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Australia can have a net-zero emissions electricity system without threatening reliability or affordability.

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Response to the Inquiry, initiated in March 2021, by the House of Representatives Standing Committee on the Environment and Energy on the current circumstances, and the future need and potential for dispatchable energy generation and storage capability in Australia.

There are no restrictions on publication of this submission or requirements for anonymity. The submission contains no personal information of third-party individuals.

1 Summary

The House of Representatives Standing Committee on the Environment and Energy has launched a new inquiry into dispatchable energy generation and storage capability in Australia. The central concern is to ensure that electricity remains affordable and reliable through and beyond the transition already underway towards a low-emissions future.

Based on our published analysis (see below), Australia can move to high levels of renewable electricity, specifically across the NEM, with little risk to reliability or affordability.

As the proportion of renewables increases, the value of long-distance transmission grows. Battery storage, alongside gas-fired generation, will also play an important role in ‘balancing’ the system.

The best information today indicates that achieving net-zero emissions will be most efficient if a small and declining quantity of emissions are offset. The alternative – achieving absolute-zero emissions – looks more costly. As the proportion of renewables grows, the physical and economic challenge of balancing the system during rare, sustained periods of high demand, low wind, and cloudy skies becomes too big.

Gas generation with offsets looks to be the lowest-cost ‘backstop’ solution until zero-emissions alternatives – such as hydrogen-fired generation or near-perfect carbon capture and storage – are economically competitive. Gas is likely to play a critical, but not

expanded, role: the NEM faces a gas-supported transition, not a ‘gas-led recovery’.

Policy makers can be confident in planning for net-zero emissions. Governments should back current efforts, led by the Energy Security Board, to integrate renewable generation and storage with interstate transmission and renewable energy zones. 100 per cent renewable energy is too inflexible a target to set today, given that the economics look harder in the next few decades. As Australia moves towards net-zero emissions across the economy, emissions-reduction policy and market frameworks will need to accommodate the technology developments that will best close the final gap to a real zero-emissions future.

This submission provides responds to the Terms of Reference. It draws on Grattan’s recently published report, *Go for net zero: a practical plan for an affordable, reliable, low-emissions electricity sector*, and on a 2020 submission to the Energy Security Board’s Consultation Paper on post-2025 design of the National Electricity Market. The analysis and recommendations in these documents are focused on the NEM. While the general conclusions and recommendations are likely to apply to Western Australia or the Northern Territory, further, targeted analysis would be needed before going further in those jurisdictions.

We have not specifically addressed all the issues listed in the Terms of Reference as we do not claim competence to do so in several areas. Our submission is directly relevant to issues (a), (b), and (d) with some linkage to issue (c).

2 Recommendations

2.1 Pursue policies to reduce electricity sector emissions.

Governments should pursue policies to reduce carbon emissions, confident that a high-renewables National Electricity Market (NEM) can be reliable and affordable. They should not use taxpayer funds to extend the life of existing coal-fired generators, or to subsidise the entry of new coal-fired generators.

2.2 Target 'net-zero emissions' not '100 per cent renewables'

Governments should target net-zero emissions for the NEM for the 2040s, given the importance of low-emissions electricity for decarbonising parts of the transport and gas sectors. To reach this goal quickly and efficiently, governments should commit only to net-zero emissions, not to absolute-zero emissions or 100 per cent renewable energy targets.

2.3 Continue to support development and deployment of low-emission technologies.

Governments should plan for how and when to eliminate the last few per cent of emissions from the NEM. They should maintain support for developing zero-emissions firming technologies and closely monitor the relative economics of these technologies and negative-emissions offsets. They should facilitate the deployment of these technologies when it becomes clear that reducing emissions to zero is lower cost for consumers than using offsets.

2.4 Resource adequacy

A decision should be made on the market mechanisms to deliver timely investment in adequate generation and storage resources. Options have been proposed by the ESB and WA has its own reserve capacity mechanism. There are advantages with a decentralised model that puts the obligation on market participants to determine what resources to procure to avoid penalties for contributing to poor reliability.

2.5 Support transmission integration

Governments should re-commit to an interconnected NEM. They should support the Energy Security Board (ESB) to develop a common approach to underwriting early work on high-priority interstate transmission and implementing Renewable Energy Zones.

