of course, all completed projects are available on the ISCR website (www.iscr.org.nz).

Second, the results of the research programme are what they are, and thus independent of the interests of any particular member. Members can commission work on a variety of topics, but have no input into the research process and no influence over the results of the research. ISCR members receive a number of benefits, including access to researcher expertise, but the research programme is largely the prerogative of its executive director (a university employee) although it is agreed in broad terms with ISCR.

Third, the research programme is not fixed on one particular area or based on one particular method. Some of it is empirical; some of it is theoretical. Some of the research focuses on a particular industry; other areas have a more general perspective. Some projects are primarily designed for an academic audience; others have a more practical and applied focus. Some address an immediate issue; others look to the long term. In short, ISCR research is a broad church.

My own experience of the regulation of markets and firms in New Zealand has been a mixed one. Through NGC, I was pleased to support ISCR when it was established, and I look forward as ISCR chair to do what I can to improve public debate and institutional performance in this complex area.

EDITORIAL



Richard Bentley CMNZ is chair of ISCR's board. He is also chairman of Rissington Breedline Limited, MediaLab South Pacific Limited, Wool Equities Limited, Crop and Food Research Limited, the Karori Wildlife Sanctuary Trust, and the Carter Observatory. From 1989 to 2001 he was the Chief Executive of NGC, and subsequently a director of NGC. Richard is a qualified engineer and a Distinguished Fellow of the Institution of Professional Engineers New Zealand, and he holds a master of commerce degree in economics from the University of Canterbury.

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Hanqing Wang Earnings Manipulation and Risky Investment

CAPM skating on thin ice

Practical applications of the celebrated Capital Asset Pricing Model (CAPM) typically employ a prior and independent estimate of the market risk premium (MRP). But, as Glenn Boyle explains, the CAPM itself places an exact restriction on the allowable MRP, an insight that has intriguing implications for cost of capital estimates.¹

In estimating the cost of capital for any investment project, the most pressing issue is how big a premium should be allowed for risk. Intuitively, high-risk projects should command a higher premium than low-risk projects, but this qualitative insight offers little help in assigning a specific value. Because the premium is not directly observable, progress requires estimation of a theoretical value – typically from the CAPM. According to that model, the risk premium for a given project is equal to the product of that project's beta and the MRP. Intuitively, beta is the 'quantity' of risk to which the project is subject while the MRP is the 'price' per unit of risk; their product then provides the increment to expected return required to compensate investors for taking on the risk inherent in the project.

Using the CAPM to estimate an investment's risk premium therefore requires reliable input values for beta and the MRP. In practice, these are usually assumed to be unconstrained parameters that can be estimated directly from data. In the case of the MRP, for example, one common method calculates the historical average of the realised difference between aggregate stockmarket returns and some proxy for the riskless interest rate. An alternative method backs out the MRP implied by the current stockmarket level, given expectations about future growth in aggregate dividends and earnings.

Despite the popularity of these data-based methods, they suffer from a significant flaw: they ignore the implications of the CAPM for the MRP itself. After all, the aggregate market is simply a weighted combination of all individual assets; so if the CAPM can shed light on the latter, it should also be able to say something about the former.

In fact, an often-overlooked implication of the CAPM is that the MRP must equal the product of average investor risk aversion and the variance of stockmarket returns:

$$MRP = \text{average investor risk aversion} \times \text{variance of stockmarket returns}$$

This can be understood by recognising that average risk aversion reflects investors' required tradeoff between risk and expected return, which must equal the tradeoff offered by the market – the ratio of the MRP to the variance of stockmarket returns. That is:

$$\text{average investor risk aversion} = \frac{MRP}{\text{variance of stockmarket returns}}$$

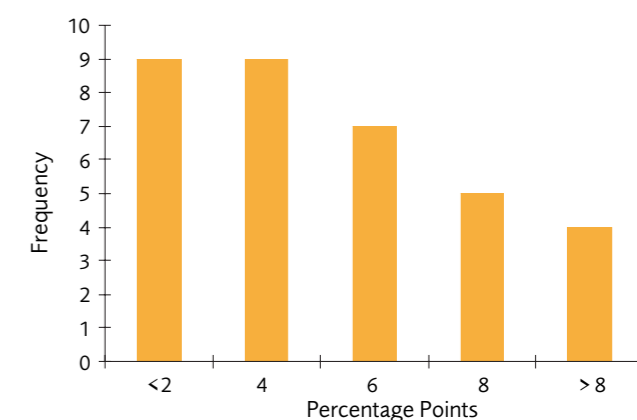
which can be rewritten as the first equation above.

This analysis suggests an additional 'fundamentals-based' method for estimating the MRP. That is, rather than estimate it directly, one can do so indirectly by estimating its underlying components – risk aversion and volatility. Such an approach has two distinct advantages over the traditional data-based methods. First, obtaining the MRP from the CAPM itself ensures consistency in the estimation of all risk premiums. Second, estimating the variance of returns (the fundamentals-based approach) is much easier than estimating expected returns (the data-based approach); the precision of the former increases with the number

of observations, but accuracy in the latter also requires a long time series of data. Therefore, by using high-frequency data, the fundamentals approach can potentially pick up risk-based shifts in the cost of capital over the business cycle. By contrast, the data-based methods, depending as they do on data extending back over many years, change only very slowly and are thus largely impervious to changes in the risk environment.

