NZIER
NEW ZEALAND INSTITUTE OF ECONOMIC RESEARCH

MDAG Issues discussion paper

Price discovery under 100% renewable

NZIER report to MEUG

10 March 2022

About NZIER

NZIER is a specialist consulting firm that uses applied economic research and analysis to provide a wide range of strategic advice.

We undertake and make freely available economic research aimed at promoting a better understanding of New Zealand's important economic challenges.

Our long-established Quarterly Survey of Business Opinion (QSBO) and Quarterly Predictions are available to members of NZIER.

We pride ourselves on our reputation for independence and delivering quality analysis in the right form and at the right time. We ensure quality through teamwork on individual projects, critical review at internal seminars, and by peer review.

NZIER was established in 1958.

Authorship

This paper was prepared at NZIER by Mike Hensen.

It was quality approved by John Yeabsley

Registered office: Level 13, Willeston House, 22–28 Willeston St | PO Box 3479, Wellington 6140
Auckland office: Ground Floor, 70 Shortland St, Auckland
Tel 0800 220 090 or +64 4 472 1880 | econ@nzier.org.nz | www.nzier.org.nz

Key points

MDAG focus on future wholesale market design

The core objective of the MDAG issues paper is to gather stakeholder views on how wholesale electricity markets need to evolve to cope with the price and supply volatility where 100 percent of electricity is generated from renewable sources. The scope of the paper is deliberately limited to wholesale markets and to a comparison of 'today' with '2035' and '2050' and excludes consideration of transition issues except for questions about how the phase-out of fossil fuelled generation could be managed.

What the MDAG Issues Paper covers well

The MDAG 100 percent renewables issues paper and supporting analysis provides an excellent starting point for the comparison of the distribution of wholesale electricity prices in the current system and a system with 100 percent renewable (100%RE) generation and higher demand in 2035 and 2050. The current system is described using both actual history over the last twenty years and 86 simulations of 2020 based on differing weather patterns.

The modelling shows weighted average prices for the 'current state' and 100%RE futures are similar, but spot price volatility is higher, hydro and wind spill will be much higher than in the current state and the system will be heavily dependent on flexible demand response during peak demand periods to ensure security of supply and limit wholesale prices.

What the MDAG analysis needs to consider alongside the issues raised

Current prices are high

The outturn of wholesale electricity prices over the past four years is higher than the long run 'current state'. The annual average prices for 2018 to 2020 of $106 to 117 per MWh were about 1 standard deviation above the 'current state' mean, while the annual average price for 2021 of $167 per MWh was almost 3 standard deviations above the 'current state' mean. The higher prices have been attributed to a lack of thermal generation capacity which is a step toward 100%RE. It would be helpful if the MDAG papers commented on how the drivers of recent actual prices differed from the modelling assumptions particularly as the MDAG issues paper asks about approaches to the phase-out of thermal plant.

Transition paths matter

The high level of recent wholesale prices has also raised questions about whether some generators are exercising market power. The issue of market power is not discussed in the Issues paper but the difficulty of distinguishing between the exercise of market power and the cautious management of hydro reserves Is discussed in one of the supporting papers. The retirement of thermal generation will concentrate market power during peak periods among hydro generators with storage capacity (rather than run of the river) and the providers of demand response.

The MDAG modelling forecasts average prices about 10 percent higher/15 percent lower if investment in generation follows/leads demand growth.

Contents

Appendices

Figures

Tables

1 Overview

1.1 MDAG Brief

The MDAG Issues Paper compares the 'current state' of wholesale markets with a combination of fossil-fuelled and renewable generation with simulations of future wholesale markets in 2035 and 2050 in which there is no fossil-fuelled generation and electricity demand is substantially higher than in the current state. The MDAG Issues paper uses this comparison to consider how the role for wholesale markets would differ between the current and the future states in 2035 and 2050,

> *Our brief boils down to answering the following core questions:*
>
> *(a) How is New Zealand's electricity system expected to change in physical and economic terms with 100% renewable electricity (100%RE)?*
>
> *(b) Will New Zealand still need a wholesale electricity market with 100%RE?*
>
> *(c) If so, what issues will need to be addressed in light of the expected physical and economic changes with 100%RE?* [1]

1.2 What is being compared?

The key difference between the current state and the 2035 and 2050 future states is the change in drivers of price volatility from demand fluctuations to weather driven fluctuations. Demand in 2035 is assumed to be 27 percent higher than the current state and demand in 2050 is forecast to be 68 percent higher than the current state. This increase in demand (along with partially offsetting the retired fossil-fuel generation) is met primarily with increased wind and solar generation. (The new thermal generation using renewable fuel is run less often than existing fossil-fuelled generation.)