2.6 Implement policies that integrate resource adequacy and emissions reduction objectives.

A single, economy-wide emissions price would be the most efficient way to ensure that emissions in each sector are reduced at lowest cost. If that remains out of reach, then Governments should at least cease direct intervention in the electricity market and embrace the ESB's resource-adequacy mechanisms combined with state-based renewable electricity mechanisms.

3 Introduction

This submission is made by Tony Wood of the Grattan Institute. It responds to the Terms of Reference of the inquiry launched by the House Committee on the Environment and Energy in March 2021. This paper sets out potential solutions to identified problems and opportunities. The desired outcome is an electricity system that delivers secure and reliable power at least cost to consumers and accommodates the changes underway and expected in the future.

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In 2020, Australia's electricity sector emissions, at 172 million tonnes, were 34 per cent of the nation's total. The Government's latest projections indicate they will fall to 111 million tonnes by 2030, 44 per cent below the level of 2005. This is a remarkable achievement, driven primarily by the growth in renewable energy, projected to reach 55 per cent of generation by the end of this decade.

The major federal political parties are committed to net-zero emissions. The current policy debate is focused on how to meet this target and ensure that a system dominated by intermittent wind and solar power can deliver acceptably reliable electricity. Responding to climate change is the central and critical influence on the issues that are the concern of the Inquiry.

This submission covers the broad objective of the Inquiry with supporting analysis and recommendations. It is not structured specifically around the Terms of Reference, although it is relevant to several of the identified issues and briefly covered in the following section.

4 Issues identified in the Terms of Reference

Current and future needs

Electricity prices and electricity sector emissions have been falling and reliability has been stable in recent times. There are concerns that these trends will not be sustained. There will be closures of coal-fired power stations and the reliability of the ongoing, but ageing coal plants, may deteriorate; momentum for more renewables may become harder to sustain with uncoordinated state-based policies, and a system with greater dependence on wind and solar power will be less reliable without firming or balancing support.

The Energy National Cabinet Reform Committee is looking to the ESB and the electricity market agencies to address these issues that are directly linked to the Terms of Reference. This is the right direction and process, although there some fundamental issues with how the ministers are likely to respond. The key issues and options for ministers raise concerns that are addressed in Appendix A to this submission.

System integration, connection, and grid transmission

The challenge to achieving lower electricity sector emissions and higher levels of renewable generation are less in the cost of renewables and more in the integration of new renewable

generation and storage with the transmission grid, interregional and to build out Renewable Energy Zones within regions.

Grattan's recent report, *Go for net zero*¹, provides a detailed analysis of the challenges, barriers and solutions to this most critical of issues being addressed by the Inquiry.

Existing, emerging, and new technologies

Solar and wind generation already dominate the shift to lower electricity system emissions reduction. Gas is likely to be the critical backstop technology for some time. The policies that drive these renewable technologies are, and remain, frustratingly poorly structured and uncoordinated. Yet, they will dominate the transition of Australia's electricity to lower emissions. The relative proportions of grid scale solar versus rooftop or onshore wind versus offshore will have some influence on effective integration.

Battery and dedicated pumped hydro are likely to dominate the short-term (seconds and minutes) and medium-term (hours) demand for energy storage.

Other storage, such as molten salts and compressed air may have niche applications as may concentrated solar thermal power.

Today it is technically feasible but very expensive to generate electricity from hydrogen, particularly if that hydrogen is produced from electrolysis of water. Any future role of hydrogen for power generation is likely emerge if storing hydrogen becomes a cost-

¹ <https://grattan.edu.au/wp-content/uploads/2021/04/Go-for-net-zero-Grattan-Report.pdf>

effective backup to wind and solar, or some form of economic coupling between hydrogen-based manufacturing and power generation becomes economically viable. The key technology issues lie in the costs of renewable generation, electrolysis, and hydrogen storage.

Carbon capture and storage could technically be applied to dramatically reduce emissions from coal or gas generation. Again, this remains a very expensive option.

