Bryan Leyland Consulting Engineer
Hydropower Power Systems Electricity Markets

17 Bangor St,
Pt Chevalier,
Auckland 1022,
New Zealand

Electricity Authority – Transmission Pricing Review

As far as I can see, all the proposals are complex and not easy to understand. They seem to be reacting to a short term situation – that we now have sufficient transmission capacity – rather than looking at the big picture.

Everybody agrees that "demand side management" is a good thing and needs to be encouraged. In spite of this, the electricity reforms deprived the lines companies of the ability to profit from managing their consumer's load using ripple control so, in most regions, ripple control is no longer used as it was. (In case it is lost in history, I would point out that, until we switched to an electricity "market", the system peak demand was held virtually constant from 8 AM to 8 PM using ripple control.)

As a result of the rundown of the ripple control system, we now need maybe 200 MW more generating capacity than would otherwise have been the case and many lines companies have reinforced their systems to meet the unrestricted peak demand – for which they are rewarded by the Commerce Commission. The EA have also failed to take advantage of the fact that sophisticated ripple control systems can contribute to frequency management and help to cope with the fluctuations from wind power. The large consumer benefit that would have resulted from continuing to encourage the implementation of ripple control seems to have been totally ignored.

If, as it seems, the TPM proposal will further reduce the financial inducement to manage peak demand, consumers will pay even more for generation, distribution and, ultimately new transmission reinforcement. When transmission reinforcement is again needed I assume that the whole transmission charging system will change to an emphasis on peak demand, so the game would change once again. And this switch from one regime to another would, presumably, continue into the future. Has this possibility been contemplated?

The problem seems to me that the Transmission Pricing Methodology ignores the unintended consequences of a policy that no longer promotes limiting peak demand. This is because of the review concentrates only on covering transmission costs and not, as I believe it should, also considers the unintended consequences of a policy that ignores the benefit to consumers from limiting peak demand on generation, transmission and distribution.

I would suggest that what is really needed is an overview of the options from the point of view of the effect it will have on the consumer rather than considering the transmission system as an isolated entity. If you regard the components of the electricity system as quite independent of each other and try to optimise each one, the overall result will be far from optimal. The consumers will suffer most.

There are many reasons for limiting maximum demand but, because of the way the industry is structured, very few ways that players can make money out of doing so. So the additional costs fall upon the consumer who, in reality, has no say in the matter.

T +64 9 940 7047 F +64 9 849 7045 M +64 21 978 996 bryanleyland@mac.com www.bryanleyland.co.nz

Perhaps the Electricity Authority could put some serious consideration into methods of encouraging the adoption of peak demand management with the primary objective of maximising the benefit to the consumer. One of the ways of doing it is outlined below. The consumer benefit would be huge. But with a fragmented industry and perverse regulations, it is hard to see how it can be implemented.

Might I also suggest that the EA pay some attention to providing reports that are models of clarity and brevity. Perhaps some professional training is needed!

Sincerely yours,

Bryan Leyland

"Advanced water heater control

The idea is to replace the thermostat in an electric water heater with an electronic device that is sensitive to water temperature and frequency and, optionally, has a Wi-Fi connection. This device would proportionally control the power input into the water heater from off to full power using a Triac or similar.

The frequency sensitive range could operate over a band of plus or -0.05 Hz on either side of 50 cycles. If the water temperature was below normal and the heater was operating at full power, the power input would decline proportionally to nothing as the frequency dropped by 0.05 Hz. If the water temperature was normal, then, if frequency increased, it would inject more power into the water heater until it was at full power with a frequency 0.05 above normal. If the water temperature rose by 10° or more, the power input would back off.

Such a device would be much better than ripple control. The system operator could control system demand simply by altering the system frequency. If the Wi-Fi unit was fitted, then retailers and lines companies could also control their customers load over the Internet. I have discussed this with the system operator and he sees no major problems.

A huge advantage is that it would practically eliminate the need for spinning reserve and for ramping stations up and down in response to the fluctuating outputs of wind and solar power. All the system operator would need to do would be to ensure that the frequency time was correct when averaged over a day – which is what they have always done.

As the unit would be a plug-in replacement for a thermostat, it would be easy to install. The benefits to the system would probably be in excess of $50 million per year – probably even more when the other advantages of effective peak demand control – like reduced generating capacity, transmission capacity and capacity in the distribution system – were taken into account. Sadly, under the present

regime, it is difficult to reflect this back to the consumer. This is one of the major problems.

Overseas the potential is even greater. Many systems are having huge problems coping with wind and solar power fluctuations and they are suggesting things like domestic batteries and making use of batteries in electric cars. But the cycle cost of storing energy in the cheapest battery is about $0.35 per kWh recovered – and you have to feed in 1.2 kWh! My system does exactly the same thing. It stores energy when it is in surplus and makes more energy available when it is needed. (There is no difference between reducing demand and exporting energy: 6 kWh of water heater storage does exactly the same thing as 3 kWh of battery storage. And, of course, the cycle cost is zero.)

I have talked to my friends in the electronic business and they are confident they could produce a prototype quickly and easily. At a guess, the quantity price would be less than $200.

Please note that the intellectual property remains with me.

Bryan Leyland Fri, Jul 3, 2015 “