The MDAG issues paper considers how wholesale markets might need to evolve to meet these challenges, but we suggest more detailed consideration is also required of the following:

- What price signals retail consumers will receive if the market becomes more volatile - see Appendix A for a comparison of recent price changes
- Effect on the market position of the major gentailers and (Trustpower) of the retirement of fossil fuel generation - see Appendix B.
- Recent average spot prices and how these compare to the values modelled in the MDAG Modelling Paper – see Appendix C..

The remainder of the body of this report comments on the questions from the MDAG Issues paper in the format requested.

[1] 'Price Discovery Under 100% Renewable Electricity Supply Issues Discussion Paper, Market Development Advisory Group, 18 January 2022', page 31

Table 1 Questions 1 to 3- 100%RE is technically challenging but achievable

Question[1]	Comment
1. Do you agree with the broad conclusions that emerge from the simulations in relation to spot price levels and volatility, in particular:	Partially,
(a) significantly more spot price volatility is likely with a 100%RE system, especially shorter-term weather-driven volatility?	Yes. However, the measurement of price volatility used in the simulations does not indicate the level of asymmetry in the distribution of prices. The annual standard deviation for the reference case is $39/MWh for 2035[2] but the box and whisker plots show a more skewed price distribution over time (page 23).
(b) New Zealand's sizeable hydro generation base is likely to moderate the growth in volatility to some extent, making extreme oscillations between zero and shortage spot prices relatively unlikely?	Partially. In theory there is potential for New Zealand hydro storage to moderate price volatility but there seems to be a wide range of opinions among generators and modellers about the hydro capacity available to moderate price volatility. The lack of transparency around water levels, decision-making rules and risk appetite of hydro generators, make it difficult to assess how volatility will play out. The modelling goes part way to addressing this question by considering 'low' and 'high' hydro offers alongside the reference case. However, a more detailed analysis of hydro generator water management decision-making and aversion to the risk of not being able to meet system demand is required to answer this question.
2. If you disagree, what is your view and the reasoning for it?	See answer to question 1 above.
3. Do you agree that in a 100%RE system there will be many diverse and disaggregated resources to coordinate, and that a wholesale market will be the preferred mechanism to coordinate plans and actions among all the resource owners? If you disagree, what is your view and the reasoning for it?	Partially. Most of the increase in number of resources will be in small scale batteries at residential level. A wholesale market will not be an effective mechanism for co-ordinating these resources and will require changes in EDB pricing and the development of aggregators as well new contracts between retail customers and retailers that allow for the demand response to be consolidated at GXP level The change required in wholesale markets will be modest compared to the change required in retail markets to combine residential demand response into units that can be traded on the wholesale market. The key issue determining the type of co-ordination is the extent to which the demand response capability is built into EV and residential solar batteries and automated.

Note:

1 Questions 1 and 2 are on both pages 18 and 61 of the MDAG Issues Discussion Paper. Question 3 is on both pages 18 and 65 of the MDAG Issues Discussion Paper.

Source: NZIER

[2] MDAG Modelling Paper by Concept Consulting and John Culy, page 39

Table 2 Question 4 Real time co-ordination

Question	Comment
4. Do you agree that these are the key issues in relation to real-time coordination? If you disagree, what is your view and the reasoning for it? The key issues referred to in question 4 are listed in the following rows:	Yes, but the issues also include improved information around the hydro lake levels and the decision-making rules used by hydro generators to set offers.
(a) Will forward scheduling processes be effective in a future environment where short-term system conditions change more rapidly (e.g. will there be a need to adopt more frequent cycles of schedules, different publication timeframes, new information content such as confidence intervals)?	For many of the issues mentioned 'adequacy of forward scheduling, 'demand forecasting' and capacity of aggregators to interact with wholesale markets; change from current practice will be required but the direction and pace are difficult to predict. A precursor to these changes will be the development of retailer and EDB products [3]that allow the development of residential demand response products.
(b) Will demand forecasting processes be effective with an increasing prevalence of electric vehicles, and behind the meter storage devices?	It would be helpful to separate the discussion of demand response into the type of technology and what the ideal process would be for the management of the response.
(c) Will the range of resources subject to dispatch by the system operator be appropriate?	This question needs to be narrowed down to be useful. The supporting papers should provide an indication of the resources available for dispatch
(d) Will there be an efficient mechanism to allocate dispatch rights when the volume of generation seeking to run at a zero price exceeds demand?	It would be helpful to outline the situation in which allocation of dispatch would be required. The starting points would be the current approach to dispatch when the price is low and the estimate of volume of generation at zero from the MDAG Modelling Paper.
(e) Will there be a need for new mechanisms (such as a short-term commitment market) to coordinate resources that require a lead time to get ready, such as batteries which need to be charged, or production processes which need to be modified on the demand side?	It would be helpful for the Issues paper to compare the lead time required for existing mechanisms for co-ordinating resource and demand response and then consider what factors have changed. In particular, will the existing resources be scaled-up or will new resources be added
(f) Will downstream parties such as aggregators be able to interact efficiently with the spot market (for example via adopting new mechanisms beyond the coming 'dispatch notification' product being introduced with real-time pricing)?	Aggregators are unlikely to develop without this capacity, but the binding constraint is more likely to be the characteristics and size of the retail demand response resources and the consolidation of these resources at the GXP (See real time pricing)
Note: 1 Question 4 is on both pages 20 and 69 of the MDAG Issues Discussion Paper.	