Nuclear power generation is currently illegal in Australia and there would be considerable political and social barriers for a change in that regard. Yet, the challenge to eliminate the last few percentage points of fossil fuel generation remains. Australian policy makers should maintain a watching brief on developments with small modular reactors that could be considered if costs reduce significantly, and issues of intrinsic safety and fast ramping are addressed.

Comparative efficiency, cost, timeliness of development and delivery, and other features of various technologies

Various generation, storage and transmission technologies have different technical and economic characteristics and are at various stages of economic and commercial development. That logic is behind some aspects of the Federal Government's Technology Investment Roadmap and associated stretch targets for cost reductions.

Government can play a significant dual role in this area. One is to support early-stage technologies that have the potential to make a material contribution to low-cost, low-emissions reliable electricity. The government is playing this role through ARENA, CSIRO, and the CEFC. The other is to implement policies that will pull through those technologies to commercial deployment at scale. Significant gaps remain in this area.

Appendix A

October 2020

Targeted, incremental reforms is the best way forward for the National Electricity Market

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Response to the Consultation Paper: “Post 2025 Market Design” released by the Energy Security Board in September 2020.

There are no restrictions on publication of this submission or requirements for anonymity. The submission contains no personal information of third-party individuals.

5 Summary

The Energy Security Board (ESB) has published a Consultation Paper setting out a comprehensive work program to ensure the National Electricity Market (NEM) delivers secure and reliable power at least cost to consumers and accommodates the changes underway and expected in the future.

It is valuable to have a full suite of market design initiatives in a single agenda. This enables priorities to be set and interdependencies to be managed. It is more important to have a focused work program that prioritises the most significant and most urgent reforms. This approach is envisaged by the ESB and should be adopted by the National Cabinet Energy Reform Committee.

The benefits of market reforms that emerge from the post 2025 market reform project will be negated if jurisdictional governments, Commonwealth, state, or territory, pursue unilateral actions that intervene in the markets in the way of the last few years. Policy uncertainty and government interventions are the greatest risk to efficient investment and achieving the desired objective of the NEM.

This submission provides our response to the issues and draft positions in the Consultation Paper. We have made specific recommendations on three of the market design initiatives:

- To deliver resource adequacy, the paper has abandoned the notion of a centralised capacity auction, with a central agency both determining reliability requirements and procuring capacity. But in a ‘decentralised’ approach, there remains an important choice between a central agency setting future capacity requirements and requiring market participants to procure this capacity, or market participants determining what resources to procure to avoid penalties for contributing to poor reliability. We recommend the latter approach, on the grounds that it better protects consumers from inappropriate reliability requirements.
- The exit of ageing coal-fired power plants is a concern for governments and some industry participants. We recommend that the current notice of closure rules be strengthened with a financial obligation on generators to comply with their own nominated closure dates.
- Development of the national transmission grid is too slow, and the way its costs are allocated to consumers is no longer fit for purpose. Prioritising solution to these problems should largely address concerns about how to ensure new generation is located where it adds most value and achieves an adequate return on investment.

6 Introduction

This submission is made by Tony Wood and Guy Dundas of the Grattan Institute. It responds to the Consultation Paper released by the Energy Security Board (ESB) in September 2020. This paper sets out potential solutions to identified problems and opportunities. The desired outcome is a National Electricity Market that delivers secure and reliable power at least cost to consumers and accommodates the changes underway and expected in the future.

Grattan Institute is an independent think-tank focused on Australian domestic public policy. It aims to improve policy outcomes by engaging with both decision-makers and the community.

The Consultation Paper outlines and seeks submissions on seven Market Design Initiatives (MDIs). In our view these are not of equal importance or urgency and are not all interconnected. Work in the right direction has already commenced on several of them, while major doubts exist on others. This submission reflects these differences and our own level of knowledge across the MDIs.

The energy sector is a complex and changing area of government policy. A valuable aspect of the recent work of the ESB and its working groups has been to understand and respond to this environment. In providing advice to the National Cabinet Energy Reform Committee, the ESB's recommendations should include a clear agenda for implementation.

7 Issues arising from the Consultation Paper

The paper seeks responses to solutions covering seven MDIs.

8 Resource adequacy mechanism

Existing resource adequacy mechanisms are theoretically enough to drive investment in the quantity and mix of resources required through the transition.

