Submission on *Measures for Transition to an Expanded and Highly Renewable Electricity System*

Name	
Organisation (if applicable)	Electric Power Optimization Centre, University of Auckland
Contact details	

Release of information

Please let us know if you would like any part of your submission to be kept confidential.

☐ I would like to be contacted before the release or use of my submission in the summary of submissions that will be published by MBIE after the consultation.

☐ I would like my submission (or identified parts of my submission) to be kept confidential, and **have stated below** my reasons and grounds under the Official Information Act that I believe apply, for consideration by MBIE.

I would like my submission (or identified parts of my submission) to be kept confidential because [Insert text]

[To check the boxes above: Double click on box, then select 'checked']

Responses to questions

Part 1: Growing Renewable Generation	
1.	Are any extra measures needed to support new renewable generation during the transition? Please keep in mind existing investment incentives through the energy-only market and the ETS, and also available risk management products. Any new measures should add to (and not undermine or distort) investment that could occur without the measures.
	The Government should not intervene unduly in the ETS market. ETS prices should be allowed to move to levels consistent with NZCCC emissions budgets. The Government should promote an understanding of the enormous scale required for the transition to renewable energy, and the need to ramp up investment in wind and solar energy. This understanding is enhanced by the development and publication of open -source computer models. The Government should be agnostic to investigating all forms of renewable generation for the transition without ruling out technologies via Government legislation. This should extend to making available the costs and risks associated with baseload fossil-fuelled plant (e.g., with carbon capture) and small-scale nuclear energy. The costs of these technologies might make them uneconomic, but this information should be made part of the discussion.
2.	If you think extra measures are needed to support renewable generation, which ones should the government prioritise developing and where and when should they be used? What are the issues and risks that should be considered in relation to such measures?
3.	If you don't think further measures are needed now to support new renewable generation, are there any situations which might change your mind? When and why might this be?
	If Lake Onslow proceeds, then this will provide disincentives for commercial market participants to build firming capacity. Some form of firming mechanism will be needed to restore the reliability that Onslow was designed to ensure.
4.	Do you think measures could be needed to support new firming/dispatchable capacity (resources reliably available when called on to generate)? If yes, which kind of measures? What needs do you think those measures could meet and why?
	The need for capacity measures depends on the form of the electricity market. In the New Zealand energy-only market, capacity is paid for by spot energy prices. If these short-run prices decrease because of more zero-marginal-cost renewable plant, or government intervention to ensure reliability, then some form of capacity mechanism (for ensuring firming capacity during windless cloudy days) is likely to become necessary as wind penetration increases. This might be an explicit capacity auction or bilateral mandatory options between consumers and generators.
5.	Are any measures needed to support storage (such as battery energy storage systems or BESS) during the transition? If yes, what types of measures do you think should be considered and why?
	No. Participants in the market should determine the best technology for dealing with windless cloudy days, rather than the Government. At current costs, battery energy storage is feasible at a household level to get through a short windless cloudy period. Households can decide based on cost if this is worthwhile. At current costs, batteries might not make sense at industrial scale, compared with peakers (even accounting for their high fuel cost which might include an emission component).

