Role of the regulator in security of supply

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1. Introduction

Thank you to the WFER organising committee for providing an opportunity for us to discuss security of supply, particularly in regard to how it works with market arrangements for electricity.

Concerns about security of supply are never far from the surface in New Zealand (NZ) due primarily to our reliance on large hydro generation from relatively shallow hydro lakes and fickle rainfall patterns.

Approximately 60% of NZ's electricity is sourced from hydro generation, but our hydro lakes – when full – hold only enough water to meet six weeks of electricity demand. This compares to other hydro countries, such as Norway which have hydro lakes that in aggregate hold two-years of electricity demand. Although NZ is a rainy country, our main hydro lakes are concentrated in the south-west of NZ. It has to rain on the south-west of key mountain ranges to benefit our electricity system. On average NZ's hydro-electricity system experiences reasonably severe dry periods and supply shortages loom.

2. In our experience market arrangements for electricity fundamentally alter the dynamics of security of supply

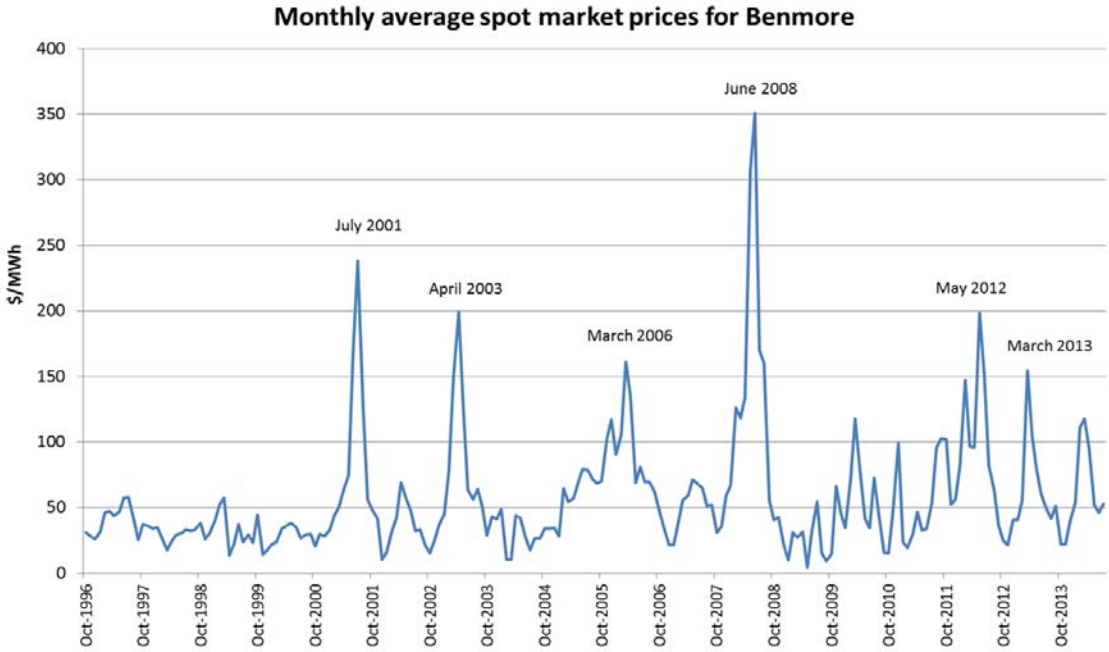
NZ has had wholesale and retail electricity markets for nearly 20 years now. For most of that period our hedge market was purely an over-the-counter market. It was opaque and traded only a small fraction of spot market volumes.

Under these conditions, if security of supply issues are not addressed with the right interventions they can create **vicious cycles** in which poorly-designed interventions worsen security of supply, leading to further interventions that further worsen security or harm the market in other ways.

a. The interesting outcome in NZ is that supply adequacy was far inferior under centralised planning than under market arrangements but concerns about security of supply increased once we began experiencing hydro shortages under market arrangements. These concerns were a mix of genuine supply issues and issues of perception. Perception was driven by greater **transparency** under market arrangements and by new and powerful **incentives** for spot market buyers to lobby publicly for ad-hoc policy interventions.

b. Market arrangements for electricity increase the **transparency** of impending supply shortages, as potential shortages are reflected in market prices.

NZ has had a half-hourly spot electricity market since 1996. Hydro conditions were okay for the first five years of our spot market (1996 to 2000) but over the last 14 years (2001 to 2014) we experienced three very dry hydro conditions and three moderately dry conditions.



As shown in the above chart, monthly average spot prices typically range from $25 - $75/MWh in non-dry periods but when there are concerns about low lake levels we typically experience monthly average prices of $150 - $350/MWh depending on the severity of the dry spell. To put this in perspective, the average retail tariff for residential consumers is currently $280/MWh.

c. These very large movements in spot prices create powerful commercial **incentives** on spot market purchasers (eg retailers and industrial consumers) to argue for ad-hoc interventions to reduce spot prices. This was particularly the case for parties that hadn't hedged physically or financially.