In our 2018 working paper, *Designing a more reliable electricity market*, we observed recognised that² The need for a reliability mechanism arises from concern that scarcity pricing in an energy-only market may not deliver adequate investment to meet future demand.

But we have also noted that reliability concerns have been politicised, and therefore overstated.³ And that policy uncertainty and government interventions, not market design, are the greatest risk to efficient investment and achieving the desired objective of the NEM, including reliability.⁴

In this context, it is not clear that a new and distinct reliability mechanism is required. And such a mechanism would not replace the need to deliver essential system services (discussed in Section 3.3), which cause far more power outages than problems with resource adequacy. Our view is that any such mechanism

² <https://grattan.edu.au/wp-content/uploads/2018/02/896-Reliability-Obligation-1.pdf>

should be as ‘light-touch’ as possible, and we commend the ESB for ruling out the relatively heavy-handed approach of a centralised capacity market, like that in the UK.

The Retailer Reliability Obligation (RRO) was designed to address concerns about resource adequacy. It has yet to be triggered and doubts exist as to whether it will be an effective solution. Given that the ESB has ruled out a centralised capacity auction, the key choice in the Consultation Paper is between an enhanced RRO and a more decentralised capacity mechanism or market. In our view, this positioning does not capture the full range of policy options available.

The Consultation Paper, and future ESB discussions, would benefit by distinguishing between quite distinct policies that are currently grouped under the umbrella term ‘decentralised capacity market’.

The consultation paper (second table on p.41) says that such a mechanism may have the obligation “administratively determined or based on market forces”.

In our view, those two approaches are quite different, and grouping them makes it harder for the review to elicit views on the pros and cons of each. Many aspects of policy design are quite different depending on how the reliability outcome is determined.

We summarise these distinct approaches under the ESB’s own headings in the following table:

³ <https://grattan.edu.au/report/keep-calm-and-carry-on/>

⁴ <https://grattan.edu.au/report/power-play/>

	Administratively determined decentralised capacity market	Market determined decentralised capacity market
Alternative title	Ex-ante (decentralised) capacity market	Ex-post capacity market
Product description	Tradeable capacity units as defined by the rules. Financial contracts not linked to physical supply could be excluded or included.	Tradeable capacity units as defined by the rules. For integrity, units must be linked to physical supply.
Obligation	Administratively determined ex-ante capacity requirement, translated to the level of individual market customers	Determined ex-post based on actual market outcomes (i.e. unserved energy and RERT events). If a market customer has fewer capacity units than their demand during a shortfall event, they would face a penalty for this shortfall.
Procurement approach	Rules determine what products can and cannot be used to meet the ex-ante capacity requirement	Market customers determine what supply contracts to procure, and what assets to build/own, based on financial risks arising under the enforcement regime.
Enforcement	Rules determine the penalties applying if market customers do not hold sufficient complying products ex-ante.	Market customers held responsible for, and pay for the cost to consumers of, shortfalls and RERT events after the event (ex-post), in accordance with the obligation described above. Rules determine how these costs are apportioned to market customers. If no shortfall or RERT events occur, no penalties accrue.
Pricing	Separate price for defined capacity products	Separate price for defined capacity products. Different sub-markets may emerge, depending on whether the buyer or the seller bear the risk of non-delivery.

<p>Underlying premise</p>	<p>An ex-ante requirement is needed to drive investment and will give policy-makers confidence that the market has sufficient coverage ahead of time.</p>	<p>That imposing penalties on ex-post outcomes will lead to market participants owning or contracting with more generation to manage their financial risks. This is consistent with the original premise of the NEM, that an energy-only market with a high market price cap will create sufficient financial incentives to support reliability.</p>
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Our initial position is that the ex-post model is superior to the ex-ante model. The primary reason is that market customers (e.g., retailers) bear the consequences of procuring too many or too few reliability units under the ex-ante model. If they over-procure, they may not be able to recover these costs from their customers (in a competitive market). And if they under-procure, they will bear the cost of RERT or shortfall events that may arise.

By contrast, under an ex-ante model, consumers bear the consequences of any misspecification of the desired level of reliability. If the system operator procures too few reliability units to maintain reliability (either by under-estimating demand, or by over-estimating the reliability of different classes of generators), consumers face worse reliability. Or if the rules over-specify (either through over-estimating demand or under-estimating the reliability of different classes of generators) consumers will face higher power bills.

