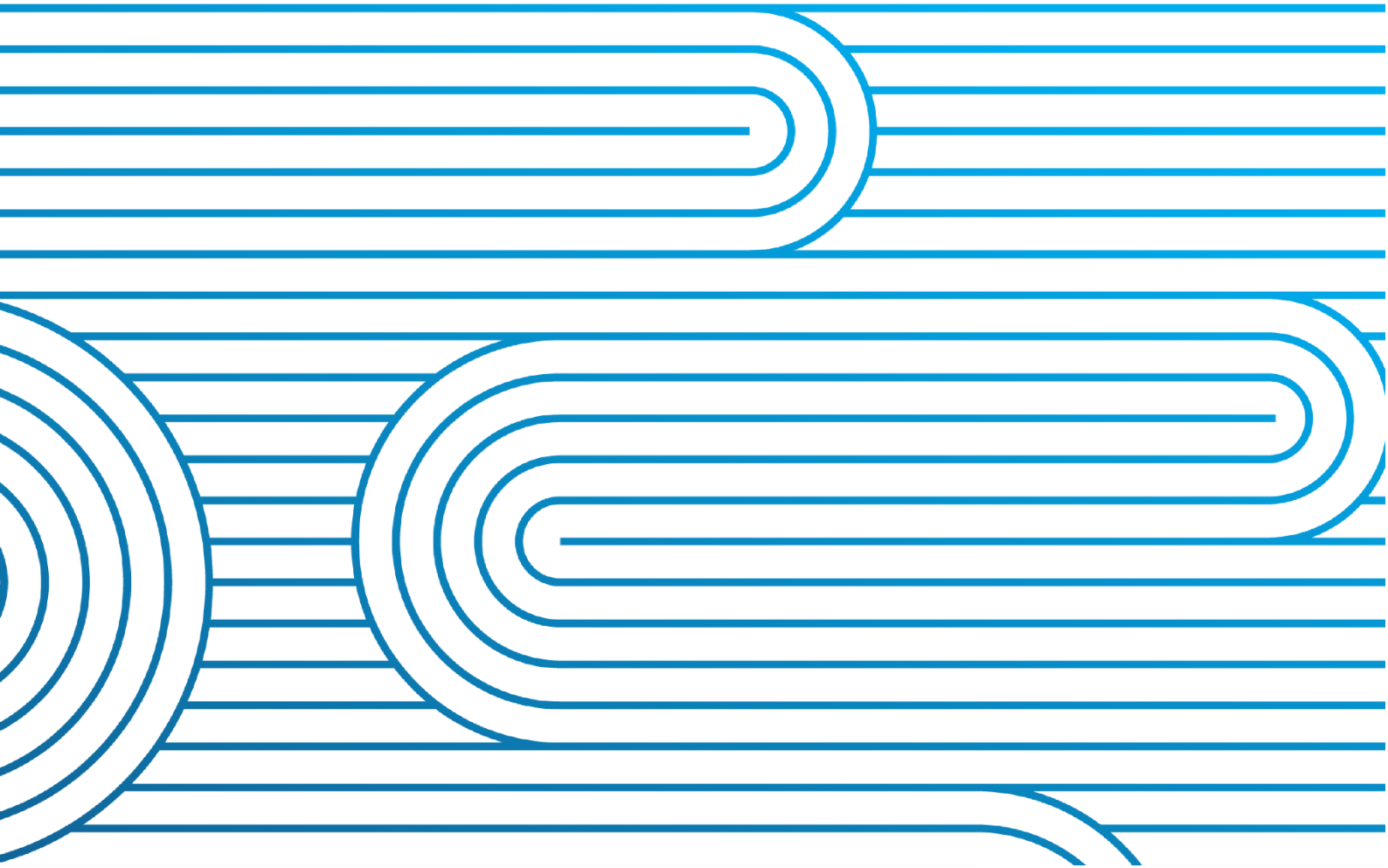
TRANSPOWER

Submission to the Market Development Advisory Group

Price Discovery under 100% Renewable Electricity Supply – Issues Discussion Paper

16 March 2022



Contents

Summary

Transpower supports the Market Development Advisory Group's work to ensure the market is effective in transitioning to 100% renewable electricity

We broadly agree with the Market Development Advisory Group's (MDAG) identification of issues with the wholesale electricity market in its project scope. In our response as Grid Owner and System Operator, we focus on both the main issues related to wholesale market design and secondary issues and enablers that we feel are important to realise the benefits of MDAG's work.

A broader whole of system perspective will be required to fully deliver benefits sought by MDAG

New Zealand is at a pivotal point in decarbonising its economy. The changes required to achieve 100% renewable electricity (100%RE) will set direction for the country for at least the next decade, and many changes will need to occur across the energy sector and economy. In this context, the changes we make to the electricity wholesale market should be aligned with a sustainable, affordable and reliable future.

There is potential for an 'issues gap' to deliver the benefits of MDAG's work. This gap represents the issues that need to be resolved in the wholesale electricity market, and the issues in the wider energy sector to realise the benefits sought by MDAG. In other words, for New Zealand to achieve 100%RE and the wholesale market to remain efficient, enablers will be required alongside and outside of the wholesale market. It is not clear if this gap is intended to be addressed in whole, or in part, by the Electricity Authority's roadmap, by MBIE and the energy strategy, or other industry participants.

