Submissions

Electricity Authority

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17 October 2022

Wholesale Market Competition Review

Thank you for the opportunity to cross submit on this important topic.

No part of this submission is confidential and I am happy for all of it to be published.

The Authority is to be congratulated on:

- The success of its trading conduct provisions;
- It's work on identifying barriers to new entry and what can be done to reduce these barriers; and
- The level of new investment interest that is starting to emerge (the authority does have some impact on this by providing a stable regulatory environment).

I endorse all the work the Authority is proposing on reducing barriers to entry for new entrants. I suggest this could be further enhanced by improving competition in provision of firming services. An area of low hanging fruit in this area is the flexible demand currently available from hot water load control (HWLC). A relatively simple regulatory change is proposed to address the free rider problem currently constraining the uptake of HWLC as a flexible load in the market. This would markedly improve competition for intraday firming, to back up intermittent renewables, and thus help bring forward much of the new entrant generation currently being actively pursued, but not expected to deliver till after 2025. This increased competition from new supply should also materially impact forward price expectations prior to 2025, to the material benefit of the NZ consumer.

Reducing Barriers to New Entry - Improving Competition in Firming Services - Hot Water Load Control is Low Hanging Fruit

The Authority's analysis has identified a potential gap in investment in new entry renewable generation before 2025. In particular many overseas investors, outside the incumbent big four, are interested in investing but face barriers to entry. One

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barrier is the access to firming services at reasonable prices. Particularly as the incumbent big four are the main source of firming service contracts at present.

This submission suggests the existing hot water load control (HWLC) system could provide some level of intraday firming services for renewable generation, but faces regulatory barriers at present. The advantage of the HWLC is that it is already ready to go, only needs regulatory changes to enable it to participate in providing firming services, and the ownership of the HWC assets is largely outside the big four gentailers.

As such it is the 'low hanging fruit' in the renewable firming space in NZ. And because it is physically ready to go today, it is also the low hanging fruit in the demand flexibility space. It is only changes in the regulatory space that are needed to release this flexible load, and if this regulatory change is well signalled the new entrant generators currently actively pursuing options post 2026 might be encouraged to bring them forward.

Bringing such competitive new supply forward, to pre-2025 rather than post 2025, is likely to increase competitive pressure on hedge prices over this period and materially benefit the NZ consumer.

Size and Nature HWC Assets in NZ

An EECA study in 2020 suggested just under 1000MW of HWLC is available in NZ at the moment. https://www.eeca.govt.nz/assets/EECA-Resources/Research-papers-guides/Ripple-Control-of-Hot-Water-in-New-Zealand.pdf

My view is that the total controllable load may be greater than stated, as it is not currently being optimised for use in firming intermittent renewable generation. That is if 1,134,301 ICPs currently have HWLC and if the typical water heating element is 3KW and approximately 6KWh[1] of heat is required to heat the average hot water cylinder then the total stored energy could be as high as 6.8GWhs/day.

Not all this stored energy is available for managing as no one wants cold showers. And it is not a substitute for dry year backup, so the work with the GIC on the future of gas is still needed. But it is well suited to being switched on and off relatively quickly, of the order of a few minutes maximum to respond. So is well suited to meet part of the firming requirement for a sizable proportion of the 1.7GWh/day of renewable projects being actively pursued but not expected till after 2026. (Concept Study page 11 translated from GWh/yr to GWh/day approximately).

Also the use of the HWCL for firming intermittent renewables will have to compete with other uses of the same managed load such as optimising distribution investment

[1] https://www.hotwatercylinders.nz/explaining-electric-hot-water-heaters/

and transmission investment. But co-optimising a single resource over multiple markets is nothing new to NZ and many generation options also are co-optimised in their use.

Intraday Firming but not Dry Year Back Up - Gas security of supply work still needed

HWLC is really only suitable for intraday firming of intermittent renewable generation. It is more like a battery with a relatively constant drain (people using hot water) but some choice over when it is charged. This will not cover the intrayear and multiyear variability of intermittermittent renewables so other firming products with longer durations will still be needed. In particular I strongly encourage the Authority to continue to coordinate with GIC on gas security of supply work.

Competition with Big Four Incumbents wrt Hydro Intraday Firming

I suspect that much of the intraday firming for variable renewable generation is currently provided by hydro-generators as they probably have the lowest intraday fuel cost to move generation around within a day. And, as you point out, most of this is held by the big four incumbents, with Meridian having a high concentration.