Unfortunately, applying the fundamentals approach reveals a significant problem: the estimated variance of New Zealand stockmarket returns is extremely volatile, resulting in implausible swings in the MRP and hence the cost of capital. Setting risk aversion equal to the 1.4 value implied by long-run New Zealand data, Figure 1 summarises the MRP distribution generated by the fundamentals approach for the period 1970-2004. Approximately 25% of the estimates are less than two percentage points, while another 25% are greater than six percentage points. Over the full period, the minimum premium estimate is 0.009% while the maximum is almost 34%. Acceptance of such volatility implies comfort with large swings in the cost of capital.

Figure 1: Estimated market risk premium using the fundamentals approach 1970-2004



What might explain this result? One possibility is the presence of irrational noise traders whose optimism waxes and wanes over time. Another is that investors are rational, but the true risk-return tradeoff differs from that envisaged by the CAPM. Unfortunately, neither inspires much confidence in the ability of the CAPM to provide reliable cost of capital estimates. Such estimates need to be treated with considerable caution.

¹ This article is based on: G Boyle. 2005. 'Risk, expected return, and the cost of equity capital' *NZ Economic Papers* 39(2) pp181-194.

Glenn Boyle is the Executive Director of ISCR and a professor of finance at Victoria University of Wellington.

RESERVE GENERATION: swimming against the current?



During the winters of 2001 and 2003, low water-levels in New Zealand's key hydro lakes created the prospect of insufficient electricity-generation capacity – and electricity blackouts. At the same time, the spot market for electricity experienced high price volatility. While a range of voluntary consumption-reduction measures helped avert compulsory blackouts and brought down spot-market prices in both years, the government decided to try to forestall a repeat of these episodes by creating an Electricity Commission whose main role was to ensure security of supply by maintaining dry-year reserve-generation capacity. Three years on, Seamus Hogan evaluates the thinking behind this.

The intention was that the Electricity Commission would maintain capacity (in both generation and fuel) at a level that allowed normal demand to be met in a '1 in 60' dry year, with that capacity lying idle in most years. This policy is now in place: the 155MW thermal station at Whirinaki is able to supply about 3% of normal winter electricity use in New Zealand. Since the Commission will earn revenue from the sale of electricity only in those rare '1 in 60' events, the cost of maintaining the reserve capacity is largely met through the imposition of a levy on all sales of electricity in all years.

At one level, this policy seems to make sense. The root problem in dry years is not that the electricity market is functioning any differently from how it functions in other years. It is simply that adverse climatic conditions means there is less generation capacity than would normally be the case.

Reserve generation looks to maintain additional generation capacity to be brought on-line in dry years.

Economist gobsmacked

To an economist, however, this policy initially seems very strange. Just because a certain amount of electricity is consumed in normal years when climatic conditions are favourable, it does not automatically follow that it would be worthwhile consuming the same amount in years when it is more expensive to produce. It is obviously very expensive to maintain a significant amount of generation capacity that will be used only in the winter months of about 1 year in every 60.

The key question for an economist is the following: if the benefit of maintaining the reserve capacity exceeds the cost, why would a private firm (or state-owned enterprise charged with making profit) not have invested

in the capacity itself, and captured the benefit in the form of the price charged to customers? The government addressed this question by noting that 'reserve generation for use in very dry years will not be used often enough to make an adequate return on capital by normal commercial criteria'.¹ This statement is uncontroversial – but it does not explain why reserve generation would still be socially beneficial despite its inability to earn an adequate return on capital.

The difference between the two views is a matter of perspective. The government sees the problem as security of supply: 'the current electricity market does not appear to provide enough incentive for generators to provide for adequate supply security in very dry years'.² In the economist's view, the question is not how to maintain security of supply, but rather how to ensure that supply is maintained *to the extent that its benefit exceeds the cost*.

There are, however, some singular features of electricity as a commodity in general (and of the New Zealand electricity market's structure in particular) that mean an economist's reaction may not be warranted in this case – although the reserve-generation policy is not necessarily the best response to those features.

To understand why a policy of reserve generation could in principle be an improvement on the situation New Zealand faced in 2001 and 2003, it will be useful to first consider how other markets deal with volatility in the difference between demand and capacity.

Dry and high

The question, in an electricity network in which weather patterns can bring about year-to-year fluctuations in total capacity, is whether to build enough capacity to meet normal demand in years when capacity is reduced because of adverse weather – or to build only enough to meet normal demand in normal years. A similar issue is faced in a market where demand fluctuates over time. Consider, for instance, the market for motel accommodation in areas where motel demand is much higher in the summer than the winter. The response of moteliers to this fluctuating demand is to set prices higher in the summer than the winter. The resulting price variation between the seasons can even out the demand variation so that there are high levels of capacity utilisation at all times. Alternatively, if the demand variation is sufficiently high, the price in the peak season can be high enough to cover the cost of maintaining the capacity required during that season, even though it will lie idle in the off season.