We suggest that the energy trilemma framework continues to be used to help identify broader issues across the different aspects of the electricity system. Consideration across the three dimensions (delivering sustainable, reliable and affordable energy) will ensure we have a successful energy system that can deliver long-term benefits for consumers.

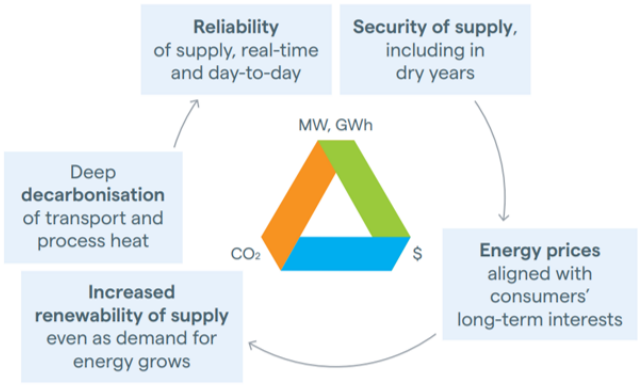


Figure 1: Energy trilemma framework

We recommend that MDAG take steps to consider a whole of system perspective and identify the key interdependencies between the wholesale market changes and other parts of the energy system and economy. By using the energy trilemma we have been able to identify a potential 'issues gap' not explicitly addressed by MDAG. Some of these gaps are already being addressed by other workstreams. However, the interdependency with 100%RE must be acknowledged for completeness:

- Timely and least regrets efficient investment in electricity transmission infrastructure to keep pace with renewable electricity supply and demand.

- The need for supporting legislative and policy guidance and changes for renewable energy infrastructure investment, that would occur alongside changes in the wholesale electricity market to ensure the market evolution is not inconsistent with or leave behind the decarbonisation of the wider energy system.

- The need for the Electricity Authority to consider increased co-ordination and collaboration of MDAG's work both outside and within the electricity industry with other related projects, such as the Future Security and Resilience[1] (FSR) workstream.

- The need to commit time and resources required to ensure timely implementation and delivery of changes required to tools and processes in the electricity market by participants.

- Analysis on the distributional and cost impacts for household consumer energy bills as a result of the transition to 100%RE.

- Enabling high consumer participation (e.g. demand side flexibility) and confidence in a competitive energy market.

- The barriers to use of biofuel, biomass and potentially green hydrogen for competing end uses across fast-start electricity generation and fuel switching for process heat.[2]

- Non-energy sector regulations, standards and market settings to ensure electrification of new sectors of the economy, particularly electrification of new sectors of the economy, particularly the electrification of the light vehicle fleet and decarbonisation of heavy freight to support decarbonisation goals by 2050.[3]

- Ensuring there is quality data and information flows in real time, such as visibility of distributed energy resources.

When seeking to make changes to the wholesale electricity market, analysis of the linkages, options and trade-offs that may need to occur in the broader energy system would need to be considered.

[1] See here
[2] Energy News article, "Woods concerned about biomass overcounting", 11 March 2022
[3] Analysis of the Climate Change Commission report Ināia tonu nei: a low emissions future for Aotearoa. Gross emission reductions includes transport, process heat and electricity generation which makes up 88% of the emission reduction required to meet net zero at 2050.

A major shift of the electricity system is required alongside the wholesale market to enable increased renewable electricity supply and electrification at pace, while still maintaining secure operation of the system

Transpower is ready to support the electrification of the economy as part of New Zealand's decarbonisation goals.

A key issue for Transpower as the Grid Owner is making timely and least regrets investment in the transmission grid for the benefit of consumers. Reliability of supply, efficient use of generation resources and competition are adversely impacted when the grid is constrained which reduce the benefits delivered by the market. The relevance of this issue to MDAG is the importance of the transmission grid and efficient investment in the grid as a key enabler to the benefits sought by potential future wholesale electricity market changes and 100%RE. Transpower will continue to support rapid, easy connection of distributed and renewable generation and load to the grid and ensure we stay ahead of the game with timely and least regrets enabling investment as the risks of investing in the grid too late are higher than the risks of investing too soon.

New Zealand's power system will transform with the changing mix of supply and demand technologies as we decarbonise our economy. This will impact on the operability of the system, such as ensuring supply-demand balance in real-time, signalling future supply-demand balance conditions and security of supply (dry-year) risks, maintaining voltage and frequency standards with increased inverter-based generation and ensuring sufficient reserves and ancillary services for secure, resilient power system operation, as shown in Figure 2. This will have impacts in our role as the System Operator. The Future Security and Resilience (FSR) program is a key piece of work undertaken by the Authority and the System Operator looking into the operation of the power system in the future. We see rapid development of the FSR workstream as critical to understanding the impacts of increased renewable penetration on New Zealand's future power system (the physical requirements) which would have implications on the future electricity market design (e.g. the need for additional ancillary service and other market enhancements). The FSR program and the importance of interacting with this MDAG project is discussed in greater detail in our response (see page 7).