Allowing a 'new' entrant to this intraday firming services market should increase price pressure on the incumbents.

A Proposed Regulatory Structure to Enable Hot Water Load Control to Provide Firming Services

The key barrier to entry to the HWLC into provision of firming services today is a free riding problem where any retailer who contracts for this service can't exclude other retailers from also getting the benefit of the service. The proposed solution is to require all retailers benefiting from the service to contract with the distributor, as key enabling agent, for the service. The revenue distributors earn from provision of the service would be subject to a custom price plan (CPP). The balancing restraint to the regulated recovery would be a regulated opt out provision. Where individual customers could opt out, and have their HWLC relay disconnected, if they didn't want their load controlled, and the cost for the opt out would be subject to regulation.

- It is noted that:
  This is one regulatory option to enable HWLC to participate in provision of firming services but their could be others;
- This option requires work by the Commerce Commission and it is suggested the Authority invite the Commerce Commission to explore how it could facilitate HWLC participation in the firming market; and

- A clear signal of the regulatory direction in this area may be sufficient to give new investors confidence to proceed further with proposed renewable investments.

Refer to appendix A for details of proposed regulatory arrangement.

Conclusion

The Authority is to be congratulated on its work to date and should continue to pursue all the items proposed in “Supporting an efficient transition to a low emissions energy system”.

However, I suggest they urgently add to this work an initiative to “Invite the Commerce Commission to consider how it could best facilitate regulatory arrangements to encourage use of hot water load control to participate in the renewable generation firming market.”

This is an area of ‘low hanging fruit’ which may encourage the new entrant generators currently actively pursuing options post 2026 to bring them forward, and thus reduce the risk of an overly long persistence of wholesale prices above the LRMC of new generation.

A possible regulatory structure to enable hot water load control to participate in the firming market is put forward in Appendix A.

Response to specific consultation questions

Table 8 Consultation questions

Chapter 2

1. Do you agree that a key competition in the transition toward 100% renewable electricity is that it weakens competition during extended times when intermittent generation cannot run?

Yes, and I propose an option to increase competition in this firming market.

2. Do you have any comments on the contents of this chapter?

I congratulate the Authority on the success of their new trading conduct provisions.

Chapter 4

3 Do you have any comments on the impediments to generation investment?

I think greater depth in the firming market for new intermittent renewable generation may help bring forth some of the new entrant generators that are under active consideration but not likely to come on line before 2026.

4. Do you agree that the lag in investment is not due to anti competitive behaviour to slow down investment and discourage entry, or can you provide instances or other evidence to the contrary?

I agree in general but consider having greater depth in the firming market, to firm renewable generation should help bring forward some current investments outside the big four incumbents.

5. Do you have any comments on the role and impact of carbon pricing on investment and wholesale market competition or the other contents of this chapter?

I think carbon pricing has a role in helping encourage non-fossil fuelled firming options to develop.

Chapter 5

6. Do you agree with the Authority's overall conclusion that it currently considers that continued reliance on the current conduct-based measures to mitigate the exercise of market power remains broadly appropriate in the transition toward 100% renewable electricity?

Yes.

7. Do you agree with the objective and evaluation criteria set out in this chapter?

Yes, but suggest adding "Invite the Commerce Commission to consider how it could best facilitate regulatory arrangements to encourage use of hot water load control to participate in the renewable generation firming market."

8. Do you have any comments on the contents of this chapter?

No.

Chapter 6

9. Are there any other options that would promote wholesale electricity market competition in the transition that you consider would be more effective and efficient?

I think including options to allow hot water load control to participate in the market for firming intermittent renewable generation could further promote overall wholesale electricity market competition in the transition to 100% renewables.

10. Do you have any comments on the contents of this chapter?

No.

Chapter 7

11. Are there any other options that would better facilitate efficient investment in renewable generation to promote wholesale electricity market competition in the transition?

Not better but additional, considering how the existing hot water load control could participate in firming for intermittent renewable generation might further facilitate

efficient investment in renewable generation to promote wholesale electricity market competition in the transition?

12. Do you have any comments on the contents of this chapter?

No.

