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Electricity Authority,
Wellington.

Transmission Pricing Review

It seems to me that the wrong approach has been taken.

All power systems where the objective is – or has been – to minimise the long-term cost of electricity and maintain a reliable supply, recognise that supplying peak demand is expensive for generation, transmission and distribution and that anything that reduces peak demand and increases capacity factor is beneficial to the system and to the consumers.

About 80 years ago wise engineers in the State Hydroelectric Department and the Ministry of Works realised that in a system where nearly all the power is provided by hydropower there was a huge cost involved in providing for peak demand and virtually no cost in providing kWh. So bulk electricity was charged at £5/kW of maximum demand with no charge for kWh.

As a direct result, all the lines companies invested in peak load control systems – initially pilot wire and later ripple control. This had a massive effect on peak demand.

When I commissioned the new ripple control installation at Quay Street substation for the Auckland Electric Power Board in 1959 I noticed that we could hold the demand steady from 7 AM to about 9 PM except for a small dip at lunchtime. The load curve for the New Zealand system was similar. At that time, domestic energy demand was 40% of system load and water heating was 40% of domestic load. So we could – and did – reduce system peak demand by something like 20%. In today's terms, this would be 1200 MW.

This led to huge savings all through the system and saved consumers millions and millions of dollars. The Power Boards paid £5/kW to State Hydro and set their own tariffs for the consumers. This meant that there was no problem funding the installation of ripple control. As I recall, ripple relays cost about £30 and each one saved £5 to £10 per year. The National benefit was enormous.

Later on, a small charge for kWh was introduced which became larger over time as more and more fossil fuel generation was added.

Along with the electricity reforms of the 90s came a market ib kWh only and a requirement that all Transpower charges be "passed through". This meant that operating, maintaining and expanding ripple control systems was no longer a profitable occupation from the point of view of the lines companies. As they no longer had any economic inducement to manage the consumers loads most of them allowed their ripple control systems to run down. The upper South Island is the only exception to this. They make good use of ripple control and they have saved their consumers millions of dollars.

One factor that exacerbated this problem was the over hyping of smart meters. Everyone believed that they would make ripple control obsolete and bring many other load control opportunities to the consumer. For reasons that were obvious at the time they didn't and they still haven't.

If a "whole of system" view is taken then it is obvious that every 1 MW increase in after diversity maximum demand brings extra costs to generators, transmission authorities and lines companies.

The cost to generators for providing peak demand is exacerbated by unpredictable wind and solar power now being added to the system and require rapid generator response if the wind suddenly drops. Because ripple control is not used for this as it could be, there is a need to install extra inefficient open cycle gas turbines that have a rapid response rate. Rapidly fluctuating loads also impose inefficient operation on Huntly steam station and the combined cycle stations. Hydropower is limited in its ability to respond largely because of increasingly strict environmental rules.

At the very minimum, every MW increase in ADMD would cost $1,500,000 in capital costs just for additional generating plant.

For the transmission system the long-term cost of meeting increased demand would be something in the range of $500,000-$1 million/MW and I would expect that a similar cost would accrue to distribution systems.

So it is reasonable to conclude that a 1 MW increase in ADMD would, in the long-term, cost the consumer something between $3.5 million and $4.5 million. The annualised cost at 7% would about $280/kW. If this is charged to consumers it gives them a strong and long lasting economic signal that they can respond to with confidence.

Now that smart meters are almost universal it would not be difficult to impose a peak demand charge on consumers. Such a charge would give a very substantial reward to those who chose to control their peak demand either by a rejuvenation of ripple control, or, better still, a smart thermostat that can do so much more. As widespread installation of smart thermostats and other devices to manage peak demand would benefit all consumers, (because it would reduce the price that everybody pays for electricity) their installation could be funded by a levy on all consumers.

If all generators were rewarded for their contribution to meeting peak demands those generators that provide predictable and reliable power over peak demand periods would have an increased income compared to intermittent generators. This fairly rewards them for the extra benefit they provide.

To maximise the benefit that it can provide in the way of mitigating frequency excursions, price spikes, sudden changes in the output of wind and solar farms and managing peak demand, load management should be centrally coordinated. Lines companies are an obvious candidate but other solutions are possible and need to be considered carefully to maximise the benefit to the consumer.

The allocation of the revenue from peak demand charges also needs to be considered carefully. Maybe 50% of this needs to be allocated to generators to reward them for providing power when it is really needed over peak demand periods. The remainder could be used to pay for

transmission and distribution either in full or in part. It might also be a good idea to allocate some to the lines companies to compensate them for the cost of operating, maintaining and extending load control systems.