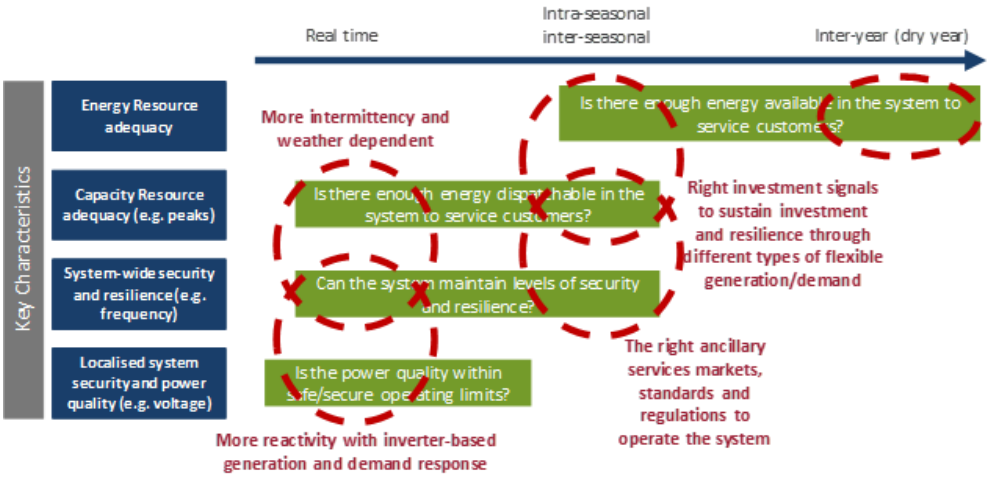


Figure 2: Illustration of potential issues when operating with a high proportion of inverter-based variable renewable generation

The speed and nature of the transition will not be linear so solutions must be flexible and practical

Consistent with MDAG modelling, our work from Whakamana i Te Mauri Hiko shows that the increase in demand through electrification can be met with 100%RE supply, and what needs to be true to enable this outcome. We also know that the transition is likely to be non-linear and will evolve through different pathways and forms until it reaches 100%RE. For example, we know that different types of technology capable of offering flexible generation to the market (e.g. green peakers) will impact that transition. In other words, the market design required to transition to 100%RE may be different to the market design required to operate at 100%RE.

Given the complexities of navigating the speed and timing of the transition, it may be appropriate for MDAG in its future analysis to consider whether market changes for 100%RE would be different for non 100%RE scenarios, noting that 100%RE supply is currently an aspirational target. The difference between how we operate a highly renewable (e.g. 95%) and 100% renewable electricity system may be significant. For example, the issue of cost differential and therefore affordability to the consumer are potentially significant and we must ensure the transition is at a cost that all consumers can afford. We recommend the next phase of the MDAG work incorporates further analysis to better understand the distributional and cost impacts on consumers energy bills under 100%RE.

Changes to the market design should also be fit for purpose in the context of this transition to 100%RE. These changes may require significant time and resource to ensure the market system, the Code, and System Operator security tools are fit for purpose. Significant changes would require longer timeframes and significant investment in IT systems (e.g. the market system) which could impact the practicality of some options explored by MDAG. We believe that the close collaboration with Transpower, in our role as System Operator, in the MDAG options assessment phase of this project will be critical to highlight deliverability and flow on impact aspects of various options.

Competition is the cornerstone of an effective wholesale electricity market for consumers

Sufficient competition is key for the electricity market to deliver efficient, secure market outcomes for the long-term benefit of consumers. From a wholesale market design perspective market participants and consumers rely on effective competition to moderate prices, especially when system conditions are constrained and there are periods of sustained higher prices. For example, if there are prolonged periods of elevated prices, consumer confidence that these prices are credible will decrease if there is a suspicion of weakening competitive pressure. This lack of credibility in the price signal will have a flow on effect to investment in new supply and demand-side resources. Conversely, if the wholesale and retail markets are competitive, then price signals will be credible and consistent with efficient operation, contracting and investment in the electricity market which will benefit consumers.

We recommend the next phase of the MDAG work considers measures to ensure adequate competition in the market as we transition into and operate under a 100%RE setting.

Strong cross sector and industry collaboration and leveraging cross sector work streams can help deliver better outcomes

We welcome the efforts by MDAG to adopt a highly interactive and open approach in this first phase of the work. We encourage future collaboration by MDAG both within and outside the electricity industry given the number of future-focused initiatives that may have an impact on this MDAG project. Some of these initiatives are being advanced by the Authority or its advisory groups such as the Future Security and Resilience (FSR) workstream Updating Regulatory Settings for Electricity Distribution Networks, Real-Time Pricing and the Innovation and Participation Advisory Group (IPAG) work on demand-side flexibility. In addition, other projects are being pursued by other industry stakeholders such as MBIE's New Zealand Battery project, the Governments soon to be released Emission Reduction Plan, the Gas Industry Company's proposed transition strategy for gas and Transpower's Renewable Energy Zones (REZ) concept.[4] Wider interaction by MDAG with consumer advisory groups would also help provide a consumer-focused lens on the future market under 100%RE.