Source: NZIER

[3] EDB have used demand response tools for the management of network constraints and are not exposed to wholesale prices. Retailers offer customers average prices that smooth and respond with a lag to the volatility in wholesale spot prices.

Table 3 Question 5 Market for Ancillary services

Question[1]	Comment
5. Do you agree that these are the key issues in relation to ancillary services with 100%RE? If you disagree, what is your view and the reasoning for it?	Yes. However, the Transpower report[2] on future security and resilience (FSR) suggests these issues will emerge and need to be addressed well before 100% RE is reached. Also, the FSR paper provides a clear description of Transpower's analysis of the challenges and opportunities for the grid.
(a) Are there services that are currently provided freely as by-products that will become scarce under 100%RE?	Yes.
(b) Will new ancillary services such as inertia, standby reserves on a longer time scale than current instantaneous reserves, ramping duties and reactive power be required?	The Transpower FSR dashboard (Table 1 page8) which is quoted in the MDAG Issues Discussion Paper (page 73) indicates these issues will need to be addressed in 3 to 7 years.
(c) How can these new products be priced in a way that sends the correct operational and investment signals? Can or should they be integrated with the dispatch objective to allow automated dispatch and co-optimisation?	The products listed in the FSR dashboard rely very heavily on aggregation and co-ordination of residential demand response which in turn will require redesign of retailer and electricity distribution business (EDB) pricing structures. The new products should be integrated as closely as possible with the dispatch objective.
(d) How can decentralised distributed resources and new technology be sourced and used to provide current and new ancillary services?	

Note:

1 Question 5 is on both pages 21 and 74 of the MDAG Issues Discussion Paper.

2 Opportunities and challenges to the future security and resilience of the New Zealand power system, Draft report for discussion Version: 1.0, Date: November 2021'

Source: NZIER

Table 4 Question 6 Key issues for price signalling

Question[1]	Comment
6. Do you agree that these are the key issues in relation to price signalling with 100%RE as summarised in paragraph 3.42 above? If you disagree, what is your view and the reasoning for it?	
(a) Whether higher prices (occurring with greater frequency) signalling genuine scarcity of supply will be accepted in the wider political economy of the market; and	'Acceptance' is an ambiguous term both with respect to what it means for the nature and type of external intervention and by which parts of the market. The high wholesale prices over the past three years have not affected retail prices. The question should first consider the incidence of and consumer response to higher and more volatile spot prices.
(b) Whether the five elements set out in paragraph 3.38 above are required for an energy-only pricing regime to work; and	Partially. Elements a), b) and c) all imply that consumers can predict the average price of electricity based on history and an understanding of costs drivers and manage their exposure to price outside the market. The papers supporting the MDAG issues paper as well as the submissions on the EA Wholesale Electricity Market indicate that these conditions do not hold in the current market. There is a wide gap in market views over whether wholesale prices reflect real demand conditions or whether market power is being exercised by generators, concern that the high prices are not attracting investment in new generation and that the new form of generation (wind and solar) will not lower average prices.
(c) Whether you agree that fulfilling (d) and (e) in paragraph 3.38 above is highly influenced by whether (a) to (c) are satisfied.	Partially. The general public are shielded from price volatility by retailer and EDB pricing and there is no obvious mechanism for this to change. It is unclear who is actually paying the high spot price and carrying the risk of generation shortfall.