6.	If you answered yes to question 4 or 5 above, should the support be limited to renewable generation and renewable storage technologies only or made available across a range of other technologies? Keep in mind that fossil fuels are generally the cheapest option for firming, though this may change over time as renewable options (particularly batteries) become more efficient and affordable.
7.	If you answered yes to question 6 above, what are the issues and risks with this approach? How could these risks and issues be addressed?
8.	Are any measure(s) needed to support existing or new fossil gas fired peaking generation, so as to help keep consumer prices affordable and support new renewable investment? Gas-fired peaking plant are supported in an energy-only market by episodes of very high prices. These would be incurred on windless cloudy days when hydro and geothermal capacity is insufficient to meet demand. Risk plays a role here, and contracts between consumers and generators can reduce the volatility of cash flows for peaker investment. Extra support for these plants would only be necessary if these high prices were capped by regulators, leading to a missing money problem. Electricity prices are already high; for some they are barely affordable. The transition to renewable energy will increase these prices since consumers have to pay to avoid the damage currently being inflicted on the environment (which they are currently not doing). It should be recognized that, unless the cost for the transition is borne by taxpayers, electricity prices will become less affordable.
9.	If you answered yes to question 8 above, what measures should be considered and why? What are the possible risks and issues with these measures?
10.	If you answered yes to question 8 above, what rules would be needed so that fossil gas generation remains in the electricity market only as long as needed for the transition, as part of phase down of fossil gas? The rules depend on the government's goal for the transition. If the objective is to reduce fossil fuel electricity generation capacity to zero, then some legislation to enforce this is needed. If the objective is to reduce New Zealand's carbon emissions, then it might be optimal to retain some fossil-fuel capacity to be used very rarely.
11.	Are there any issues or potential issues relating to gas supply availability during electricity system transition that you would like to comment on?
12.	Do you agree that specific measures could be needed to support the managed phasedown of existing fossil fuel plants, for security of supply during the transition?
13.	If you answered yes to question 12 above, what measures do you think could be appropriate and why? What conditions do think you should be placed on plant operation? For example, do you have any views on whether there should be a minimum notice period for reductions in plant capacity, and/or for placing older fossil fuel plant in a strategic reserve?

14.	If you answered yes to question 12 above, what are the issues and risks with these measures and how do you think these could be addressed?
15.	What types of commercial arrangements for demand response are you aware of that are working well to support industrial demand response?
16.	What new measures could be developed to encourage large industrial users, distributors and/or retailers to support large-scale flexibility?
17.	Do you have any views on additional mechanisms that could be developed to provide more information and certainty to industry participants?

Part 2: Competitive Markets

18.	Do you agree that the key competition issue in the electricity market is the prospect of increased market concentration in flexible generation, as the role of fossil fuel generation reduces over time?
	This is a competition issue but not the key one.
19.	Aside from increased market concentration of flexible generation, what other competition issues should be considered and why?
	Market concentration is a feature of the New Zealand wholesale market. This is difficult to avoid in a system with a thin transmission grid that makes some market participants pivotal from time to time. Economies of scale, coordination issues and risk management also favour large generators, leading to high levels of concentration. This needs to be recognized, but structural changes to reduce concentration are expensive, disruptive and often do not deliver what is promised. It is more important to accept concentration as a feature of the New Zealand system and to try and discourage generators from exploiting this. This means that electricity market offer prices should be monitored to stay as close as possible to perfectly competitive values. Methods of estimation of marginal water values by large hydro generators are not transparent, and not subject to enough scrutiny by regulators. These need to be monitored and subject to scrutiny.
20.	What extra measures should or could be used to know whether the wholesale electricity market reflects workable competition, and if necessary, to identify solutions?
	Market monitoring as carried out by the Electricity Authority is essential.
21.	Should structural changes be looked at now to address competition issues, in case they are needed with urgency if conduct measures prove inadequate?
	No.
22.	Is there a case for either vertical separation measures (generation from retail) or horizontal market separation measures (amending the geographic footprint of any gentailer) and, if so, what is this?
	No. Vertical integration reduces price and quantity risk for generators. For a hydro generator this decrease in risk enables more aggressive use of stored water, resulting in lower emissions and less spill.
23.	Are measures needed to improve liquidity in contract markets and/or to limit generator market power being used in retail markets? If yes, what measures do you have in mind, and what would be the costs and benefits?