One parallel workstream we'd like to emphasise in this context is the FSR project. The System Operator's phase 1 report to the Authority highlighted several challenges and opportunities in operating the future power system. It will be important for close interaction between the FSR and MDAG as both projects progress. This will help ensure the suite of options considered in MDAG's next stages of work are consistent with the findings from the FSR project.

In addition to these forward-looking assessments, collaboration with the Electricity Authority's market performance team (and their assessments of the current market[5]) could potentially help inform MDAG in its thinking and understanding of the competition issues for 100%RE.

Transpower is committed to play its part in the next stages of this work

We recognise that the issues identified have relevance to us, and others, and that the options and solutions will be found in a well co-ordinated and collaborative approach. We are committed to enabling new connections and least regrets timely investments, to build, operate and maintain the National Grid safely and efficiently, and fulfil our role of System Operator to manage the real-time power system and operate the electricity market to support a decarbonised energy future.

In our role as the System Operator, we are uniquely placed in the industry with practical experience in operating and understanding the power system and the electricity market. We believe this expertise, together with our independence can assist MDAG and the Electricity Authority in the next phases of this project to better understand and analyse the range of potential options and their practicality.

We welcome the opportunity to have closer involvement and engage with MDAG on this project going forward. If you have any questions about our submission, please contact Nicolas Vessiot (nicolas.vessiot@transpower.co.nz) in the first instance.

[4] There is around 11GW of wind and solar generation that investors may consider building in the next 30 years in New Zealand. Around 5GW of this generation is in regions where currently, barriers such as high connection costs or the first mover disadvantage could inhibit investment. Transpower's Renewable Energy Zone (REZ) concept could enable access to this generation.

[5] See https://www.ea.govt.nz/monitoring/enquiries-reviews-and-investigations/2021/wholesale-market-competition-review-2/

Response to consultation questions

Please find our responses to the consultation questions in the table below. Where noted, our responses are provided in our role as the Grid Owner or System Operator.

Question 1

Do you agree with the broad conclusions that emerge from the simulations in relation to spot price levels and volatility, in particular:

(a) significantly more spot price volatility is likely with a 100%RE system, especially shorter-term weather driven volatility?
(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?

We broadly agree.

We consider actual spot price volatility could be greater than what is indicated in the simulations due to operational considerations which MDAG has not included in its analysis. Operationally, there are planned and unplanned generation and transmission outages, and the available market resources are utilised for both energy and ancillary services (e.g. frequency keeping, instantaneous reserve and potentially other ancillary services in the future). These operational issues mean that the resources available are more constrained than assumed in the simulations. This could result in more extreme spot price variations as supply and demand resources become constrained. Further sources of uncertainty could also manifest on the demand-side with the increase of "behind-the-meter" distributed energy resources (DER) going forward. If the behaviour of this DER is not aligned with wholesale spot price signals it could result in additional spot price volatility in the market. The MDAG study highlights the potential for longer-term climate changes resulting in greater variations in temperature, inflows and wind however these were not included in the MDAG analysis due to insufficient information. Including these effects can further increase volatility in electricity demand and available generation further impacting the supply-demand balance uncertainty and increasing spot price volatility.

The MDAG study makes assumptions on the availability of demand response and "green" peaking generation[6]. Both these resources reduce modelled spot price volatility, however if these do not develop to the extent assumed in the MDAG analysis or the sensitivities, there would likely be further increases in spot price volatility. As an example, the barriers to use of biofuel and biomass in decarbonisation for competing end uses might reduce its availability for fast-start electricity generation. This might require other forms of fast-start generation to fulfil this need under 100%RE.

Careful consideration needs to be given to the impact of the increased volatility has on both new investors and consumers. It is important that wholesale market design incentives enable, rather than

[6] 750MW by 2035 and 900MW by 2050 with sufficient fuel stored for the green peakers to enable about 2.5 weeks of operation. In its 2050 simulations, the MDAG analysis assumes that up to 2.5% of monthly demand could be curtailed in some months during low hydro inflows.

inhibit, investment from a wide pool of competing investors in renewable electricity. For consumers the market design must enable electricity that is reliable, affordable and accessible as we decarbonise our economy and transition to 100%RE.

We agree that the flexibility of our sizeable hydro generation fleet with storage, together with other energy-arbitrage activities can help moderate increases in short-term spot price volatility provided there is sufficient competitive pressure on generator market offers. We also agree, as noted in the MDAG simulations, increased volatility could be expected in New Zealand over longer horizons (monthly/annual) compared to observation in other jurisdictions given the dependence of a sizeable portion of our generation on variable inflows from year-to-year.

A key issue for Transpower is making timely and least regrets investment in the transmission grid for the benefit of consumers. There is a real risk that investment in the grid may not keep pace with a goal of 100%RE. We expect this to be considered in our planned engagement with industry on Phase 2 of our New Zealand Grid Pathways (NZGP) project, and we will be engaging on the needs for the grid to service a highly electrified and renewable economy. Transpower will continue to support rapid, easy connection of distributed and renewable generation and load to the grid and ensure we stay ahead of the game, as the risks of investing in the grid too late are higher than the risks of investing too soon.