In our view, an ex-post capacity market should pass back to 'short' market customers not only a share of RERT costs (as occurs under the RRO), but also a monetised cost of unserved energy. Broadly this would be calculated as the estimated amount

of energy not served, multiplied by each customer's estimated value of lost load (grouped by customer class). This money should be paid to the customers that were curtailed, as compensation for the curtailment.

This model has some similarities to the French capacity mechanism. The main difference is that the French system assesses compliance based on availability in peak periods for every year, whether there is a shortfall or not. In our proposed model, compliance would only be assessed if there is a shortfall or a RERT event.

In summary, we support a market-determined capacity market utilising commercial market drivers. But there are risks. The next steps must involve comprehensive stakeholder consultation on design details to avoid unintended consequences and address identified risks.

Implied above is support for the RERT, if only to provide a safety valve that can provide comfort to ministers at relatively low cost. We would emphasise that we are unconvinced of the need for the recently introduced Interim Reliability Measure.

9 Ageing thermal generation strategy

Australia’s coal fleet is ageing and will progressively be retired over coming decades. But the timing of individual plant closures is highly uncertain, and the large size of many coal power stations makes it hard for the market to manage sudden retirements. The abrupt closures of the Northern and Hazelwood power stations in 2016 and 2017 respectively have heightened political concerns that future closures will increase price and reduce reliability.

The introduction of a three-year notice of closure rule was a positive step but is unlikely to be effective with the modest penalties for non-compliance. In our 2019 report, *Power Play: how governments can better direct Australia’s electricity market*⁵, we concluded that a transparent and rules-based approach is needed to promote orderly retirement.

As referenced in the Consultation paper, we recommend requiring generators to place funds into escrow to ensure they comply with nominated closure dates. If the generator closes within the nominated window, it will have these funds returned, but not if it failed to comply. This financial incentive would be much stronger than compliance incentives under the existing three-year notice rule. In the report, we set out the proposal and why it should be supported.

⁵ <https://grattan.edu.au/wp-content/uploads/2019/10/922-Power-play.pdf>

10 Essential system services

The different technical characteristics of the changing generation mix became clearer over the last five years, triggering a belated response for the market agencies to identify and, where necessary, introduce changes to rules and management processes. Relevant reforms have already been delivered through the AEMC’s rule change process, and a range of relevant further changes and proposals are being considered through that same process – for example, the AEMC’s review of system strength frameworks, and a range of rule changes on operating reserves and other system services.

It is unclear whether the ESB’s work will over-ride past rule changes or those currently under consideration, or take these as given, or amend them incrementally. We think this creates significant uncertainty and scope for ‘forum-shopping’ if stakeholders do not like the AEMC’s conclusions.

We also think the interaction between essential system services and scheduling and ahead mechanisms is over-stated. As the ESB notes, system strength is not well suited to dynamic spot market delivery, and so it must be procured ahead of time. This in turn means that these services do not need to be scheduled through an ‘ahead’ market that is integrated with the broader market design. As some providers of system strength can also provide inertia, this also weakens the case for integrated ‘ahead’ scheduling of inertia services (though the case for an inertia market is stronger).

Given this, we argue that it is very difficult to consider the ESB's discussions of essential system security services until the AEMC's current relevant work has concluded.

11 Scheduling and ahead mechanisms

The Consultation Paper indicates that the ESB supports a need for AEMO to be able to activate certain market services ahead of time. We are unconvinced that this is a priority issue. The benefits may be overstated, but on balance we support the ESB's preferred Unit Commitment for Security mechanism as at least doing no harm.

12 Two-sided markets

The Consultation Paper observes that the “responsiveness of the demand side, and the ability of consumers to access value associated with demand response, is growing and will continue to grow.” We strongly support this development and the growing diversity of suppliers, including aggregators, who can capture and deliver the value to consumers. We support the completed AEMC wholesale demand response rule change, which allows third party aggregators and market participants to provide demand response services as part of the market design.

Given the AEMC's completed rule change, we do not think the paper has clearly articulated a case for further policy action. The role of the ESB should be to identify barriers to further demand side response and options to address these – and we do not think the paper has clearly done this.