In the electricity market, the seasonal variation that we are concerned with here – the variation between dry and rainy autumns in the key hydro lakes – comes in capacity rather than demand. But the general principle is the same: if prices to consumers were to be higher during winters with low hydro-lake levels than in winters with higher lake levels, then the high dry-year prices would create *both* an incentive for consumers to reduce their demand to meet the lower capacity *and* an incentive for generators to maintain higher capacity in order to be able to sell more electricity at those higher prices.

The fact that the overall reserve-generation operation is likely to run at a loss, thus necessitating the levy, does not in itself indicate that the supply provided in dry years would not be socially valuable.

Spot the price

There are many technical features of electricity as a commodity that make the market for electricity more complicated than many others. But in the New Zealand electricity market the key institutional detail is that, while the spot-market price can be highly volatile in response to climatic volatility in generation capacity, the majority of electricity consumers are on fixed-price contracts. Indeed, much of the high volatility in the spot market can be attributed to the fact that only a small proportion of end users face any price volatility at all. As a result of retail prices not varying to reflect underlying climatic conditions (and hence not creating an incentive for demand to adjust to those conditions), much capacity goes unused during summers and normal-year winters; but, in dry-year winters, consumers face the real prospect of blackouts at the fixed price even though many of them would be willing to pay a higher price to guarantee supply.

In the event of a blackout, some consumers would be willing to pay more than the fixed price for additional units of electricity. If the government then introduced reserve capacity into the market in a year when blackouts were likely, the value to consumers (as indicated by their willingness to pay) of those additional units of electricity could be higher than the amount the government would receive from selling them. That is, the fact that the overall reserve-generation operation is likely to run at a loss, thus necessitating the levy, does not in itself indicate that the supply provided in dry years would not be socially valuable.

One cannot dismiss the hypothesis that the current government policy of maintaining reserve generation administered by the Electricity Commission arose simply as a political response to the perceived need to be seen to be doing something about a market that had resulted in a threat of blackouts in two years out of three. But the above analysis does provide an argument for why a reserve-generation policy along these lines could *in principle* constitute an improvement on the policy environment that had been in place previously.

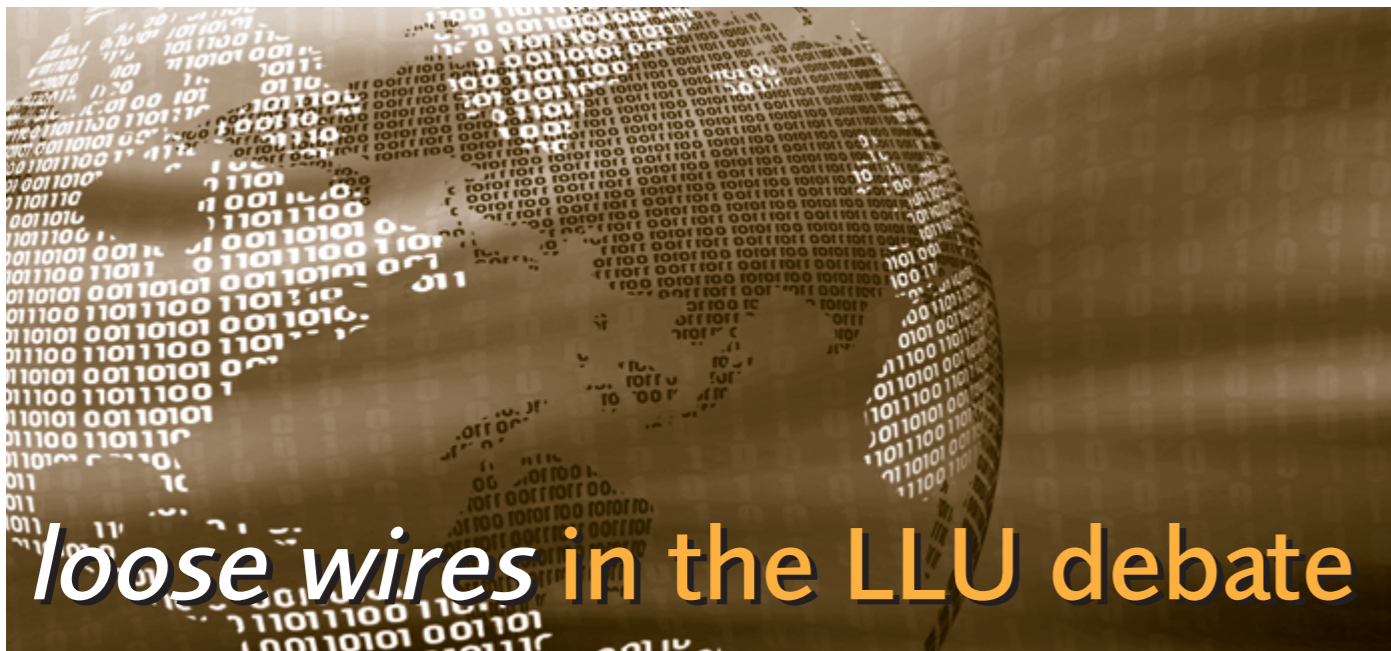
The relevant question, however, is not whether the reserve-generation policy represents an improvement on what went before. It is whether that policy is the best one available for dealing with the problem of an electricity-generation system that is heavily subject to climatic fluctuations. Reserve generation is the optimal policy only in the extreme case where it is cheaper to have *all* of the burden (of making up for the 'lost' hydro capacity in a dry year) borne by creating reserve supply – and none of it borne by consumers' reducing their demand.

