The Standing Committee on the Environment and Energy
Committee Secretariat
PO Box 6021
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Canberra ACT 2600

Submission
Inquiry into the current circumstances, and the future need and potential for dispatchable energy generation and storage capability in Australia

Delta appreciates the opportunity to contribute to the Committee's work on the future need and potential for dispatchable energy generation and storage capability in Australia. Delta's generation portfolio includes the 1320MW Vales Point power station on the NSW Central Coast and a 150MW off-take from the Darlington Point Solar Farm. In addition to its wholesaling activities, Delta retails to large commercial and industrial customers. Delta has operated in the National Electricity Market (NEM) since its inception in 1998 and has developed renewable and gas fired generation capacity.

Weather dependent Variable Renewable Energy (VRE) such as wind and solar generation, financially supported by Government schemes, is radically changing the way the National Electricity Market (NEM) operates. The Australian Energy Market Operator's (AEMO) Quarterly Energy Dynamics Q1 2021 report highlights the trend of VRE displacing conventional generation, high levels of negative prices (generators pay to dispatch their energy) and increasing intervention in the market by AEMO to maintain power system reliability. Whilst average wholesale electricity prices are falling, as are greenhouse gas emissions from electricity generation, AEMO[1] has identified the challenges presented by the high and increasing levels of VRE. In particular, AEMO[1] has stated that "*The power system is being operated closer to its known limits more frequently, with increasingly variable and uncertain supply and demand, and declines in system strength and inertia*."

Wind and solar technology are non-synchronous technology and, therefore, cannot provide all the critical system services necessary to maintain a reliable and secure power system. It is conventional dispatchable and flexible technology like coal, gas and hydro generation (synchronous technology) that ensures a reliable and affordable supply of electricity to households and business, both now and for the foreseeable future, or at least until new cost competitive technologies can be developed and proven to be able to operate at grid scale. As noted by the Energy Security Board (ESB)*"…there are currently no gigawatt scale power systems that do not rely on synchronous resources for grid stability and resilience."*[2]

Storage will play an increasingly important role in shifting energy from times of surplus VRE to times of low VRE. The market is well placed to incentivise this type of technology through

[1] AEMO Renewable Integration Study 2020, Appendix C.
[2] ESB System Services and Ahead Markets, April 2020.

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price signals and locational signals based on network capability. In the case of network limitations, local storage technology such as batteries can store energy that would otherwise be lost due to limited network capacity to periods when there is more room on the network. There are sound commercial drivers to support investment in storage technology without the need for Government support.

The ESB's Post 2025 Market Design project is looking at what changes are needed to the NEM to ensure it is fit for purpose as the NEM transitions to low carbon emissions. The ESB, in its April 2021 Post 2025 Market Design Options Consultation Paper, recognises the urgency for reform but its proposals for immediate implementation appear to particularly rely on:

1. monopoly transmission network companies procuring some additional system services and providing priority network investment; and
2. integrating State Government underwriting of new investment, along with their support for transmission upgrades, into the resource adequacy reforms for new investment.

The critical reform to establish market-based mechanisms that support existing dispatchable energy generation needed for power system reliability and security, as well as incentivising efficient and timely provision of new dispatchable generation and storage, have been delayed to some future time. There are considerable risks for consumers from the pathway presented:

1. a reliance on network solutions via regulated monopoly businesses will deliver very long-lived network assets with relatively high costs that are locked-in for the life of the asset regardless of whether real benefits for consumers are achieved and regardless of whether there are new technological developments in the pipeline that could potentially deliver lower cost outcomes within a reasonable timeframe;
2. the loss of low-cost system services from conventional generators that are forced into early retirement due to low energy prices and limited dispatch opportunities, with these services replaced with expensive non-market options;
3. Government intervention is creating a highly uncertain investment future which could ultimately result in investment only delivered if underwritten by Government; and
4. the return of problems that led to the establishment of the NEM in the first place. These include wasteful over-investment, poor centralised decision making and taxpayers and consumers bearing the financial risk of investment.