24.	Should an access pricing regime be looked at more closely to improve retail competition (beyond the flexibility access code proposed by the Market Development Advisory Group or MDAG)?
25.	What extra measures around electricity market competition, if any, do you think the government should explore or develop?
	Price discovery in the wholesale market can be inefficient and can be an imperfect mechanism at coordinating the dispatch of electricity. This potential lack of coordination can be exacerbated by real-time price signals. A day-ahead market serves to reduce these effects and can improve coordination. It should be considered.
26.	Do you think a single buyer model for the wholesale electricity market should be looked at further? If so, why? If not, why not?
	No, in the short term. This would be a major change and has many risks, most notably overbuild of the wrong capacity in the wrong places at the wrong time. The wholesale market can be improved to make this more competitive and stimulate investment. If the transition to renewable electricity cannot meet growing demand, then there is a case for capacity mechanisms, or a single buyer (as a last resort).
Part 3: Networks for the Future	
27.	Do you consider that the balance of risks between investing too late and too early in electricity transmission may have changed, compared to historically? If so, why?
28.	Are there any additional actions needed to ensure enough focus and investment on maintaining a resilient national grid?
29.	Do you agree we have identified the biggest issues with existing regulation of electricity distribution networks?
30.	Are there pressing issues related to the electricity distribution system where you think new measures should be looked at, aside from those highlighted in this document? How would you prioritise resolving these issues to best enable the energy transition?
31.	Are the issues raised by electricity distributors in terms of how they are regulated real barriers to efficient network investment? Please give reasons for your answer. Is there enough scope to address these issues with the current ways distributors are regulated? If not, what steps would you suggest to address these issues?
32.	Are there other regulatory or practical barriers to efficient network investment by electricity distributors that should be thought about for the future?
33.	What are your views on the connection costs electricity distributors charge for accessing their networks? Are connection costs unnecessarily high and not reflective of underlying costs, or not? If they are, why do you think this is occurring?
34.	If you think there are issues with the cost of connecting to distribution networks, how can government deliver solutions to these issues?

35.	Would applying the pricing principles in Part 6 of the Code to new load connections help with any connection challenges faced by public EV chargers and process heat customers? Are there other approaches that could be better?
36.	Are there any challenges with connecting distributed generation (rather than load customers) to distribution networks?
37.	Are there different cost allocation models addressing first mover disadvantage (when connecting to distribution networks) which the Electricity Authority should explore, potentially in conjunction with the Commerce Commission?
38.	Should the Electricity Authority look at more prescriptive regulation of electricity distributors' pricing? What key things would need to be looked at and included in more prescriptive pricing regulation?
39.	Do current arrangements support enough co-ordination between the Electricity Authority and the Commerce Commission when regulating electricity distributors? If not, what actions do you think should be taken to provide appropriate co-ordination?
40.	Will the existing statutory objectives of the Electricity Authority and Commerce Commission adequately support key objectives for the energy transition?
41.	Should the Electricity Authority and/or the Commerce Commission have explicit objectives relating to emissions reduction targets and plans set out in law? If so, • should those objectives be required to have equal weight to their existing objectives set in law? Why and how might those objectives affect the regulators' activities?
42.	Should the Electricity Authority and/or the Commerce Commission have other new objectives set out in law and, if so, which and why?
43.	Is there a case for central government to direct the Commerce Commission, when dealing with Electricity Distributors and Transpower, to take account of climate change objectives by amending the Commerce Act and/or through a Government Policy Statement (GPS)?
44.	If you answered yes to question 43, please explain why and indicate: • What measures should be used to provide direction to the Commerce Commission and what specific issues should be addressed? How would investment in electricity networks be impacted by a direction requiring more explicit consideration of climate change objectives? Please provide evidence.
Part 4: Responsive Demand and Smarter Systems	
45.	Would government setting out the future structure of a common digital energy infrastructure (to allow trading of distributed flexibility) support co-ordinated action to increase use of distributed flexibility?