Ideally, one would have a system providing electricity at a price that reflects the true cost of production (including any environmental costs), creates the right producer incentives to create additional capacity, and creates the right consumer incentives to economise on consumption. The key is that these twin sets of incentives require higher prices in dry years. It is not clear why the market in New Zealand has produced so little price variability to consumers – and, if there is an external constraint that prevents optimal price variability, then reserve generation may be the second-best option. The risk, however, is that by insulating consumers from the main downside of fixed prices – that is, the possibility of blackouts – the reserve-generation policy has made a move to flexible pricing less likely and so has prevented a first-best outcome emerging.

¹ www.beehive.govt.nz/hodgson/electricity-commission/qa.cfm

² *ibid.*

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In early May, following a Ministry of Economic Development (MED) stocktake of the New Zealand telecommunications sector, the government announced Telecom would henceforth be required to lease local-loop access on request to any new entrant, at prices to be set by the Telecommunications Commissioner. Bronwyn Howell assesses the evidence.

The stocktake's case for local loop unbundling (LLU) is based on the premise that New Zealand's current OECD ranking of 22nd for broadband connections per capita is a failure that constrains New Zealand's ability to participate in economic growth associated with the so-called 'knowledge' economy. LLU is seen to be necessary for New Zealand to reach the top OECD quartile in broadband uptake per capita by 2015, for two principal reasons. First, 'the striking characteristic of all countries in the OECD top quartile is that the new entrants hold a significant share of the total broadband market',¹ with the OECD being 'in no doubt that [LLU] has been a major factor in the recent acceleration of broadband uptake across the OECD'.² Second, 'the European Regulator's Group states that competition is (mainly) driven by access regulation and is access-based (intra-modal) rather than inter-modal (facility-based/alternative infrastructures)'.³ In short the MED stocktake asserts that New Zealand's low broadband-uptake is primarily attributable to a regulatory regime that inhibits intra-platform competition, that local loop unbundling will stimulate such competition, and that as a result broadband uptake will increase.

All this may be true. But, based on the evidence contained in the stocktake, one cannot be too confident.

Jumping through loops

Consider the first assertion – that New Zealand's low broadband-uptake is due primarily to an absence of intra-platform

competition. The stocktake uses the market share of new entrants as the measure of such competition, pointing out that the 'top eight' OECD countries have a higher percentage of broadband connections sold by new entrants than does New Zealand. While this is true, it is difficult to draw any robust conclusions from the data. For example, Finland (6th in broadband uptake) has a new-entrant market share of 28%, only marginally more than New Zealand's 22%. More generally, the data for EU new-entrant DSL market shares and DSL uptake (at May 2005) fail to reveal any significant correlation between these characteristics – and, if any correlation exists, it is negative. (See Figure 1.)

More detailed research also casts doubt on the existence of any robust economic link between regulatory regime and broadband uptake. For example, one careful study assesses the relative effects of unbundling (intra-platform competition) and competition between different infrastructures⁴ (inter-platform competition) in the EU between 2002 and 2004.⁵ The authors state that 'while inter-platform competition drives broadband adoption, competition in the market for DSL services does not play a significant role'. Moreover, they point out that 'the coefficient of the Herfindahl index expressing the level of concentration within the DSL segment is ... numerically much smaller than the one related to the inter-platform concentration index, and is very close to zero ... although competition between DSL firms can potentially play an important role in promoting broadband

diffusion, this effect seems to be completely overwhelmed by the negative 'indirect' effect of increased inter-platform competition'. Interestingly, the stocktake describes these conclusions as 'tentative' – a somewhat questionable interpretation.

Similarly, a US study based on 1999-2004 data concludes that 'intra-platform competition seems to have a positive impact only initially on the rate of diffusion, but then dissipates. For the longer term, inter-platform competition has a much more important role in driving the rate of diffusion'.⁶

On this sort of evidence, it seems questionable whether New Zealand's perceived low broadband-uptake can be attributed to its regulatory regime.

More is less

On to the MED's second assertion – that LLU enhances intra-platform competition. Despite claiming that circumstances have changed since 2003 (when the Telecommunications Commissioner recommended against LLU), the stocktake does not revisit the relative costs and benefits of LLU. Instead, it prefers to accept the view of foreign (OECD and European Regulator's Group) officials that 'emerging international evidence indicates that competition has increased and the uptake of broadband services has improved following full implementation of LLU'.⁷ And it simply rejects the significant negative impact that unbundling may have on the incentives of providers (especially incumbent providers) to invest in future generations of infrastructure.⁸

Yet Figure 2 shows that, as a percentage of revenue, EU incumbents are investing substantially less in infrastructure under LLU, and that total new infrastructure investment is decreasing across time.⁹ Figure 2 also contradicts officials' claims that incumbents invest aggressively in the face of increased competition. Rather, as revenues fall with falling market shares, incumbents appear to invest no more than their declining revenues would justify.