Notes:

1 Question 6 is on both pages 24 and 88 of the MDAG Issues Discussion Paper

2 The five elements are:

- a Prices that reflect real supply and demand conditions, including very high prices in times of scarcity
- b Confidence among wholesale buyers and sellers that the high prices make sense, (which means confidence in the structure and rules of the market, including the sufficiency of competition).
- c Availability of 'tools' for wholesale buyers and sellers to manage their exposure to those spot price risks.
- d General public and political acceptance that volatility and high prices (in times of scarcity) in the wholesale market are, in fact, in the best long-term interest of consumers, and that measures to 'soften the landing for unhedged participants can trigger a vicious circle of undermined investment incentives and higher future prices; and
- e Confidence among consumers/politicians that investment will be timely and competitive.

Source: NZIER

Table 5 Question 7 Pre-conditions for effective energy-only market

Question[1]	Comment
7. Do you agree that the preconditions in paragraph 3.38 would need to be in place for an energy-only market design to be effective? If you disagree what is your view and the reasoning for it?	This question seems to overlap with question 6 (b) answered above.

Note:

1 Question 7 is on both pages 24 and 88 of the MDAG Issues Discussion Paper

Source: NZIER

Table 6 Question 8 Options to increase spot price confidence

Question[1]	Comment
8. Do you agree that we should take forward to the next stage of the process (options identification and analysis) the measures referred to in paragraph 3.43 above? If you disagree, what is your view and the reasoning for it?	Paragraph 3.43 of the MDAG Issues Discussion Paper refers to measures that would: • Reduce spot price suppression during genuine scarcity events • Impose compulsory forward contacting obligations for purchasers to cover their firm demand and for suppliers not to sell contracts that exceed their firm output. This multi-layered question combines the assertion that there are one or maybe two market failures with simple options to resolve those failures. Overall, the MDAG Issues Paper does not make a compelling case that either of the two market failures have occurred or are likely to occur within the medium term and does not explain how the options would resolve the failures or suggest a framework for assessing the relative benefit and cost of the options. Rather than taking the measures in paragraph 3.43 to the option identification and analysis stage it would be more helpful for MDAG to define the problem in more detail particularly with respect to quantifying the gap between the current situation and what MDAG regards as the situation that the measures are intended to achieve. The following tables include a more detailed response to the two market failures and the suggested options. A more detailed response to: • 'Reduce spot price suppression …' is included in Table 7. • Compulsory contracting options Table 8.

Note:

1 Question 8 is on both pages 24 and 88 of the MDAG Issues Discussion Paper

Source: NZIER

Table 7 Question 8 Options to reduce spot price suppression

Question[1]	Comment
Measures to increase confidence in spot prices during genuine scarcity events (a) Reduce scope for spot price suppression during genuine scarcity events, for example via:	The MDAG papers do not describe examples of suppression of wholesale prices in genuine scarcity events or quantify how much MDAG expects suppression to increase over the transition period to 100%RE. The MDAG paper does not provide a clear explanation of what high spot prices in times of scarce supply are expected to achieve in respect of either encouraging investment in new generation or demand management response
(i) Increase awareness of the necessity of high spot prices when supply is genuinely tight, and the adverse consequences of artificially suppressing prices in those events, with information programmes for market participants, consumers, media, policy makers etc.	This suggestion does not explain the 'necessity' of high prices, how the terms 'high' and 'genuinely tight supply' would be defined and measured. The adverse consequences are not specified are presumably inefficient allocation of energy during periods of scarcity and delayed investment in new generation. The suggestion for awareness and information campaigns overlooks the disconnect between spot prices and retail energy prices – see Figure 1. Retailer - all you can eat pricing based on average of generation prices means that retail consumers are not exposed.
(ii) Strengthen the stress testing regime to ensure market participants are consciously aware of the risks of their hedging choices	The MDAG papers should indicate the options for strengthening the stress test regime – more frequent stress tests, or a wider range of scenarios for spot prices and capacity that reflect the greater price volatility suggested in the MDAG papers. It would also be helpful to discuss the rationale for used by the Electricity Authority in setting the spot prices to be used in the stress test.
(iii) Strengthen processes for reviewing high price events to ensure they are examined in a robust and timely manner	See comments below on strengthening the UTS process below.
(iv) Strengthen the process for determining UTS claims to include an explicit requirement to consider effects of any decisions on future investment incentives.	UTS claims are rare and include an allegation of exercise of market power. The MDAG papers do not explain either how the current UTS investigations would discourage investment or how a change in the process would encourage investment,