In NZ these parties lobbied Cabinet Ministers, often via the news media, for interventions to require generators to reduce spot prices or for the removal of the spot market. They also lobbied the Government to run

public advertising campaigns asking consumers to voluntarily save power (called conservation campaigns in NZ). These campaigns have typically reduced electricity demand by [7 – 10%] but reduced spot prices by [50%] or more.

Of course, directly intervening in the market in these ways reduces the commercial incentives for retailers and industrial consumers to buy hedge contracts, creating an even bigger problem the next time the hydro lakes run low.

d. Quite aside from the powerful commercial incentives created by prolonged increases in spot prices, market pricing of electricity **multiplies** the episodes of concern about potential hydro conditions.

   Under centralised approaches to operating the electricity system consumers in NZ didn't know about the risk of supply shortages until the risks were really material and they were asked to conserve power.

   Under the market approach, any hint of possible hydro shortages translated into higher spot market prices for a period of time until the situation was clearly returning to normal. High spot prices are of course highly visible and commercially meaningful to spot market purchasers, and so lobbying was occurring every 2 – 3 years under the market approach, creating perceptions that supply shortages were occurring more frequently than previously. The general perception was that hydro shortages were occurring because of insufficient thermal generation to cover for low hydro generation. This was despite the fact that we had more thermal generation than ever before.

3. In our experience, regulators need to focus on three key factors to get good security of supply outcomes under market arrangements for electricity: incentives, information and plurality

One lesson we have learned is the importance of removing commercial **incentives** for parties to call for ad-hoc interventions in the face of supply issues.

a. In the NZ electricity system official conservation campaigns can be an efficient means of addressing exceptional hydro shortages as the effective cost of building hydro-firming plant to cater for very severe and rare hydro shortages is very high. Official conservation campaigns suppress spot prices and they are free to spot market purchasers, and so it is in their commercial interests to call for such campaigns too frequently and before they are actually needed.

In NZ we have sought to overcome these incentives by requiring electricity retailers to pay compensation to their customers for every week of a conservation campaign. The rate of compensation has been set at $10.50/week/customer. These payments are large enough to wipe-out the daily profit of retailers and indeed are a sizeable portion of the annual profits of retailers if the campaigns last for six weeks or more.

b. We also introduced a quarterly stress testing requirement on all spot market participants, to correct for the incentives that had developed for them to rely on "political hedging" rather than financial hedging. One of the key tests in the stress testing regime requires all spot market purchasers to calculate the net impact on their cash-flow of spot market prices averaging $250/MWh for three months. If they are well-hedged then the cash-flow impact is minimal and their cover ratio will be close to a value of unity.[1] The parties doing the stress test have to report their results to their company boards, send the results 'in confidence' to a stress test manager appointed by the Electricity Authority, and their boards have to warrant to the Authority that they have seen the results.[2]

c. The stress test regime makes it patently clear to the media and politicians that spot market purchasers **know the risks** they are taking if they decide not to hedge their exposure to the spot market. This regime has undermined the credibility of parties lobbying the media and politicians for ad-hoc interventions when hydro conditions become tight.

   Whereas extensive lobbying occurred during the 2001, 2003, 2006 and 2008 dry episodes, no lobbying occurred during the severe dry episode in the first six months of 2012 or during moderately dry episodes in 2013 and 2015.

Another lesson we have learned is that security of supply is not just about managing physical supply risks. It is equally important to have an active hedge market for market participants to cover their financial risks. Active hedge markets are critical because it is generally too costly (and inefficient) for all retailers and industrial consumers to have their own source of back up generation.

a. The NZ Electricity Authority developed an active futures market by encouraging the major generators to provide market-making activities –

[1] The cover ratio is only one of three metrics testers are required to report to their boards. The cover ratio is given by the increase in cash profits the firm receives from higher spot market prices (eg hedge contract payments) divided by the reduction in cash profits arising from higher spot market prices (eg spot market purchases). The other two metrics are (1) the change in net cash-flow and (2) the change in balance sheet equity.

[2] Note that electricity retailers are also required to inform their customers of the stress test if they are being encouraged to adopt retail prices closely related to spot prices.

that is, generators were encouraged to post buy and sell prices for baseload futures contracts with no more than a 5% bid/ask spread for minimum volumes placed in the market. The 5% spread introduces competitive pressure for the generators to price the contracts at their expected future spot price.

b. Although we continuously monitor security of supply by comparing hydro lake levels with hydro risk curves and annual supply margins, futures prices provide essential **information** about the market's view of forthcoming supply risks. It is generally agreed in NZ that the active futures market has led to far better coordination among hydro and thermal generators and far better hedging outcomes.

A third lesson we've learned is the value of having a **plurality** of parties with decision rights over the uncertain hydro resource. In our case there were only two major hydro generators operating in the South Island of New Zealand. As the largest hydro generator was government-owned, two of its South Island hydro plants were transferred to a government-owned generator that already owned some North Island hydro generation but was predominantly a North Island thermal generator. This action increased the number of hydro decision-makers in the South Island from two to three.