Set my broadband free

Finally, what can be said about the assertion that LLU results in greater broadband penetration? As already mentioned, recent studies suggest that intra-platform competition is less important than inter-platform competition for the purposes of promoting broadband uptake. A growing body of literature also finds that demographic and geographic characteristics (such as GDP per capita, population density, the degree of urbanisation, the price of broadband products, and the price of the local telephone call required for dial-up access) account for much of the difference between

countries' broadband penetrations.¹⁰ Thus New Zealand's low GDP per capita (21st in the OECD), small and relatively dispersed population, relatively large land-area, low ISP charges, and zero marginal cost for dial-up largely explains the low number of broadband connections.¹¹

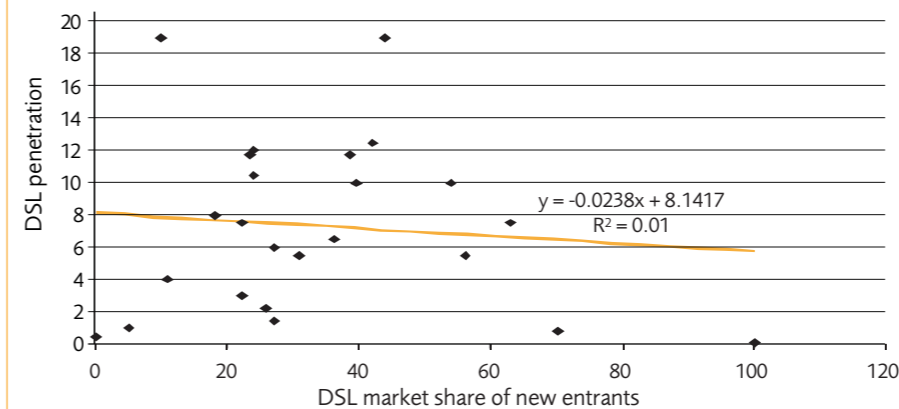
Implicit in the stocktake is the view that a significant supply-side problem frustrates an underlying and pent-up demand for broadband. Yet other characteristics of the New Zealand telecommunications sector offer little evidence of a supply problem: it has the highest percentage of internet users in the world,¹² one of the earliest commercial ADSL offerings (in January 1999, after the United States and Canada), one of the widest availabilities of DSL lines in the OECD (reaching over 93% of the population at September 2005), and incumbent broadband packages that are between 8% and 30% cheaper in purchasing power parity terms than the equivalent product in any of the 'top eight' OECD countries.¹³

Such factors suggest that demand might be at least as important in explaining New

Zealand's low broadband-uptake. For example, most New Zealanders may prefer the artificially low cost of dial-up. Alternatively, applications requiring broadband (for example, video and audio streaming) may not be highly valued by the majority of consumers – or it simply may be that such applications (as in Internet Protocol Television) are not offered in New Zealand or have close substitutes (such as Sky TV sports) not generally available over the internet. However, the stocktake devotes only two paragraphs to demand-side issues.

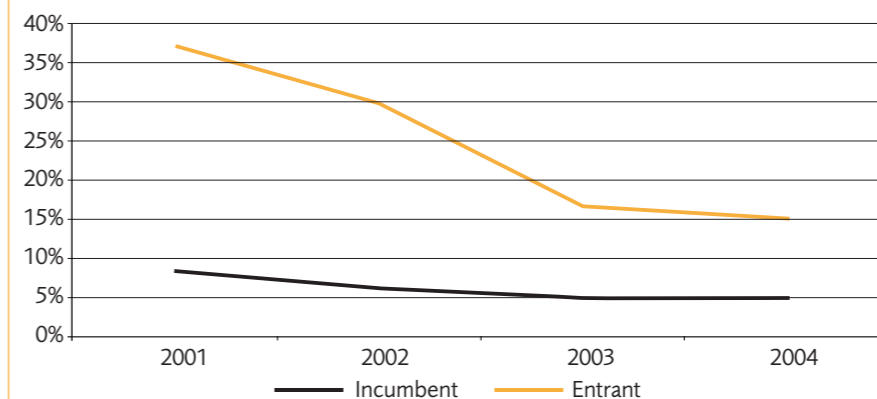
A considerable amount of high-quality evidence indicates that the link between LLU and the number of broadband connections is tenuous. It is vibrant competition *between platforms* that appears to have a significant impact on broadband penetration. In this context, the recent release of Vodafone's 3G mobile broadband into the New Zealand market, offering speeds and prices very comparable to DSL, seems likely to have a more beneficial effect on broadband uptake than LLU.

Figure 1: DSL penetration and new-entrant DSL market share in the EU 2005



Source: European Regulators Group. 2005. *Broadband Market Competition Report 25 May* p4.