It is noteworthy that pre-NEM, network costs where around 30% of an average household bill. This has risen to around 50% as the grid has continued to expand whilst wholesale energy prices, subject to benefits of competition, have reduced in real terms. Increasing the involvement of networks in procuring market services and building strategic transmissions assets to facilitate renewable energy zones will further increase the network portion of electricity bills. NEM based market arrangements have the benefit of maximising competition and incentivising innovation that should deliver better outcomes for consumers.

The ESB has noted[3] that "*Governments have indicated a preference to drive investment through the transition*" and that support schemes often represent broader policy objectives

[3] ESB Post 2025 Market Design Options, 30 April 2021.

instead of prioritising the maintenance of reliability. The lessons of the past are being ignored. The pathway that will better support energy consumers is one that prioritises the enhancement of NEM arrangements to provide a market reward for existing and new dispatchable generation capacity, storage and system services in response to a market need. This is also a pathway that removes Government interventions except as an absolute last resort and only allows network investment that passes economic net benefit tests and rigorously tests the cost of that investment. Ironically, by undermining the current market reward-based system, Government interventions may well create the need for more intervention as private investment evaporates.

As an immediate priority, existing proven technologies should be financially incentivised to remain operational as required while new system service technologies emerge and are tested. This approach would de-risk the current electricity market transition underway. This can be achieved with the implementation of new market mechanisms that incentivise supply, as a well as value the essential power system services that are currently provided as by-products by synchronous (traditional) generators and, therefore, are not valued even though they are critical to maintaining a secure and reliable electricity supply. The ESB[4] notes that the lack of markets or other means of valuing essential system services means AEMO is increasingly, and regularly, intervening in the market. This intervention, largely resulting from directing conventional synchronous units into service, has cost consumers up to $30m in a single quarter[5].

Delta contends that to avoid losing the benefits delivered by a properly functioning NEM, the next stage of reform must include priorities for:

1. the establishment of an operating reserve market[6] that provides short and medium term investment signals to incentivise the availability of dispatchable capacity, as needed, for times of low VRE output and particularly in the context of an increasing daily dispatchable generation ramping requirement when solar generators come on and off at around the same time across the NEM;
2. the establishment of market-based arrangements for system security services that adequately respond to the increase of VRE underwritten by Governments. This will include fast frequency response, inertia and ramping services to incentivise the availability of the right type of dispatch generation whether it be existing conventional plant, new dispatchable generation sources or storage; and
3. exposing new VRE generation to the cost of their locational decisions within the network and, where efficient, to the costs of system services directly attributable to their operation. Such exposure will support more efficient investment decisions and innovation.

Longer term, it is important to continue the market design work to support the electricity market of 2030 and beyond. This market will be dominated by VRE generation and the potential retirement of more than 11GW of coal fired capacity from 2028. It should be noted that coal fired plant can be life extended to continue to provide essential system services.

[4] ESB Post 2025 Market Design Options – A paper for consultation Part A, April 2021
[5] AEMO Quarterly Energy Dynamics Q1 2021.
[6] NEM Rule Change Request Capacity Commitment Mechanism for Operational Reserve and Other System Security Services (AEMC website)

This plant could be operating at low output factors that reduce greenhouse gas emission, but be online ready to respond to changes in VRE or power system events. Substantial work will need to be undertaken to find solutions to the technical challenges that will result from far higher levels of weather-dependent VRE entering the NEM.

Delta proposes the Parliamentary Committee consider a two-pronged approach for the role of dispatchable generation and storage:

1. immediate priority – keeping the system operating securely and reliably through competitive financial mechanisms to support existing proven thermal technology that currently supply essential system security services until there is confidence the NEM can be operated securely at higher levels of weather-dependent VRE, new investment in dispatchable capacity has come forward and relevant technological developments have been proven to operate at grid scale; and
2. developing a market design which supports a NEM transformation in a way that minimises the intervention of Government in underwriting new generation and transmission assets, in order to maintain the benefits of a properly functioning market that delivers the lowest cost outcomes for consumers.