The benefits of demand side response at both the wholesale and network levels are well understood. But the major remaining policy barrier – a lack of cost-reflective (time-varying) price signals for small retail consumers – cannot feasibly be addressed through this review. Other major barriers are complexity, cost, and consumer apathy – and these barriers cannot be addressed through policy.

Given these points, and the recency of the AEMC's wholesale demand response rule, we think the review's discussion of 'two-sided' markets fails to articulate a case for further policy action at this time. It may be that there is value in, for example, clarifying registration categories – but this can occur through routine rule change processes and does not need to be addressed through the ESB's review.

13 Valuing demand flexibility and integrating DER

The integration of distributed energy resources covers a multitude of technical, financial, and social issues. Many of the issues and proposals could proceed independently, while there are also areas of coordination to be addressed. The Consultation Paper seems to include a comprehensive approach. We have not studied this MDI in detail and have no additional responses or suggestions.

14 Transmission access and the coordination of generation and transmission

We fully endorse⁶ the Consultation Paper's position that the transmission grid and access frameworks are not built for the future mix of generation and storage. But we do not think the proposals for location marginal pricing and financial transmission rights address the real issues in transmission. Further, their introduction seems to introduce an unjustified level of complexity. In our view, investors in generation assets already have strong signals – primarily through marginal loss factors and the risk of curtailment – to efficiently locate their projects, and the very complicated proposals put forward appear to create more uncertainty rather than less.

In our view, the key problem in transmission is not grid access (i.e., curtailment). We identify three more pressing problems. Firstly, the connection process – primarily that the 'do no harm' requirements around system strength create extreme uncertainty on the timing and cost of new connections. Secondly, the regulatory process for approving new transmission links is simply too slow. And thirdly, cost allocation is becoming increasingly difficult in an increasingly integrated NEM.

The first issue must be addressed through the processes relating to essential system services. As discussed above, this is rightly the subject of the AEMC's system strength frameworks review

and relevant rule change requests and is not discussed further here.

The planning of new transmission links has been greatly improved through the Integrated System Plan. It provides a set of scenarios for the evolution of the transmission system aligned. It identifies transmission augmentation and new investments that are almost certainly economically efficient and should be accelerated. The work of the ESB and some governments has accelerated their development. However, this progress is a short-term solution, and, in frustration, some state governments are taking unilateral action on transmission investment and establishing renewable energy zones.

Integrating the economic assessments of the ISP for early projects with a revamped RiT-T test – as proposed by the ESB itself – should speed up the process for approving new transmission. Further steps can be achieved by either governments' underwriting planning expenditures prior to the completion of the RiT-T, or a change to the rules to allow TNSPs to incur these costs for ISP priority projects and recover them from consumers (even if the project ultimately does not pass the RiT-T). While there will be some risk of early expenditure that cannot be recovered if a project ultimately fails to proceed or fails to attract generation and storage investment, that risk is likely to be relatively small against the consequences of delay.

In terms of cost allocation, the increasingly integrated and shared benefit nature of the backbone of the NEM's transmission grid has

⁶ <https://tagg.com.au/explainer-what-is-the-electricity-transmission-system-and-why-does-it-need-fixing/>

moved beyond the current cost allocation model with state-based transmission companies. This holds regardless of private or government ownership. We have not undertaken a comprehensive assessment of alternative solutions. However, it may be that a more radical solution, such as ownership of the shared system by a national transmission company should be considered. The case for public ownership and the separation of the planning and investment decisions from the owner are amongst the issues that would need to be addressed.

15 Interdependencies and evaluation

There are undoubtedly interdependencies between the MDI's. It is valuable to have the full suite of initiatives laid out so the impact of

individual initiatives on the existing NEM and other initiatives can be assessed. However, the risk of an overly complex agenda and work program becoming bogged down and embroiled in endless debate seems greater than the risks that might arise from prioritising incremental reforms. It is also an argument that great uncertainty suggests less reason for fundamental reforms even if the latter were being seriously considered.

In this context, we support the Consultation Paper's preference for a progressive approach for delivering initiatives (that) enables the market to respond to each set of measures before building further on these with additional reforms.