Figure 2: Telecommunications investment trends in the EU 2001-2004



Source: http://ec.europa.eu/information_society/policy/ecom/comm/doc/info_centre/studies_ext_consult/assessmt_growth_invst/investment.pdf

- 1 Network Strategies. 2006. 'The broadband divide: achieving a competitive international ranking' (commissioned by the Ministry of Economic Development) p12.
- 2 MFAT cable 20 March 2006 'Regulation of Broadband Access: OECD Perspectives'.
- 3 Ministry of Economic Development. 2006. 'Promoting competition in the market for broadband services' (Telecommunications Stocktake supporting document) para 7.
- 4 Such as cable, copper, wireless, mobile, and fibre.
- 5 W Distaso, P Lupi and F Manenti. 2006. 'Platform competition and broadband uptake: theory and evidence from the European Union' *Information Economics and Policy* 18 pp87-106.
- 6 M Denni and H Gruber. 2006. *The diffusion of broadband telecommunications: the role of competition* Paper presented at the EARIE Conference Amsterdam. August 25-27.
- 7 Ministry of Economic Development. 2006. *Telecommunications Stocktake* para 114.
- 8 *ibid.* Regulatory Impact Statement p12.
- 9 Some (but not all) of this decrease reflects decreasing prices of inputs.
- 10 S Wallsten. 2006. *Broadband and Unbundling Regulations in OECD Countries* AEI-Brookings Joint Center for Regulatory Studies Working Paper 06-16.
- 11 Putting September 2005 New Zealand data into the simplest of Wallsten's (2006) models indicates a broadband uptake of around 8.6 per 100 – very similar to the measured 8.1 and leaving New Zealand unchanged at 22nd in the OECD rankings.
- 12 International Telecommunications Union (www.itu.org) September 2005.
- 13 Based on a 10Gb 2Mbps (high data-quantity, reasonably fast speed) connection. Only Korea and Canada offer products in this market that are demonstrably faster than the New Zealand product.

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Continuous Disclosure at NZX: MORE EVIDENCE

In the last issue of *Competition & Regulation Times*, Gerry Gallery considered the impact of the New Zealand Exchange's (NZX's) continuous-disclosure listing rules on the accuracy of management-earnings forecasts. Now Alastair Marsden and Russell Poskitt pick up the pace. They assess the effect of these rules on both the accuracy of analyst forecasts and the efficiency with which the stockmarket processes information.¹

In late November 2002 the Securities Market Amendment Act 2002 was passed. This legislation introduced a statutory continuous-disclosure obligation for NZX-listed companies that was modelled on the Australian regime and set forth substantial penalties for contravention of a company's disclosure obligations. And, while the legislation was before Parliament, the NZX also amended its listing rules relating to continuous disclosure. These new listing rules required companies to immediately disclose any material (that is, price-sensitive) information, on the presumption that the information belongs to all investors rather than to the company.² The new listing rules also carried forward the prohibition on selective disclosure of information.

Why were these changes introduced? For a number of years successive governments had been prepared to take a light-handed approach to disclosure regulation – but NZX's disclosure regime became perceived, in some quarters, as out of step with 'international best practice' and as a hindrance to widespread investor participation.³ Both the New Zealand government and the NZX felt that investor confidence would be enhanced if international investors could identify familiar standards such as continuous disclosure.

What did you expect?

Proponents of continuous disclosure argued that it would reduce information costs, assist

investors in making informed decisions, and enhance confidence in the integrity of the market (by removing opportunities for insider trading and for the creation of a false market).⁴ By contrast, critics disputed the claim that greater regulation would restore international investor confidence and boost economic growth, arguing instead that sound economic policy is of more importance to market confidence than greater regulation.⁵

Opponents of the reform package also suggested that the proposed disclosure regime would reduce the incentive for brokerage firms to invest in research and that investors (particularly retail investors) would be deluged with too much information. This, they argued, would increase price volatility as investors over-reacted to the influx of often-superfluous information. Finally, the prohibition on selective disclosure practices (such as providing private guidance for analysts' earnings forecasts) would, it was argued, diminish the role that analysts played in ensuring that stocks are priced efficiently.⁶

Research questions

To shed light on these issues, our research focused on two earnings-related aspects of the financial information environment of NZX-listed stocks – the performance of analysts' earnings forecasts, and stockmarket price reactions to annual-earnings announcements. We hypothesised that if the reforms lead

The paper on which this article is based received the ISCR Best Paper Award at the 2006 New Zealand Finance Colloquium. It is available from ISCR (www.iscr.org.nz/navigation/research.html).

companies to disclose more value-relevant information to investors and to do so in a more timely fashion, then we should see both an improvement in analysts' forecast accuracy and stock prices moving closer to their full-information (post-announcement) level during the period immediately before the earnings announcement. That is, a superior pre-announcement earnings-information environment should result in a smaller price reaction around the date of the annual-earnings announcement.

Since the Act took effect in December 2002, we defined the pre-reform period to be the two-year period between 1 January 2001 and 31 December 2002, and the post-reform period to be the two-year period between 1 January 2003 and 31 December 2004. Our data sample comprised the 62 companies that were continually listed on NZX over the four-year period from 1 January 2001 to 31 December 2004.

To analyse the accuracy of analysts' forecasts we collected actual and forecast annual-earnings-per-share data from the International Brokers Estimate System database.⁷ We used two measures to proxy for analysts' earnings forecast performance: forecast error and forecast dispersion. Forecast error was defined as the absolute value of the difference between the actual

annual earnings per share and the mean financial analysts' earnings forecast for the company (as at the date of the most recently updated forecasts before the earnings announcement). We measured forecast dispersion as the standard deviation of individual analysts' forecasts (also as at the date of the last annual-earnings forecast before the earnings announcement).⁸

To investigate the effect of the new disclosure regime on the informational efficiency of stock prices, we obtained adjusted stock return data for the 62 NZX-listed stocks and estimated the degree to which pre-announcement stock prices assimilated earnings-related information. Specifically, we determined the 'information gap' associated with each annual-earnings announcement by calculating the absolute value of the 'abnormal' stock return around the earnings announcement date. A smaller abnormal return in the post-reform period suggests a reduction in the information gap following the introduction of the new continuous-disclosure rules.