Further information on the matters discussed in this letter can be in found in Attachment 1.

Yours sincerely

[redacted]

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Attachment 1

Supporting Information

Delta's submission to the Inquiry into the current circumstances and the future need and potential for dispatchable energy generation and storage capability in Australia

Overview

This submission focuses on the current market issues affecting power system reliability and security and on the immediate needs for existing dispatchable energy generation from synchronous generators to remain in the system. Existing dispatchable generation is needed to continue to provide essential system security services necessary for maintaining a safe, secure and electricity system in Australia and, successfully manage the acceleration in uptake of weather dependent variable renewable energy (VRE) across the NEM. By 2025, there could be up to 75%[7] penetration of renewable energy (instantaneous generation) without the necessary operating reserves to manage uncertain changes in net demand.

The priority needs to be on what measures can be taken now to manage the 'messy' transition over the next ten years as the market operator (the Australian Energy Market Operator (AEMO) deals with high levels of non-synchronous generation and new technologies develop. Both the ability to operate such a system and the timeframes for new technologies to emerge on a cost competitive basis that can operate at grid scale are uncertain and unproven.

Given the urgency to provide back-up capacity and de-risk the changes in the composition of generation in the NEM, this submission considers the immediate proposed reform pathway. This incorporates Government intervention and the need for competitive markets to support existing, proven dispatchable energy generation and storage capability to provide system security services and, in particular, ramping services. These services are the cornerstone of a modern electricity market with high levels of variable renewable energy.

As an immediate priority, existing proven technologies should be financially incentivised to remain operational while new system service technologies emerge and are tested, and AEMO is confident that the NEM can be securely operated with a new technology mix.

This means taking a two-pronged approach to preparing for the post 2025 electricity market design:

1. keeping the system securely operating with existing proven technology until there is certainty about system operability at 75%+ levels of renewable penetration; and
2. developing the market design which supports a complete transformation in the NEM wholesale generation and storage mix, an expanded and geographically altered transmission network, distributed energy resources and active demand management.

In this context, this Committee can provide guidance to Energy Ministers on:

7 Energy Security Board (2021) Post 2025 Electricity Market Design, Infographics paper, p.3

- policy priorities informed by a broader context beyond the remit of the Energy Ministers' forum;
- technical and other evidence based matters informed by giving stakeholders the opportunity to publicly present information directly to the Parliament; and
- institutional arrangements for ongoing governance of the National Electricity Market to implement the existing work program and monitor any need for change.

The immediate priority – keeping the electricity system securely operating

The Energy Security Board's Post 2025 Market Design Options - A Paper for Consultation and briefing session highlights the priorities for action:

- the generation mix in the NEM is now approaching AEMO's Integrated System Plan 'Step Change' scenario. That is, what was the outer boundary in mid-2020 is now in existence by mid-2021. Change is happening at a very fast pace and lessons are being learned in real time;
- new planned dispatchable resources such as Snowy 2.0 and projected dispatchable resources are not available until 2025 at the earliest. There is a risk that this date may be pushed out and, in any event, new resources will not be at the scale of existing dispatchable resources for some time; and
- existing dispatchable resources, notably coal fired power stations, are likely facing commercial difficulties accelerating exit strategy decisions. Commercial challenges are two-fold. Actual revenue is falling, reflecting lower wholesale prices and declining volume, and potential revenue for system services is not forthcoming, despite a widely recognised need. While the theoretical technical life of these power stations may be 50 years, commercial factors will drive retirement and life extension decisions. The practical reality is that, apart from the Government-owned generators in Queensland, coal fired power stations across the NEM could be forced into early retirement.