Note:

1 The 'measures to reduce sport price suppression' are at paragraph 3.43 (a) pages 23 to 24 and paragraph 7.89 (a) at page 88 of the MDAG Issues Discussion Paper

Source: NZIER

Table 8 Question 8 Options for backstop measures

Question	Comment
Explore backstop measures (b) Explore measures that would introduce compulsory contracting obligations on purchasers to forward contract for their firm demand, and ensure suppliers do not sell contracts that exceed their firm output, which may include measures such as:	The MDAG papers do not define either the problem that would be solved by imposed forward contracting or the feasibility of determining 'firm' demand or supply (particularly allowing for wet or dry years) and determining a suitable period for the forward contract. The MDAG papers do not discuss the proposal in the context of purchasers and suppliers using forward contracts to match spot price risk to their risk appetite. Also, the discussion does not consider the potential impact on spot price volatility and flexibility of thinning out the spot market,
(i) A conditional forward contracting obligation if projected demand exceeds supply (say) three years into the future (similar to the retailer reliability obligation in Australia)	The Retailer Reliability Obligation (RRO) refers to a reliability gap for peak demand for retail customers. This is a different concept from forward contracting for mismatches between firm demand or supply described in (b) above.
(ii) A reserve energy/capacity scheme with standing costs for reserve plant recovered from beneficiaries (i.e. parties that do not have forward cover for firm demand)	The core question for this option is what type of generating plant could be built to reliably provide additional capacity. The thermal plant used for this role in other markets is unlikely to be an option. The NZ Battery Project will be a key determinant of New Zealand's management of capacity risk. The consideration of this option should be delayed until the next report on this project is released (expected June 2022)
(iii) Introducing a firm capacity/energy market or similar mechanism.	See above comment on (ii).

Note:

1 The 'options for backstop measures' are at paragraph 3.43 (b) page 24 and paragraph 7.89 (b) page 87 of the MDAG Issues Discussion Paper

Source: NZIER

Table 9 Question 9 Demand side flexibility (DSF)

Question	Comment
9. Do you agree that these are the key issues in relation to demand-side flexibility with 100%RE? If you disagree, what is your view and the reasoning for it?	No, the key issues with expanding demand side flexibility are: • The development of EDB and retailer pricing options that allow demand side responses to be aggregated at GXP level. • Separation of the discussion of DSF into streams for batteries linked to solar generation, electric vehicle batteries and other forms of DSF. • DSF based on retail customer participation whether it is automated or not will need to allow a contingency for resources that are unexpectedly not available. • The analysis of DSF is focused on the opportunity for DSF provided by rapid uptake of solar and EV by 2035. A more pressing problem for the system will be the uncertainty around DSF as thermal plant is retired or becomes more expensive to run from now until 2030 but when the take-up of solar and EV is still relatively low.
(a) What are the wholesale market features necessary to fully realise the benefits of DSF under 100%RE?	Prototypes of the wholesale market features required to trade simple standardised DSF already exist in the markets for reserves and load shedding. The main impediments to the development of wholesale markets for DSF will be variations in DSF products offered by retailers and EDB which may constrain both the aggregation of DSF at GXP level as well as the creation of DSF products that are uniform and simple enough to trade in a wholesale market.
(b) Are the wholesale market features identified in (a) likely to be present as the shift to 100%RE occurs?	Yes.
(c) What are the actions needed to put the necessary features in place, to the extent that the wholesale market features in (b) are unlikely to develop naturally?	Retail based DSF are likely to carry higher transaction costs and reliability risk than grid- battery alternatives.

Note:

1 The 'key issues for demand side flexibility' are on page 25 and page 93 of the MDAG Issues Discussion Paper

Source: NZIER

Table 10 Question 10 Contract markets with 100% RE

Question[1]	Comment
10. Do you agree that these are the key issues in relation to contracts markets with 100%RE? If you disagree, what is your view and the reasoning for it?	The discussion in the MDAG issues paper prior to Question 10 includes the following points: • Some participants have argued that transaction costs for existing 'simple' hedge products are barrier to their use and that the transaction costs for 'shaped' products that hedge volatility during peak demand periods are likely to be more of a problem than those for simple products • Expert advice from Sapere that the transaction costs of shaped hedging is likely to encourage vertical integration of generators and retailers. Overall, the discussion seems to presuppose that hedging products could be made available to hedge against weather driven volatility but does not discuss: • What form of generation would not be correlated with the weather driven volatility and therefore could provide supply side for this hedging? • How the vertical integration of generators and retailers affects their preference for hedging weather volatility as opposed to transferring more of the price and supply volatility to their customers • How the phase out of thermal generation will affect the capacity of different major retailers to hedge price risk internally. The assertion in the heading for this section that contracts *'will have to do more of the heavy lifting'* is not supported by an assessment of the feasibility of this claim.
(a) What are the contract market features necessary to ensure participants will have reasonable access to the risk management products needed under 100%RE?	The key pre-requisite for hedging contracts is generation capacity which is not correlated with weather volatility and with output that is not committed to a customer group. The absence of this capacity is a key obstacle to contract-based hedges in 100%RE
(b) Are the contract market features identified in (a) likely to be present as the shift to 100%RE occurs?	No, for the reason discussed in the previous two rows of the table.
(c) What are the actions needed to put the necessary features in place, to the extent that the contract market features in (b) are unlikely to develop naturally, for example by building on existing regulatory tools or developing others?	The actions need to focus on which entities may develop and offer the generation capacity described in the comment on (a) above.

Note:

1 The 'contract markets with 100%RE' issues are on paragraph 3.49, page 26 and paragraph 7.124, page 98 of the MDAG Issues Discussion Paper

Source: NZIER

Table 11 Question 11 Key issues for retirement of thermal - transition

Question[1]	Comment
11. Do you agree that these are the key issues in relation to transition to 100%RE? If you disagree, what is your view and the reasoning for it? **Strengthen market process for retirement**	Partially. The discussion preceding the 'issues' does not include comment on fuels issues (increase in fuel cost, carbon prices, fuel supply uncertainty) and plant issues such as major maintenance requirements and expected remaining life.
(a) We should rely on contracting incentives (with spot prices allowed to reach high levels to properly signal scarcity) to avoid premature retirement of large fossil-fuelled thermal plant, and (in addition) improve participants' information and contracting incentives, for example by:	Yes, contracting incentives should provide the main mechanism for managing the retirement of thermal plant. Although the MDAG papers are focused on comparing the current state with a 100%RE system in 2035 and 2050 Question 11 considers transition issues that will be completed before 2035.
(i) Ensuring that participants have sound information about the system consequences of potential lumpy decisions - for example by strengthening the annual security assessment reports prepared by the system operator to include more information on different thermal plant retirement options, or effects of possible major energy storage projects such as pumped hydro;	Scenarios for thermal retirement should be included in the modelling of the next round of the MDAG analysis along with further work on the scenarios for the timing of investment in new solar wind generation in the lead -up to 2035.
(ii) Ensuring that any retirement of major thermal plant is telegraphed in advance – for example codification of the process for the retirement of plant above a certain size could be beneficial. Such a process could seek to ensure that plant owners and other participants have sufficient time to work through the options, while also making clear that final decisions on whether to retain plant will rest with owners;	Assessment of this proposal should compare the value of • Benefits such as improved availability of information to the market about potential retirement of thermal generation. • Costs such as loss of flexibility in options for the retirement process and a false sense of certainty about the timing or thermal plant retirement.
(iii) Adopting measures to reduce the likelihood of artificial spot price suppression as set out in paragraph 3.37(a);	No.

Note:

1 The 'contract markets with 100%RE' issues are on paragraph 3.53, page 27 and paragraph 7.138, page 101 of the MDAG Issues Discussion Paper

Source: NZIER

Table 12 Question 11 Key issues for retirement of thermal - backstop

Question	Comment
11. Do you agree that these are the key issues in relation to transition to 100%RE? If you disagree, what is your view and the reasoning for it? **Explore a backstop mechanism to facilitate orderly transition**	Partially, the discussion does not comment on the expected remaining life of each of the plants and the drivers of options to change the expected life. These factors all affect the potential effectiveness of the backstop measures proposed.
(b) We should explore options that would allow the retirement schedule for large fossil-fuelled units to be centrally determined, to reduce the risk of premature retirement, for example by adopting a strategic reserve mechanism as set out in paragraph 3.43(b)(ii); and	The exit of thermal generation is very difficult to manage because of the lack of certainty let alone control over fuel and carbon prices. This combined with the age of the existing plant makes it difficult to define to 'premature retirement' let alone the cost and risk of reserve plant to cover this contingency. The MDAG papers do not clearly define the market failure or explain how a centrally planned exit would lead to better solution than would be provided by the market. It is also not clear how this transition management question fits with the MDAG modelling which refers to a situation in 2035 without thermal?
(c) If so, how to manage the risks of such a mechanism impacting on contracting and investment dynamics during and after the transition.	Need to clarify what the investment dynamic risk is here. If the existing thermal are converted to run on hydrogen or biogas the issues of spot price suppression are relevant.