Question 2

If you disagree, what is your view and the reasoning for it?

See response to question 1.

Question 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?

We agree, however we consider these resources could also have value streams outside the wholesale electricity market.

Going forward there is likely to be a large number of diverse and disaggregated resources many of them embedded within distribution networks, and as included in MDAG's modelling and analysis these will play a key role to enable the transition to 100%RE.

Many of these resources will have multiple value streams some of which will not necessarily be aligned with conditions on the wholesale electricity market (e.g. to manage local distribution network issues). To enable these resources to deliver their full benefit there needs to be wider systems thinking and clear expectations between the System Operator, electricity distribution businesses (EDBs) and aggregators or traders managing these resources. This co-ordination will also help ensure up-to-date technical standards and visibility of these resources at both transmission and distribution levels so that the benefits of these distributed resources are fully captured to ensure efficient and secure operation of the power system. These issues have been raised in the System Operator's phase 1

Future Security and Resilience (FSR) project report as key enablers for DER. The MDAG work will benefit from interaction with the FSR workstream to understand the implications of these elements and the potential impacts they can have on the wholesale electricity market.

We also note that while the wholesale market might be suitable for some services where there is sufficient competition and where a market-based approach is practical (an example could be additional reserve products cleared in the wholesale market), this will not necessarily be the optimal coordination mechanism for all system needs (e.g. connection standards and regulations may be a more appropriate mechanism to require a certain service be provided as conditions of connection). Close collaboration with the FSR and other workstreams will help highlight these issues.

Question 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?

We broadly agree.

The issues raised will have a significant impact on the operability of the power system and the system operator in meeting its performance obligations (e.g. maintaining system frequency). Balancing renewable generation was raised as one of the key challenges in the Future Security and Resilience (FSR) phase 1 report. While the scope of the MDAG project focuses on 100%RE, we would expect these issues to increase in severity during the transition to 100%RE as the proportion of intermittent renewable generation and distributed energy resources (DER) is expected to ramp up. Therefore, we consider that co-ordination on these issues between the MDAG project and the FSR project would help to ensure the options being considered by the MDAG are coherent with the FSR findings. Similarly, we consider the options in phase two of MDAG's project also need to carefully consider impacts on system security, System Operator resources, tools and processes to ensure they are practical. This could be achieved with closer collaboration between MDAG and the System Operator during the options identification and assessment phase of the 100%RE project.

Another key issue for the System Operator to enable co-ordination of resources in real-time is availability of high-quality, real-time information to increase observability of the large number of future distributed resources. This issue was also raised within the FSR project phase 1 report.

The availability of this data will also assist the Grid Owner and other providers to be better equipped to invest in the timely and least regrets investment in the transmission grid for consumers and to support 100%RE and decarbonisation whilst ensuring expecting levels of system security.

Question 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?

We agree.

The FSR project is a key piece of work to identify the opportunities and challenges of future security and resilience of the power system. We believe there needs to be ongoing interaction between the MDAG 100%RE project and FSR. We think this is particularly important during the options phase of the MDAG project to help ensure the wholesale market mechanism options considered are aligned with the expected physical characteristics of the future power system both as we transition to and achieve a 100%RE system. The issues raised in the FSR phase 1 report are relevant here to ensure the Code, technical requirements and market tools are not a barrier to the uptake of new technology being able to provide energy and ancillary services to the market. We therefore see early progress on the issues raised in the FSR report as key enablers for future ancillary service options in a highly renewable market.

It will be important to ensure the potential future ancillary services and the associated mechanisms for procuring them are fit-for-purpose (e.g. procured via the wholesale market, contracted or via regulation/code obligations on connected assets). Procuring ancillary services via the spot market through co-optimisation might be more suited to some types of ancillary services (e.g. instantaneous reserves) however it increases the complexity of the pricing process as well as the System Operator security and market tools which will increase costs and time to implement. There may also be instances where market procurement might not be the most efficient option (e.g. where the required ancillary service is very localised and hence competitive pressure on suppliers is limited). In these instances alternate mechanisms might be a more efficient outcome (e.g. obligations on connected assets). It will be important to ensure that under phase 2 of this project, there is a mechanism to consider these trade-offs. We also consider the options in phase 2 of MDAG's project need to carefully consider impacts these options may have on system security risks, System Operator resources, tools and processes to ensure they are practical and can be delivered in a reasonable time. We believe this could be achieved with closer collaboration between MDAG and the System Operator during the options identification and assessment phase of this project.

A key part of the future investment case will be understanding the least cost option. These options are a toolbox and can include optimised market products, ancillary services or grid asset investment. For example, the grid asset investment in the first phase of the Waikato Upper-North Island Voltage Management (WUNIVM) project saw the installation of grid assets. Additionally, ancillary service products (either procured through the market or via connection standards) are also part of the toolbox that can provide grid support ancillary services. These solutions and products should be technology agnostic and will need to be co-ordinated. Some of these might reduce the need for regulated grid investments (e.g. grid investment to manage harmonic distortion). This could result in cost avoidance of investment in regulated assets for the benefit of the system and avoid costs to users.

Question 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?

We broadly agree.