Regards

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Appendix A

Regulatory Arrangements for Load Management to Support 100% Renewable Transition

Contents

The Problem – Hot Water Load Control Not Able to Support 100% Renewable Transition

New Zealand is trying to transition to 100% renewable electricity as part of its climate change response. Renewable generation is inherently intermittent and needs to be matched with energy storage to provide a reliable supply. More energy storage is needed in NZ including both the long term (NZ Battery project) and the short term. Some parties are already investing in batteries for short term storage, but a much lower cost existing option exists in the form of hot water controlled load. Most NZ Electricity Distribution Businesses (EDBs) and metering equipment owners have existing load management systems in place to control hot water controlled load. But lack of incentives to invest and operate has led to these being run down and underutilised. Many are being by-passed, or replaced by gas water heating, or the control not being used. This load management represents low hanging fruit for easy wins for provision of energy storage to assist our 100% renewable transition path.

However, this low hanging fruit is not being taken up because of regulatory barriers to its contribution to the energy market. This article explores the value of hot water load control, the regulatory barriers to its use as a back up to intermittent renewable generation and proposes a possible solution to those regulatory barriers.

I define the regulatory problem as a free rider problem where retailers can get the benefit of the managed load service without paying for the service. This is because the EDB (and metering equipment owners) who own the physical assets, cannot differentiate between retailers in how the service is delivered (it controls all how water loads connected regardless of who the retailer is). I suggest a customized price path, as a mandatory opt-in for retailers, would allow EDBs (and metering equipment owners) to extract the value of managed load and an incentive to invest in its ongoing provision. That is EDBs would be able to charge, via a mandatory Use of System (UoS) agreement, for the service for all retailers who benefit from the service. And pass some of this value on to metering equipment owners (owners of the ripple relays) via their contracts.

The regulatory counter to the mandatory opt in would be regulated opt out, where retailers could choose to opt out of the cost of the managed load service and the EDB could only charge a regulated fee for disconnecting them from this service. The price EDBs charge for the managed load service would not otherwise need to be regulated as the service competes with many alternative services. Also the regulated opt out provision might need to be balanced with a locationally specific distribution pricing regime if the opt out triggered a need for new distribution investment.

The Opportunity – Load Control Now Free of Transmission Pricing

The opportunity for load control to provide back up to intermittent renewable generation is likely to be enhanced from 1 April 2023 when the new transmission pricing arrangements come into force and do away with the regional coincident peak demand pricing arrangements which incentivized use of managed load for managing transmission price risk. Free of this constraint, managed load is much more available for use to back up intermittent renewable generation.

The Overall Benefits to NZ Inc – About $100-200M pa

It is difficult to get an accurate figure for the potential hot water managed load out there because it is not fully utilised at the moment. A 2020 report to EECA suggested about 987MW of controlled hot water load existed in NZ at the moment. But the theoretical maximum would be much more (e.g. total number of controlled ICPs times average water heating element size).
Very roughly the value per MW is about $100k pa (if based on best alternative source of peak shaving (gas peaker), or about $200k per MW pa if based on current price profile (last 2.5 years) and assuming load could be moved from highest priced 3 hour period to lowest priced 3 hour period in each day.

How this value is split between the owners of different assets such as ripple control plant (EDBs mostly) , Ripple relays (same as metering owner in many instances), retailers and consumers) would be subject to contract negotiation and competitive pressure.

Load Control is low hanging fruit but has free rider problem

Hot water load control is the low hanging fruit in the energy storage area because it already exists and there is very little additional cost to utilise it better in the energy market (as back up for renewable generation). Other forms of managed load or energy storage like batteries, smart home systems etc. are increasingly emerging. But the key differences are:

- Hot water load control is in place now and is low hanging fruit, with minimal implementation cost and only moderate running costs;
- Hot water load control is not individually controllable so has a free rider problem, while the others don't.

The Problem Definition – Classic Free Rider Problem

This inability to individually control the hot water load control is the key problem with the current arrangements because it creates a classic free rider problem. This manifests itself as an unwillingness of retailers to pay for the service. For example, although the default distribution use of system agreement (DDUoSA) allows distributors to contract with retailers for use of the managed load, most don't want to pay for this service. Because they get no competitive advantage from doing so. That is if you can't withhold the service from other retailers also operating on the network. So, a classic free rider problem, a bit like why we have regulated transmission pricing.