Note:

1 The 'contract markets with 100%RE' issues are on paragraph 3.53, page 27 and paragraph 7.138, page 101 of the MDAG Issues Discussion Paper

Source: NZIER

Table 13 Question 12 – Other lumpy issues

Question	Comment
12. Are there any other 'lumpy' issues that warrant specific consideration in the transition to 100%RE?	Demand response will be hampered by the current EDB and retailer market structure. The demand response blends EV and residential solar generation.

Note:

1 The 'other lumpy issues' question is on page 27 and page 101 of the MDAG Issues Discussion Paper

Source: NZIER

Table 14 Question 13 Key issues for wholesale market competition with 100%RE

Question	Comment
13. Do you agree that we should analyse how competition in the wholesale market is likely to be affected by a shift to 100%RE, in particular, in competition for seasonal flexibility services? If you disagree, what is your view and the reasoning for it?	Yes. There is already a lack of confidence the price reflect competition or that they are encouraging investment in the type of generation that is required to lower average wholesale prices.
(a) What (if any) areas of the wholesale electricity market are likely to experience increased supplier concentration and cause inadequate competition in the shift to 100%RE?	Generators with thermal capacity will need to replace some of this capacity with wind capacity and therefore will have reduced access to capacity that can be used peak demand. (Before the capacity is retired these generators are likely to find thermal plants will be increasing expensive to run.) The assessment in Table 2 that supplier concentration for base energy services will decline and competition will increase should be tested in more detail. At most the direction of change is ambiguous and at worst supplier concentration will increase.
(b) For any areas in (a) what is the timeframe over which changes are likely to occur?	From now until 2035.
(c) What are the options for addressing competition concerns identified in (a)?	See comment in (a) above.
Note: 1 The 'Wholesale market competition with 100%RE' issues are on paragraph 3.60, page 29 and paragraph 7.144, page 103 of the MDAG Issues Discussion Paper	

Source: NZIER

Table 15 Question 14 -Achieving the EA objectives

Question	Comment
14. What other key areas of opportunity or challenge (if any) will arise in the wholesale electricity market with 100%RE that are likely to have a significant impact in relation to achieving the statutory objective of the Authority, which is to "promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers"?	As stated in the comments above the key challenges not covered above are: • Changes in the EDB and electricity retailer pricing to create incentives for DSF • Absence of new generation capacity with a fuel source that is not affected by weather volatility and is competitive with peak prices.

Source: NZIER

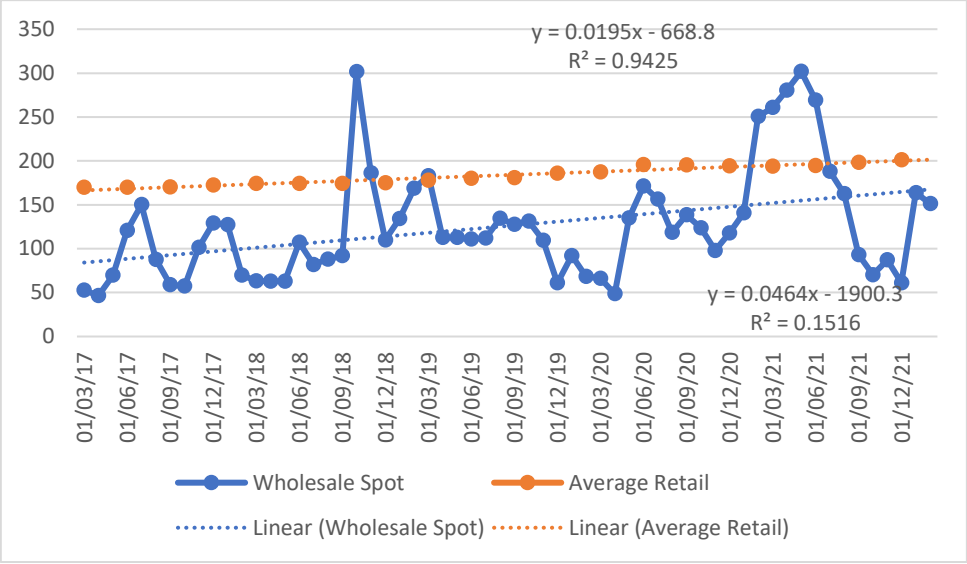
Appendix A Retail and wholesale prices

The MDAG Issues Paper includes several questions about the suppression of wholesale prices but does not provide:

- Examples of current suppression of wholesale spot price and which consumer groups are affected by the suppression
- A description of what future wholesale price suppression might look like and which consumer groups might be affected.