Energy Ministers, the Energy Security Board, energy market institutions and jurisdictions have done much work to support and accelerate the transition. However, the speed of the transition is now very challenging and the ESB's paper on market design options highlights where further work is still required. A particular concern is how to ensure large conventional dispatchable thermal generators, the largest provider of dispatchable energy and essential system security services which are critical to effective operation of the electricity system, continue to operate where required to support an affordable and reliable supply of electricity to households and businesses during this transition.

Role of system services in underpinning electricity system security

"*Security is the most concerning and urgent issue in the National Electricity Market.*"[8]

Security is provided by system services and includes:

- flexibility to manage sudden fluctuations in demand and supply through ramping or backup;
- resilience to the grid to changes in operating frequency through inertia;

[8] Energy Security Board (2021) *Post 2025 Electricity Market Design – A Paper for Consultation*, Part A, p.18

- operational stability through managing of operating frequency within the required envelope; and
- system strength so that likely faults do not result in a collapse of the power system.

The importance of system services and the need to explicitly compensate providers of system services has long been recognised. An earlier (2017) inquiry by this Standing Committee (Powering our Future) made a number of recommendations about the need for system services and that they be ascribed a value that encourages investment in the provision of those services. More recent work for the Energy Security Board and the EU-SysFlex[9] project also highlights the need for and compensation of system services. This issue is common to electricity markets globally.

The NEM will not have the requisite capability to provide the system services required for maintaining a safe, secure and reliable electricity supply without investment in new generation capacity and technology prior to the retirement of thermal power stations.[10] Until new investment and proven technology can be economically delivered, Australia's electricity supply will remain highly dependent on conventional plant.

Against this background, it is recommended that the Committee consider:

1. What is needed now to keep existing proven technology operating in order to maintain a safe, secure and reliable supply of electricity to households and business? When will AEMO be confident that large thermal plant can retire without interruptions to supply?; and
2. What market design is needed for a future technology mix very different from that operating now in order to provide the required system services critical to ensuring the continuation of a safe, secure and reliable supply of electricity?

Technology options to provide flexibility

The only current proven technology which can provide flexibility at the large scale and longer time periods needed to support rapid changes in the supply of energy from weather dependent VRE is dispatchable resources (i.e. thermal and hydro).

The benefit of using existing power stations with established infrastructure in place to provide these services, at least in the medium term, is that they do not require expensive new capacity investment, such as a new gas fired power station which may become stranded assets in the longer term, and do not require new transmission. This leaves time for the market to incentivise the optimal mix of generation services and for the development of new technologies that are proven to be able to operate at grid scale.

The ability of coal fired power stations to provide these services is now at significant risk. As discussed above, the lack of compensation for providing flexibility and the low wholesale market prices (particularly driven by excess solar, both large scale and household solar PV) is increasing the risk that these power stations could be forced to retire early – and, quite possibly, before sufficient new capacity or appropriate alternatives are in place.

[9] https://eu-sysflex.com/wp-content/uploads/2019/10/EUSysFlex-brochure_web.pdf
[10] See note 6 p.17

The risk of early retirement is growing, as evidenced by the announcement by EnergyAustralia (EA) to bring forward the retirement of Yallourn power station by four years and reports that the Victorian Government entered into an arrangement with EA to prevent an even earlier closure.

To minimise the risk of early retirement before a clear understanding of what technology will replace the existing fleet, it would be prudent to keep a proven, workable technology operational. The clarity and confidence does not currently exist as to the timing of when alternative technologies that have been proven to operate at grid scale will emerge to both replace the capability of coal fired power stations and support the volume of flexibility services required.