And the answers are: no ... and yes

Our analysis showed that there was no significant change in either the mean or median analysts' forecast error in the post-reform period. The mean and median analysts' forecast dispersion, however, showed a significant decline in the post-reform period. These results were also confirmed by multivariate regression analysis, where we sought to control for factors (such as company size and the number of analysts who follow a company) that may impact on the accuracy and dispersion of earnings forecasts. Overall our results showed greater convergence of analysts' forecasts in the post-reform period, suggesting that continuous disclosure results in the same information set being available to all analysts.

Turning to the informational efficiency of stock prices, we found evidence suggesting that the information gap was smaller following the introduction of continuous disclosure. That is, in the post-reform period there was a smaller abnormal price reaction when the company's actual earnings results were released to the market. This finding suggests that the reforms were successful in encouraging the flow of value-relevant information into the market before the release of the annual-earnings announcement. However, closer examination of the results using multivariate regression analysis revealed that the increase in informational efficiency was primarily

concentrated in smaller stocks – there was no indication of an increase in the informational efficiency of the prices of larger stocks in the post-reform period.

What do we make of all this?

We find that the enhanced continuous-disclosure regime introduced in December 2002 led to modest (but possibly important) improvements in the information environment for NZX-listed stocks. This is consistent with the intent of the reforms. And – interestingly – it is contrary to the proposition that successful prosecution of violations of securities markets' regulations, rather than the introduction of sanctions, is essential to changing firm and market behaviour.⁹

While on the face of it this might be cause for celebration in investor and regulatory circles, several caveats are in order.

First, there have been well publicised problems with the application of the continuous-disclosure regime as it is applied to profit revisions. Shortly after the introduction of the new regime, a number of factors inhibiting companies from providing timely revisions to profit forecasts were identified. These included:

- the reluctance of companies to disclose downward revisions until the last moment, either in the hope that a turnaround could be achieved or to avoid a negative reaction by investors
- the difficulty companies have in distinguishing between an aberration and a trend
- the problems companies face in preparing forecasts outside their normal six-monthly budget cycle.¹⁰

More recently, the controversy surrounding the timeliness of Feltex's earnings-downgrades in 2005 suggests that some

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Investment in transmission assets is subject to high and irreversible costs, and uncertain net benefits. The former implies a desire to avoid over-investment in transmission; the latter a desire to avoid under-investment. In general, these desires involve balancing economies-of-scale efficiencies (which help avoid under-investment, but make over-investment more likely) with the flexibility associated with smaller and/or alternative investments (which reduce the likelihood of over-investment, but may result

companies are still struggling with their continuous-disclosure obligations.

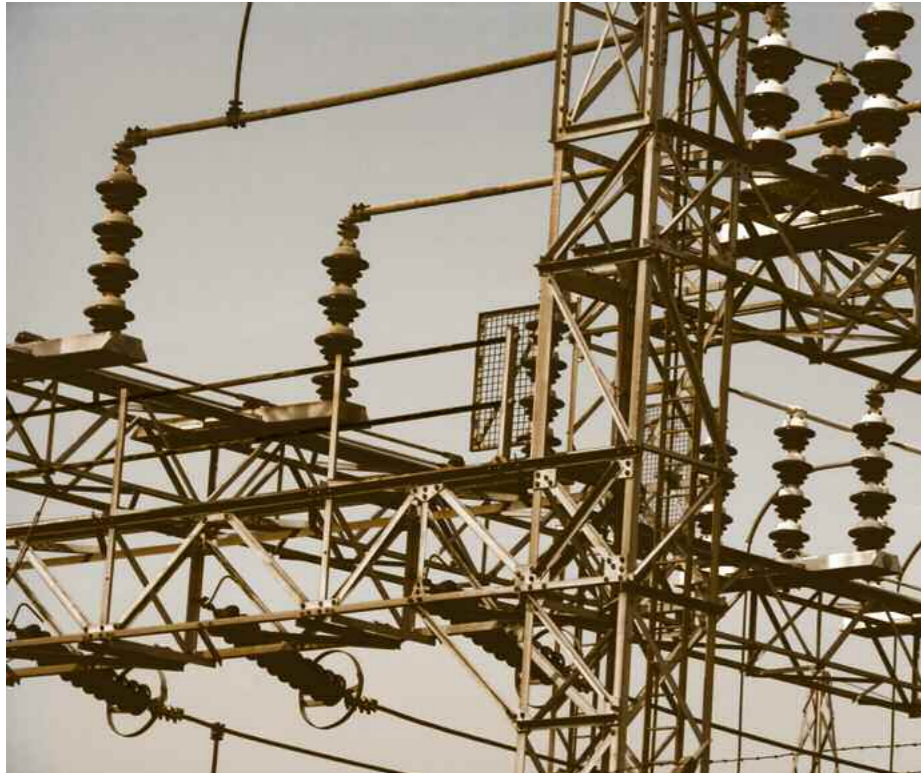
Second, our analysis contains no assessment of the regulatory burden placed on listed companies. Invariably companies will incur higher compliance costs, and will need to employ specialised staff to fulfil their obligations under the new rules. Whether these are justified by the modest benefits outlined above is a question that researchers are yet to answer.