A comparison of wholesale spot energy and retail energy price movements over the past five years indicates that average retail prices have increased much more slowly than average wholesale prices.

Figure 1 Wholesale spot energy price and average retail energy prices



Source: NZIER

The arguments for demand response in the MDAG Issues paper rely on at least retail consumers being exposed to increased wholesale prices either directly or by being offered compensation to shift or lower demand.

Appendix B Effect of retirement of thermal on generator capacity

The retirement of thermal capacity will reduce the ability of some generators to supply the market during peak/demand price periods and could concentrate market power at peak periods among generators with hydro assets that have some storage capacity. The current generation capacity[4] reported in Table 16 below indicates that retirement of fossil-fuel generation will require Genesis to replace 45 percent of its capacity and Contact to replace 33 percent of its capacity.

Table 16 Current generation capacity (MW)

Major gentailers and Trustpower

Fuel	Genesis	Contact	Mercury	Meridian	Trustpower	Total
Thermal	953.8	621.0	0.0	0.0	9.0	**1,583.8**
Geothermal	0.0	480.0	467.0	0.0	0.0	**947.0**
Hydro	689.8	752.0	1,077.7	1,842.0	519.7	**4,881.2**
Wind	7.4	0.0	330.0	415.8	0.0	**753.1**
Total	**1,651.0**	**1,853.0**	**1,874.7**	**2,257.8**	**528.7**	**8,165.1**

Source: NZIER

Most of the replacement capacity will need to be wind generation and the role that Genesis and Contact play now in providing capacity for peak load will be severely eroded even if they build and operate 'green' thermal plants.

The MDAG Modelling Paper[5] estimates green thermal capacity in 2035 will be about 700 MW – less than half of the current thermal capacity and will make a far smaller contribution to total electricity generated than current thermal generation.

4 Data for generation capacity was copied from the gentailer and Trustpower websites.

5 'Price Discovery with 100% Renewable Electricity Supply, Final, Prepared for Market Development Advisory Group, 10 December 2021', by Concept Consulting and John Culy page 85, Reference Case

Appendix C Recent spot market returns to generators

A brief analysis of the spot market prices received by generators indicates the flow-on-effects of high wholesale prices at peak periods to wind generators as shown in Table 17 below. The recent average wholesale prices are well above the average prices considered in the MDAG Modelling Paper but provide real market evidence of the effects about uncertainty over hydro and thermal capacity – what the early stage of transition toward 100%RE might look like.

Table 17 Generator weighted average prices

Year ended	Generation (GWh per year)			Generation weighted average price ($per MWh)		
	Tararua	West Wind	System	Tararua	West Wind	System
31/12/2018			40,633.90			106.20
31/12/2019			41,238.60			117.50
31/12/2020	420.9	263.0	41,197.40	93.60	99.00	106.50
31/12/2021	391.4	240.2	41,002.80	133.70	146.70	171.00

Source: NZIER

The conventional approach to the modelling of wind generation investment seems to include two themes:

- Technology will steadily lower the capital cost of new wind farms reducing the cost of new wind generation relative to existing wind generation.
- As the share of wind generation increases electricity prices will be driven down toward the long run average cost of wind.

Analysis of the generation data for the Tararua and West Wind windfarms over past two years (which admittedly is a very short period) indicates that:

- While wind farm output varies widely from one trading period to the next during the day or over several days, on average over a year the volume of output is similar from one trading period to the next.[6]
- Current levels of wind farm output are not high enough to 'set' electricity prices in 'off-peak' trading periods.

It would be useful if the next round of MDAG analysis considered what the tipping point or range might be for the level of wind output to start 'setting' wholesale prices in 'off-peak' and then 'shoulder' periods.

[6] In contrast over 2020, Huntly Units 1, 2 and 4 output levels for trading periods between 7:00 am were about 11:00 pm were about twice the output levels after 11:00 pm and before 7:00 am. Although Huntly Units 1 and 4 generated almost the same output the GWAP earned by Unit 1 was about 30 percent above the system average while the GWAP for Huntly 4 was only 20 percent above the system average. Output from Huntly Unit 2 was only about 20 percent of that for units 1 and 4 but its GWAP was about 50 percent above the market average.