The role of storage is increasing, but to date it has been battery technology providing network and system security services. Deep storage (e.g. Snowy 2.0) will support higher VRE but, as noted in the report by Bongers et al[11], up to 75 Snowy 2.0s (150,000MW) would be needed for a 100% renewable system. Market price variations, as are occurring in the market now, will incentivise investment in storage and the best technological solutions. Given the size of the long-term storage requirements, allowing the market to drive investment should deliver the right amount of storage, of the most appropriate technology, in the best location and at the right time. The private sector can take on the investment risk and avoids taxpayers and consumers being exposed to poor investments in long lived assets.

In relation to the roll out of existing storage technology, both the Electricity Networks Association[12] and Energy Security Board recognise that battery storage capability is limited. The duration of services provided is not sufficient to provide backup when there is a wind drought and/or less availability of solar as a result of cloudy weather, with this being particularly relevant in the winter. Additionally, the capability of batteries degrades over time and, eventually, they will need to be replaced; the issue of how to safely and sustainably dispose of batteries has not been properly addressed.

With respect to investment in deep storage investment, Snowy 2.0 is scheduled for 2026 and the Battery of the Nation, which relies on construction of high cost undersea transmission capacity, is not expected until the late 2020s. There are significant risks of delay associated with such large greenfield developments, with associated cost overruns.

Some gas fired generation is planned, but the capacity is relatively small. The NSW and Commonwealth Governments are providing $83 million support for EnergyAustralia's new 300MW gas fired power station at Tallawarra. Snowy Hydro may commit to a 350MW gas peaking plant at Kurri Kurri in NSW.

Transmission is not a direct provider of operating reserve, ramping services, inertia or system strength. In any event, increased interconnector capacity which is expected to import thermal generation output from Queensland through New South Wales to Victoria over the long term, risks supply interruptions as a result of transmission equipment failures. Consideration will need to be given to what regional capacity operating reserve and ramping needs are required as a risk minimisation strategy within the broader context of the NEM.

[11] Geoff Bongers, Andy Boston, Stephanie Byrom & Nathan Bongers. Decarbonised Electricity. The Lowest Cost Path to Net Zero Emissions. Gamma Energy Technology P/L, Brisbane, Australia, February 2021.
[12] https://www.energynetworks.com.au/news/energy-insider/2021-energy-insider/batteries-buzz-how-many-hours-do-we-need/

Inter-regional transmission is not the answer to supporting high levels of weather dependent VRE because:

1. on their own, they provide very limited system support services;
2. there is very little wind and solar dispatch diversity across the NEM, so major upgrades of interconnection will not materially add any 'firmness' from VRE through diversity of location of supply; and
3. there will always be a need for each region to have sufficient resources for the times when transmission trips due to equipment faults, weather events or bushfires.

New transmission will be needed for renewable energy zones but to avoid the risk to consumers of stranded assets it is critical that any regulated transmission investment be subject to a rigorous economic net benefits test (such as the Regulated Investment Test – Transmission (RIT-T)). However, there are indications from the ESB that the current RIT-T arrangements could be amended to make it easier to gain approval of new transmission lines. Additionally, to ensure that this new transmission is delivered at the lowest possible cost, it will be necessary to introduce greater competitiveness into the current processes.

Prioritising short term competitive market outcomes until longer term market design work is implemented to maintain system security

The ESB and market bodies are undertaking a substantial body of work to consider the need for system services and how to compensate these services. Focus has been on providing inertia and managing frequency. This has taken a staged approach through addressing immediate issues, such as permitting networks to install synchronous condensers, while longer term price signal mechanisms can be developed to support competitive outcomes.

Implementing new market designs takes time and once completed can take several more years for the financial signals to bring forward new investment. For example, the five minute settlement rule change project has taken over three years to design and implement and it will take a few more years to incentivise material investment.

Given market design work is long term, averting early closure of thermal plant needed for reliability and security must be considered. Urgent work is required to develop a competitive mechanism to support operating reserves and ramping needs. Such an approach will be complementary to the longer-term reform package, as it will provide reward for essential market services and would operate on a technology neutral basis.