In addition to the key issues for price signalling raised in paragraph 3.42 of MDAG's paper, we consider the following are additional key issues related to price signalling:

- Competition is important to ensure that artificial price inflation (equally a risk as artificial price suppression) is avoided, which can occur for instance when parties exercise market power. The wholesale market design needs to provide the right incentives and lower barriers to entry to attract new participants and investors as well as stimulate competition and reduce any existing market share advantages held by incumbents.

- An active and competitive demand-side operating within the wholesale electricity market is key to help with price discovery and to improve price signalling.

- Accurate market offers into the forecast market schedules (especially from intermittent generation) are important for signalling potential scarcity in the scheduling process and efficient price discovery in an energy-only market[7].

The confidence of the energy-only market design depends on whether it is meeting expectations in regard to system security. As an example, under the current energy-only market design, if there is insufficient capability to balance supply and demand, demand curtailment will be instructed by the System Operator which can result in scarcity pricing. This will change under real-time pricing (RTP) where demand will have default scarcity price values that may trigger instructed disconnection (i.e. load curtailed) before higher-priced generation is dispatched. From a market perspective this might be considered an efficient price signal but could reduce consumer and wider stakeholder confidence in the market's ability to deliver the expected levels of security.

To ensure the expected levels of system security are still fit for purpose as we transition into and operate under 100%RE, we consider the relevant system security market settings be reviewed to ensure these are still fit for purpose. These include settings such as:

- Energy and reserve shortfall prices provided by the Authority to be used under real-time pricing (RTP).

- The Winter Capacity Margins and Winter Energy Margins and the Security Standards Assumption Document (SSAD) produced by the Authority and used to inform the Security of Supply Annual Assessment undertaken by the System Operator.

- The official conservation campaign (OCC) and customer compensation scheme (CCS) settings.

While not related to power system security (but rather to improve understanding potential risks to market participants with more volatile prices expected), we consider the stress test[8] regime might also need further consideration to ensure it is fit for purpose as we transition into and operate under 100%RE.

Question 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?

[7] Even with the most accurate offers, there will always be unexpected events that can impact both the supply and/or demand which can result in unexpected price movements. On balance however we expect more accurate offers improves confidence in the price signal.
[8] See here.

We broadly agree.

In addition to the issues raised we believe important pre-conditions for an energy-only market include:

- an active and competitive demand-side market is key for the energy-only market design moving forward, and
- the energy-only market is delivering the expecting levels of system security.

Please also refer to our response to question 6 where we discuss future work needed to ensure the market security settings are still fit-for-purpose as we transition into and operate under 100%RE.

The energy-only electricity market also needs to be considered within a broader energy perspective considering its impacts on reliability and sustainability and the long-term benefit of consumers.

Question 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?

We broadly agree.

As we decarbonise our economy and transition the electricity market to 100%RE there may be increased risk of inadequate levels of system security as some parts of the market may evolve faster than others. This may increase the risk of involuntary demand curtailment. We therefore agree with MDAG to also explore potential "back-stop" (or supplementary) market mechanisms to increase the security of the power system (especially as we transition to 100%RE supply) where the energy price signal and contracting mechanism might not be adequate to manage the increased risks to system security during this time of rapid change.

In addition to considering a conditional forward contracting obligation similar to the RRO in Australia, MDAG should explore the capacity obligations being used in other jurisdictions such as the USA (e.g. California Resource Adequacy program). In the next phase of MDAG's work (options analysis) we would encourage analysis on the distributional and cost impacts on household consumer energy bills as a result of the transition to 100%RE. We would encourage engagement with consumer advocacy groups to provide a consumer-focused lens on these issues.

Given the system operator's role in maintaining system security, we would welcome closer collaboration with our System Operator function as MDAG explores these options further in the next phase of the project.

Please also see our response to question 13.

Question 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?

We agree.

Increased demand-side participation is key to a well-functioning market for both energy and ancillary services. We support initiatives to increase its uptake in the market where they can assist, or do not degrade, system security. The distributed energy resources (DER) report[9] commissioned by the System Operator, noted that between 2.5GW and 3GW of DER could be installed by 2035, and a further 1GW to 1.5GW by 2050 if the pricing for DER reflects all the value it can deliver.

The importance of increased distributed energy resource (DER) penetration and the opportunities and challenges related to these are outlined in the System Operator's FSR phase 1 report (e.g. reducing Code and technical barriers to DER uptake, improving visibility and interaction of DER in the wholesale electricity market). As mentioned above, we believe that closer collaboration between the FSR and MDAG project could help ensure a consistent assessment more coherent solution to help reduce the barriers and better realise the benefits that the demand-side can play in the future electricity market.

Recently, Transpower (Grid Owner) presented[10] its views on developing flexibility markets in New Zealand to the Innovation and Participation and Advisory Group (IPAG). As a result of Transpower (Grid Owner) research and demand response programme experience, the wholesale market design requires some key features to enable demand side flexibility (DSF), some of these were presented and include:

- Need for increased visibility of DSF resources, and grid-wide constraints (e.g. access to better quality data).
- Ensuring the right incentives are in place to motivate, enable and encourage participation.
- The market is open, interoperable and technology agnostic.
- Maximizing the value stack and benefits for end consumers (e.g. such as lower distribution and transmission costs), including those value streams outside of only wholesale market value streams).
- Phased approach to growing and developing the DSF market.
- Potential increased compliance costs for demand response market participants.
- Consumer choice to participate in demand side flexibility services and offerings on a voluntary basis.