1 This article is based on: M Huang, A Marsden and R Poskitt. 2006. *The impact of disclosure reform on the NZX's financial information environment* University of Auckland working paper.
 2 New Zealand Exchange. 2002. *Continuous Disclosure* (available at www.nzx.com/regulation/listed_issuer/Continuous_Disclosure).
 3 Securities Commission. 2002. *Strengthening confidence in New Zealand's capital markets* (available at www.sec-com.govt.nz/publications/documents/capital_markets.shtml).
 4 New Zealand Exchange. 2005. *Guidance Note – Continuous Disclosure* (available at www.nzx.com/regulation).
 5 New Zealand Business Roundtable. 2002. 'Submission to the Ministry of Economic Development on the Reform of Securities Trading Law'.
 6 B Wilkinson. 2003. 'Reform of securities trading law: evolution and risks' LexisNexis Conference: Securities Markets and Institutions.
 7 Only 40 of the 62 NZX-listed stocks appear in this database.
 8 Both analyst forecast error and analyst forecast dispersion were scaled by the share price of the company at the end of the fiscal year.
 9 See U Bhattacharya and H Daouk. 2002. 'The world price of insider trading' *Journal of Finance* 57(1) pp75-108.
 10 B Gaynor. 'Warning signs disclose problems' *New Zealand Herald* 22 February 2003.

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Full speed ahead ... Or proceed with caution? Investing in the National Grid



It is debatable whether or not the Minister of Energy recently exercised an abandonment option on the Electricity Commission chairman's tenure. But life is uncertain, which makes options like these valuable. As Glenn Boyle and Richard Meade point out, when upgrades of New Zealand's electricity transmission grid are being planned it's important to consider how an uncertain future affects current investment choices.¹

In September 2003, responsibility for approving grid investment passed from Transpower to the Electricity Commission. An intriguing feature of the Grid Investment Test (GIT) subsequently proposed by the Commission is that it explicitly allows for the consideration of real options, although it does not specify what these might be, or how they might affect investment decisions. Nevertheless uncertainties about future electricity demand, competing investments (especially 'distributed generation', which 'bypasses' the grid), and uncertain investment costs and build times would all seem to have real-options characteristics. If investments are at least partly irreversible – as is certainly the case with grid upgrades – it can pay to proceed cautiously in the hope that new information will reveal the optimal scale of investment, thus potentially creating valuable options to expand, contract, abandon, switch, or wait.

Transpower's proposed grid upgrade into Auckland provides some revealing examples of the importance of real options for transmission investment.

First, there is an *expansion* option. Because future electricity-demand growth is uncertain, it is unclear whether a large (e.g. 400 kV) grid expansion should be preferred over the alternative of a smaller (e.g. 220 kV) expansion now, with perhaps another of the same size if and when demand grows sufficiently. On the one hand, the large upgrade offers greater economies of scale. But the small upgrade provides an implicit option for expanding to the scale of the large upgrade only if future demand turns out to be sufficiently great (thereby saving unnecessary expenditure if demand turns out to be less than expected). If demand uncertainty is high, then flexibility in transmission investment is important, and the value of the expansion option may exceed the value of the scale economies.

Second, there may be a *deferral* option. If alternatives to grid investment (such as new generation) are available, then both the 400 kV and the 220kV upgrades can be delayed – which allows additional information about the optimal scale of grid upgrade to be obtained. Investment in transmission alternatives therefore reduces the likelihood of over-investing in grid assets, while retaining the option to obtain economies of scale (since the 400 kV upgrade remains feasible). But it also delays the accrual of benefits from whatever upgrade is ultimately needed. If significant uncertainty could be resolved in the first few years of a planned upgrade programme, then there could be considerable value in building short-term generation capacity to tide the system over in the meantime and then choosing the scale of the transmission upgrade on the basis of the information that has been revealed.

Now you have it, now you don't

But what if there are uncertainties in planning, approving and constructing an upgrade? If the aim is to ensure that there is sufficient new capacity online by a certain date in order to avoid problems with 'the lights going out', then grid planners have less ability to defer investment decisions. While there is still value in waiting for new information about future demand, uncertainty in lead times means that any deferral of grid investment creates the risk of waiting too long and finding that transmission assets cannot be built fast enough. Consequently, there is a trade-off between the real-options value of acquiring new information and the risk of missing construction and other implementation deadlines. In general, the choice between commencing or delaying a planned upgrade depends on whether uncertainty is greatest about future demand for the upgrade or about the time needed to implement the upgrade. Ironically, greater regulatory uncertainties could cause Transpower to accelerate rather than defer investments.

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¹ For more details see G Boyle, G Guthrie and R Meade. 2006. *Real Options and Transmission Investment: the New Zealand Grid Investment Test* (available at www.iscr.org.nz/navigation/research.html).