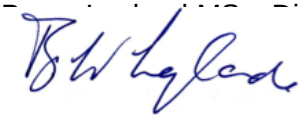
If this is done, we will no longer see a peaky demand profile that, incidentally, demonstrates that Locational Marginal Pricing does not, as claimed in the issues paper, have any noticeable effect on the shape of the demand curve. As EM6Live clearly shows the upper South Island is the only region that significantly flattened its peaks, and it does it by ripple control of hot water heaters. LMP is too small and too unpredictable to make a difference.

In conclusion, I contend that the Electricity Authority's concentration on the fine details of "fairly" allocating transmission charges while ignoring the long term cost to generators and line companies of an increase in maximum demand is totally inappropriate and is costing consumers hundreds of millions of dollars.

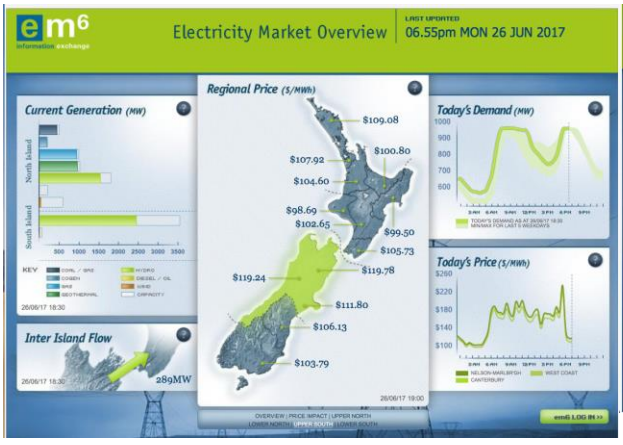
The Electricity Authority should abandon its myopic views and look at ways of bringing benefit to the consumers by setting peak demand charges on a basis that fairly represents the cost to the system of providing for peak demand.

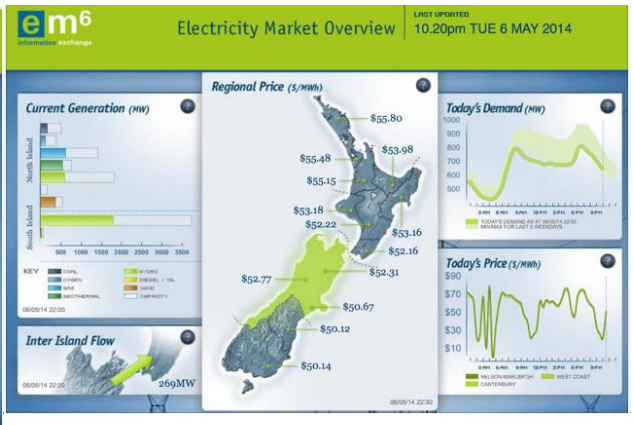
Sincerely yours,

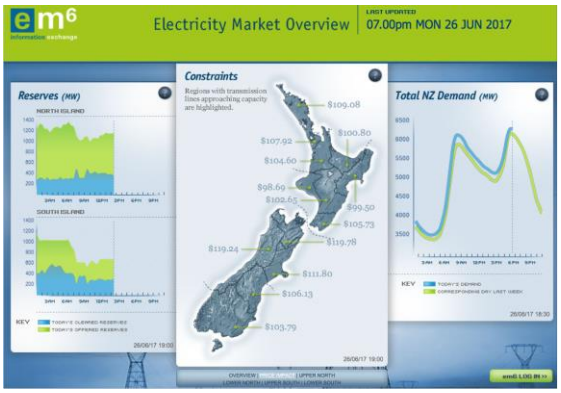
[redacted]stFEngNZ, FIMechE, FIEE(rtd), MRSNZ.



Effect of hot water control in the upper South Island and the lack of correlation between prices and demand.






em6
Electricity Market Overview
LAST UPDATED
07.00pm MON 26 JUN 2017
Reserves (MW)
NORTH ISLAND
SOUTH ISLAND
KEY
Constraints
Regions with transmission lines approaching capacity are highlighted.
$109.08
$100.80
$107.92
$104.60
$98.69
$102.65
$99.50
$105.73
$119.24
$119.78
$111.80
$106.13
$103.79
26/06/17 19:00
Total NZ Demand (MW)
KEY
26/06/17 19:30