We agree the role of DSF and enabling technology is becoming more available and at a lower cost to deploy. DSF can provide benefits to reduce system costs, help to manage price risk, and provide a mechanism to respond when short term electricity supply is variable or scarce (currently fulfilled by the role of a peaking plant), provided the usage of the DSF is aligned with the conditions on the wholesale market. Additionally, if more demand-side flexibility was available via the market dispatch process there would be less need for involuntary demand curtailment.

[9] https://www.transpower.co.nz/resources/distributed-energy-resources-der-report
[10] https://www.ea.govt.nz/assets/dms-assets/29/Developing-Flexibility-Markets-in-New-Zealand-Transpower.pdf

The wholesale market also needs to be augmented by:

- Workstreams already underway, such as FSR and IPAG. Transpower highlights the importance of increased DER penetration and the opportunities and challenges related to these in the System Operator's FSR phase 1 report (e.g. reducing Code and technical barriers to distributed energy resources uptake, improving visibility and interaction of DER in the wholesale electricity market). There will still be a need for market and regulatory development of open, accessible and interoperable standards and commercial contracts and business models to be in place. We note the work on this issue by the IPAG.

- New workstreams that are required include cross-industry regulatory review of data sharing requirements. For example, the benefits of increased data and visibility will help Transpower in its role as System Operator in the market scheduling and dispatch process to increase the quantity of resource available in dispatching the system and helps the market with more efficient price discovery.

MDAG will need to support and co-ordinate with the above.

We note MDAGs 'enhanced demand management' scenario assumes fully flexible demand that can be sustained over hours or weeks as required. We wish to comment that not all DSF participation is the same and the value of DSF can be different and asymmetric. To offer a material amount of curtailment for a long period of time would likely require high participation. In some instances, it might be expensive and an impractical use of flexible demand response resources.

We disagree that consumers are not aware of smart appliances, however we do agree that consumer education and incentives for demand-side participation is lacking. Simply having smart appliances existing and consumer awareness of these smart appliances to drive behavioural change is not sufficient on its own. There is the further issue of access and entry costs for many lower socio-economic consumers to participate in demand side flexibility (e.g. the cost of smart appliances, electric vehicles, home batteries, rooftop solar PV generation etc).

Question 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?

We broadly agree.

Improvement in the contracts market can help create incentives for additional supply and demand-side flexibility resources in the wholesale electricity market. As an example, the availability of capacity products in the futures market can help provide additional revenue streams for low capacity factor resources that can reduce peak prices (such as peaking generation, batteries and demand side resources). If these resources are offered into the wholesale electricity market, they would increase the quantity of resources available to the System Operator to dispatch to meet the peak system requirements. All else being equal, increasing the quantity of resources available to the System Operator in balancing supply and demand will be beneficial for system security and resilience.

In addition to more contract market features it would be useful to explore the current barriers raised in the MDAG paper and options to reduce these going forward to encourage greater contracting.

We believe the MDAG assumption that price volatility is not a primary concern provided that participants (such as investors or purchasers) can enter into competitively priced forward contracts to effectively mitigate their investment risks, requires further investigation. If this assumption did not hold true, then reliable, sustainable and affordable electricity for consumers may be at risk.

Transpower (Grid Owner) is supportive of accelerating investment in renewable electricity generation by matching additional supply to new sources of demand (e.g. process heat electrification). We agree that innovation and additional solutions (e.g. products and services) will be required for generation and retail investors to manage spot price volatility and financial variability. For example, Transpower (Grid Owner) is supportive of expanding access to a Power Purchase Agreement (PPA) platform/market to facilitate the exchange of long-term agreements (e.g. 5-25 years) between buyers and sellers for new electrification projects. This would reduce barriers to entry for renewables investment, increase market players and competition and provide opportunity to electrify existing demand side load. Energy users could hedge their long term electricity pricing, which can provide greater price certainty than is available via, for example, the ASX electricity futures. It is likely to flow through to wholesale market benefits through over the counter competition.

Question 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?

We partly agree.

We consider that in addition to increasing the certainty on supply-side retirement, improving the quality of information on large load exits would also help reduce future market uncertainty and help with co-ordination of future generation investment, demand-side and grid resources.

The MDAG issues paper provided some illustrative examples focusing on the uncertainty of generation retirement and how to help reduce this risk. However, we consider there are other risks, such as the reduced price signals to start and run less flexible thermal generation during the transition period. During this transition period, the "optimal mix" of different technology types might not be in the system and for example, there maybe be increased quantities of intermittent renewable generation emerging, but insufficient demand-side and peaking generation capacity to respond to the intermittent generation uncertainty. We consider additional measures may be required during the transition to help counter these transition risks (e.g. ensuring increased levels of reserves during the periods of increased risk in the transition). Given the System Operator's experience in managing these operational risks, we believe close collaboration with the System Operator would be beneficial to better understand these operational issues and potential options during the next phase of this project.