46.	Should central government see how demonstrations and innovation to help inform how trade of flexibility evolves in the New Zealand context, before providing direction to support trade of distributed flexibility? If yes, how else could government support the sector to collaborate and invest in digitalisation now?
47.	Aside from work already underway, are there other areas where government should support collaboration to help grow and develop flexibility markets and improve outcomes? If yes, what areas and actions are a priority?
48.	Could co-funding for procurement of non-network services help address barriers to uptake of non-network solutions (NNS) by electricity distributors?
49.	Would measures to maximise existing distribution network use and provide system reliability (such as dynamic operating envelopes) help in New Zealand? If yes, what actions should be taken to support this?
50.	What do you think of the approaches to smart device standards and cyber security outlined in this document? Are there other issues or options that should be looked at?
51.	Do you think government should provide innovation funding for automated device registration? If not, what would best ensure smart devices are made visible?
52.	Are extra measures needed to grow use of retail tariffs that reward flexibility, so as to support investment in CER and improved consumer choice and affordability?
53.	Should the government consider ways to create more investment certainty for local battery storage? If so, what technology should be looked at for this?
54.	Should further thought be given to making upfront money accessible to all household types, at all income levels, for household battery storage or other types of CER?
55.	Should government think about ways to reduce 'soft costs' (like the cost of regulations, sourcing products, and upskilling supplier staff) for installing local battery storage with solar and other forms of CER/DER storage? If so, what technology should be looked at?
56.	Is a regulatory review of critical data availability needed? If so, what issues should be looked at in the review?
Part 5: Whole-of-system considerations	
57.	What measures do you consider the government should prioritise to support the transition? Models developed by MBIE and the NZCCC should be open-source and all data should be made open. The HydrovSPD, JADE, and EMERALD models developed at EPOC are all open-source and publicly available and should be promoted by MBIE and the Electricity Authority.
58.	Are there gaps in terms of information co-ordination or direction for decision-making as we transition towards an expanded and more highly renewable electricity system and meeting our emissions goals? Please provide examples of what you'd like to see in this area.

	Publicly available system-wide models are important for communicating and explaining the complex tradeoffs that arise in capacity expansion of electricity systems. The stochastic nature of wind and solar, and the uncertainty in reservoir inflows make some of these tradeoffs subtle. For example, it is reported in Ferris and Philpott[1] that shutting down the Rankine units at Huntly (with no other investment) could result in *increased* CO2 emissions, as remaining gas plant are run harder every year to avoid the possibility of a dry winter, instead of delaying this decision which is possible when thermal capacity is larger.
59.	Are there significant advantages in adopting a REZ model, or a central planning model (like the NSW EnergyCo), to coordinate electricity transmission investment in New Zealand? Would a REZ model for local electricity distribution be an effective means of addressing first mover disadvantage with connecting to electricity distribution networks?
	A REZ model risks distorting investment incentives. For example, investments in offshore wind power should take account of the connection costs required to transmit electricity to demand centres, so that it can be compared on an equal footing with onshore wind.
60.	Should MBIE regularly publish opportunities for generation investment to enable informed market decision-making?
	There is no harm in doing this.
61.	How should the government balance the aims of sustainability, reliability and affordability as we transition to a renewable electricity system?
	The NZ electricity market is regulated by the Electricity Authority to promote the long-term benefit of consumers. This should aim to provide electricity to the country at the least possible cost (including the cost of capacity expansion, and costs to the environment represented by emission charges). To enhance renewable energy, the cost of ETS units should be allowed to rise to the marginal abatement cost to meet NZCCC budgets. This will discourage investment in non-renewable plant.
62.	To what extent should wholesale, transmission, distribution or retail electricity pricing be influenced by objectives beyond the (affordability-related) efficiencies achieved by cost-reflective pricing, such as sustainability, or equity?
	Distorting pricing to encourage sustainability or equity will lead to inefficiencies. Equity should be ensured by means outside the electricity market (e.g., wealth redistribution supported by general taxation).
63.	Are the current objectives for the system's regulators set in law (generally focusing on economic efficiency) appropriate, or should these also include more focussed objectives of equity and/or affordability?
	The regulators should not be concerned with equity or affordability which tend to distort market efficiency when applied directly to electricity. These objectives can be met through other means (e.g., wealth redistribution supported by general taxation.)
General Comments:	