The greater plurality of decision-makers, and the fact that a major thermal generator now operates significant South Island hydro plants, reduces the risks of miscalculation by any one player and brings greater contestability of views by parties with divergent interests. Whereas an engineering approach typically seeks to aggregate decision-rights over similar resources to rationalise operational expertise, market performance is likely to be better with a more diversified market structure when there is considerable uncertainty about generator "fuel" supplies or operating conditions.

4. A focus on incentives, information and plurality is also good for enhancing retail market competition

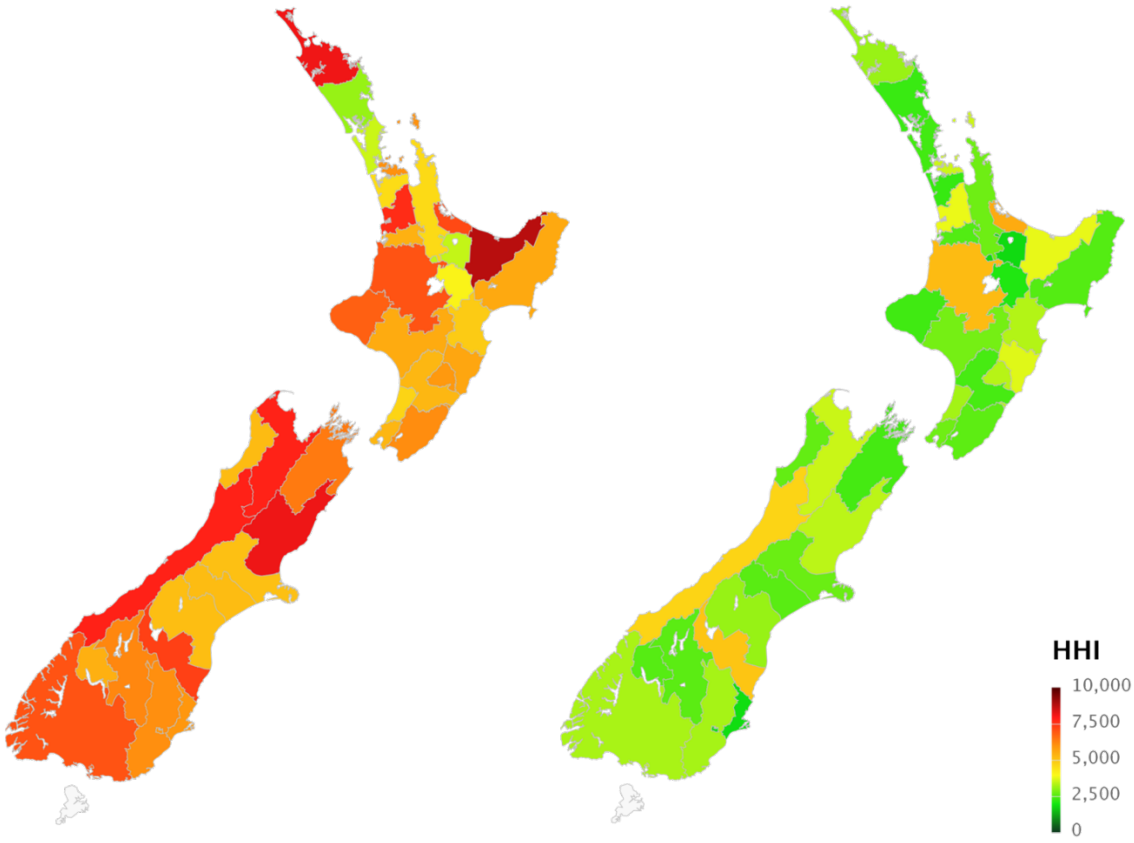
In our view, doing security of supply well creates a **virtuous cycle** for regulators.

Greater pluralism in the South Island of NZ, for example, has led to far more vigorous competition for South Island retail customers. This has contributed to a large reduction in retailer concentration in the retail electricity market since 2008, as shown by the 'heat maps' in the chart on the next page.

A more active futures market for electricity has been crucial for reducing barriers to entry and expansion for independent retailers ie. retailers with little or no generation. In the last 18 months we have had eight new retailers start up,

bringing the total number of retailers to 21. We have also witnessed a big increase in pro-active pitching by retailers to win over customers, and the three medium-sized retailers have gained market share at the expense of the four large vertically-integrated generator-retailers.

And finally, the stress testing regime has resulted in one of the medium-sized retailers adopting a more cautious hedging strategy, and the retailer has used those results to provide greater comfort to its creditors (banks and hedge counterparties), allowing it to more easily secure the credit it needed for expansion.



Further, we now have a new entrant retailer (called Flick Electric) offering spot market prices to residential consumers. It is growing its customer base quite rapidly. Our concern is that if very high spot prices occur for a prolonged period a large number of their customers might claim they didn't know the risks they were taking. We will be considering in the near future whether the stress testing regime should be extended further to address essentially the same problems that have arisen in the past.