To transition to 100%RE, many participants, will be impacted and need to make changes. This will require careful management and a sustainable rate of increasing resources and new technology during the transition to keep pace. For example, this sustained rate of change would need to apply within the System Operator's tools to ensure accurate modelling of the power system and market for operating the power system securely. Additional changes to market design impacting market and

power system tools further increases the requirements on human and information technology resources within the System Operator. These requirements would need to be considered as part of the options analysis phase of this MDAG project to understand the impact these may have on the tools and process of the System Operator and the practicality of options and potential impacts on timeframes.

While outside of the direct wholesale market design changes, the grid is a key enabler in facilitating the orderly transition and operation under 100%RE. A key issue is making timely and least regrets to investments in the transmission grid for the benefit of consumers. We expect this to be considered in our planned engagement with industry on Phase 2 of our New Zealand Grid Pathways (NZGP) project, and we will be engaging on the needs for the grid to service a highly electrified and renewable economy. Electricity transmission has long lead times and is subject to factors such as construction timeframes and regulatory approvals. There is a risk that investment in the grid may not keep pace with the wholesale market design changes to achieve a goal of 100%RE, if there is no consideration given to the co-ordinated and efficient investment ahead of future capacity needs or connection requests. This can lead to delays in the early stages of project development, resulting in significant additional costs and inefficient market outcomes due to transmission constraints, delays in connecting new generation and loads, and issues with reaching decarbonisation targets.

Question 12

Are there any other 'lumpy' issues that warrant specific consideration in the transition to 100%RE?

Yes.

In addition to supply side (e.g thermal exits) we consider operational risks may be exacerbated during the transition if "lumpy" operational capacity (such as less flexible thermal generation) does not have sufficient price signals to operate in the current energy-only spot market. The consequence of this leaves the power system more exposed to intermittent generation uncertainty (without sufficient development of peaking and demand-side flexibility).

We also consider that improving the quality of information for "lumpy" loads (entry and exit) could reduce uncertainty for future market and grid investments. We note "lumpy" load entry could be driven by rapid electrification of transportation and industrial processes en masse.

Question 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?

We agree, however we think the analysis should be extended to other markets as well, such as the contracts market (e.g. futures, FTRs, PPAs).

Sufficient competitive pressure across operational, contracting and investment timeframes is key for the market to deliver efficient, secure market outcomes for the long-term benefit of consumers. Given this we consider the potential impacts of competition should be considered across the different operational, contracting and investment markets under 100%RE.

It would also be useful to understand how these competition metrics could be measured and tested going forward as we transition into and operate under 100%RE to ensure these various operational, contract and investments environments maintain the competitive market forces. We anticipate these and other potential options will be explored more fully in the next phase of this MDAG project however we note some potential examples including from other jurisdictions such as: the Market Liquidity Obligations in the NEM (used with the RRO), comparison of spot prices against short-run marginal costs and cost of new entry, supply-side (existing and new build) concentration tests in the different markets.

We consider closer collaboration between MDAG and the Electricity Authority's Market Performance team (and their assessments of the current market) could also help inform MDAG in its thinking and understanding of the competition issues observed in the current market and how these may change as we transition into 100%RE.

Question 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"?

We recommend that MDAG take steps to consider a whole of system perspective and identify the key interdependencies between the wholesale market changes and other parts of the energy system and economy.

In addition to this, there are a number of broader issues and enablers that interface with wholesale market design changes, as discussed above and outlined below. These include:

- Timely and least regrets efficient investment in electricity transmission infrastructure to keep pace with renewable electricity supply and demand.
- The need for supporting legislative and policy guidance and changes for renewable energy infrastructure investment, that would need to occur alongside changes in the wholesale electricity market to ensure the market evolution is not inconsistent with, or leave behind, the decarbonisation of the wider energy system.
- The need for the Electricity Authority to consider increased co-ordination and collaboration of MDAGs work both outside and within the electricity industry with other related projects, such as the FSR[11] workstream.
- The need to commit time and resources required to ensure timely implementation and delivery of changes required to tools and processes in the electricity market by participants.
- Analysis on the distributional and cost impacts for household consumer energy bills as a result of the transition to 100%RE.

[11] See here

- Enabling high consumer participation (e.g. demand side flexibility) and confidence in a competitive energy market.

- The barriers to use of biofuel, biomass and potentially green hydrogen for competing end uses across fast-start electricity generation and fuel switching for process heat.[12]

- Non-energy sector regulations, standards and market settings to ensure electrification of new sectors of the economy, particularly the electrification of the light vehicle fleet and decarbonisation of heavy freight in transport to support decarbonisation goals by 2050.[13]

- Ensuring there is quality data and information flows in real time, such as visibility of distributed energy resources.

[12] Energy News article, "Woods concerned about biomass overcounting", 11 March 2022

[13] Analysis of the Climate Change Commission reportInāia tonu nei: a low emissions future for Aotearoa. Gross emission reductions includes transport, process heat and electricity generation which makes up 88% of the emission reduction required to meet net zero at 2050.

TRANSPOWER

TRANSPOWER.CO.NZ