The Solution - Custom Price Path (CPP)

I can't see how the free rider problem can be addressed without an imposed regulatory solution (same logic as why the TPM had to be a regulatory solution). And the obvious regulatory solution is a CPP which would allow WELL (as an example) to charge retailers who supply consumers with managed load an extra fee that represents a portion of the savings the retailer gains from having the load managed by WELL in response to price signals.

I recognize that defining the 'savings' to retailers of the managed load has some challenges because we can't precisely measure the counterfactual (exactly how much response we got, relative to not controlling). But I think an agreed estimation methodology could be part of the CPP.
Also, if done at a retailer level it avoids the argument about which particular consumer's hot water responded in any given half hour.

Why Commerce Commission Should Support a CPP – NZ Inc Benefit, Can Regulate Risk to Customer

The key arguments to support any CPP application would revolve around the benefit to NZ Inc of incentivizing distributors to better utilise the existing HWC managed load and how this supports NZ's transition to 100% renewables. As noted above the counterfactual would be someone investing in peaking generation (to back up intermittent renewables for within day variability), and probably fossil fueled at that.

The Regulatory Trade-off – Compulsory Opt In for Regulated Opt Out

The above argument, as to how managed load supports the transition to 100% renewable electricity, at least cost to NZ inc., will have some weight with the Commerce Commission. However, they are likely to have concerns about whether granting a distributor a compulsory opt in (for retailers to pay for the managed load service) won't create competitive problems. Both in terms of the price distributors could charge for the service, and whether it might suppress competition from other services, like peaking generators, batteries, smart home services etc. The proposed solution to this objection is to recognize that these alternative services are in competition for the managed load and have a regulated opt out option available to retailers. That is retailers could opt out of the managed load service, and if they did the distributor would be obliged to disconnect their customers hot water managed load from the ripple control, and could only charge a regulated amount for the disconnection (representing the cost of sending someone to site to bypass the ripple relay).

Price Regulation vs Competition

Competition with Managed Load Service Exists Today, and will increase with time

The managed load service provides value to retailers because it reduces their exposure to wholesale price spikes when intermittent generation is low. There are other ways of contracting for this price

risk management. Such as contracting with providers of peaking generation service, contracting for provision of battery based energy storage (charge when price is low discharge when price is high). Or new players, like Google, who are starting to offer smart home managed services which manage controllable loads within the home. All these services exist today or are emerging with time and provide a service which can be differentiated by retailer.

Regulator Does not Need to Regulate Price for Managed Load – If Retailer Can Opt Out

Retailers who do not like the price charged by distributors for the load management service have all the above technical alternatives to provide the same service. Provided they can opt out of the DDUoSA charges for the managed load service then the strong competition for the service will provide a natural price control and the Commerce Commission would not need to regulate the price distributors charge for this service. The key then is to regulate the way the opt out works. Both that it is a genuine opt out (with no free rider possibility) and the price the distributors charge for disconnection from the service.

The Regulated Opt Out

To opt out of the managed load service a retailer would have to agree to having the customers hot water managed load disconnected from the managed load service. That is the distributor would have to arrange for the ripple relay to be by-passed. At the moment that requires a site visit by a suitably qualified technician. It probably makes sense for the distributor (or their maintenance contractor) to provide this service. But the maximum they could charge would need to be regulated to avoid it becoming a barrier to competition.

Distributors Incentive to Retain Managed Load

Although the managed load is no longer needed to manage transmission level constraints, under the new TPM. It may still be useful for the distributor itself for managing within distribution network constraints and delaying distribution investment. In this instance the distributor may be reluctant to disconnect the ripple relay and the free rider problem would persist. But it is expected that this would be a minority of cases.

Locationally Specific Distribution Pricing May Help

Also, this may eventually be able to be dealt with via a locally specific distribution pricing regime. That is any retailer who opts out of load control in an area where new investment is required may be able bear the cost of investment in this area. But it is recognized this would take time to develop.

Next Steps

This brief paper has been prepared for the purposes of stimulating discussion on a possible regulatory solution to the barriers to managed load participating in the energy market, to facilitate NZ's transition to 100% renewable generation, at least cost to NZ. Areas for further consideration might include:

- The strengths and weaknesses of the problem definition and solution put forward; and
- Whether the ideas might be further developed and how?

One possible way to further test and develop the ideas would be for the Authority to invite the Commerce Commission to consider how it could best facilitate regulatory arrangements to encourage use of hot water load control to participate in the renewable generation firming market.