The ESB's focus on collecting more information to inform the notice of closure, such as seasonal shutdowns and mothballing of units, does not go far enough to adequately remove risk from the market. The inter-related questions that need to be answered are: How long will large conventional thermal plant needs to operate to ensure system security and reliability, and What is the most competitive mechanism required to encourage them to do so.

Competitive outcomes should remain a priority, with the impact on consumers (both households and businesses) the central consideration in terms of reliability and affordability of electricity. The growing direct investment in energy generation and transmission plus policy intervention by the Commonwealth, State and Territory Governments seems to be

returning us to the "balkanised" electricity system of the 1990s. This was categorised by overinvestment and poor consumer outcomes.[13]

Short term fixes for inertia and system strength are adding to challenges

Giving monopoly transmission operators that are rewarded via guaranteed regulated returns over the life of their assets responsibility for procuring inertia and system strength services either directly (ie, through the installation of network assets such as synchronous condensers) or under long term contracts may appear to be a panacea by addressing immediate issues in part, but it will add to long term transition challenges:

- transmission companies will naturally tend to technology that fits with their standards and expertise. This may bias certain types of technologies over others, and particularly favour a network asset approach as this affords them a guaranteed return over the life of the asset and, therefore, effectively shields them from any stranded asset risk.
- thermal plant may be locked out of the procurement process proposed as they cannot supply these services separately to committing generating units to service. They will be very hesitant to enter into a service contract when there is no certainty the market will support unit commitment;
- such a procurement approach could support expensive and very long-lived equipment such as synchronous condensers with flywheels which may not benefit consumers over their full life as network and market conditions will continue to change and evolve;
- a long term procurement contract by its very nature will limit incremental development over time of new innovative technologies; and
- a procurement approach will deliver the least cost solution to what is asked for at a point in time, whereas a properly functioning market promotes competition to deliver least cost and innovative solutions at all time.

Some of these risks were highlighted in the recent International Energy Agency (IEA) report "Conditions and requirements for the technical feasibility of a power system with a high share of renewables in France towards 2050" in which it particularly stated[14]:

- *"While synchronous condenser technology solutions have been proven in specific situations, a generalised roll out in the context of large-scale system strength has yet to be evaluated. In particular, because synchronous condensers are assets with relatively long lifetimes requiring longer term contracts and the system needs may evolve dynamically, their roll-out as the preferred strategy to deal with concerns of system inertia, still needs to be compared to other technical solutions that may be more flexible in terms of their implementation or more cost-effective once they reach market maturity.*

[13] https://www.energycouncil.com.au/analysis/nsw-electricity-infrastructure-roadmap-a-highway-to-hell/

[14] Link to IEA report: https://www.iea.org/reports/conditions-and-requirements-for-the-technical-feasibility-of-a-power-system-with-a-high-share-of-renewables-in-france-towards-2050; page 89.

Flexibility from dispatchable generation is critical to de-risk the near term NEM transition to high variable renewable generation penetration

In a 2020 report the IEA stated that the 'cornerstone' of electricity market security in a modern market is flexibility.[15] Flexibility allows for sudden changes in net demand to be managed seamlessly through backup capacity which has the ability to ramp up or decrease generation output as net demand changes. It is provided by a variety of services across timescales ranging from seconds, hours, days to seasons. These services are provided by a variety of sources such as thermal and hydro power stations, demand management, networks and storage. Each source has a particular strength with regards to the amount of flexibility it can provide, the speed it provides the service and the timescale it delivers against. No one source satisfies all needs.

The rapid and unprecedented change occurring in the NEM and other markets globally, particularly as a result of increased solar, means that greater and unprecedented levels of flexibility are required to maintain security because of the increased variability and uncertainty that becomes prevalent as the grid becomes more reliant on weather related VRE. Although these systems are transitioning, there is still no gigawatt scale power system that does not rely on dispatchable, synchronous resources for grid stability and resilience.

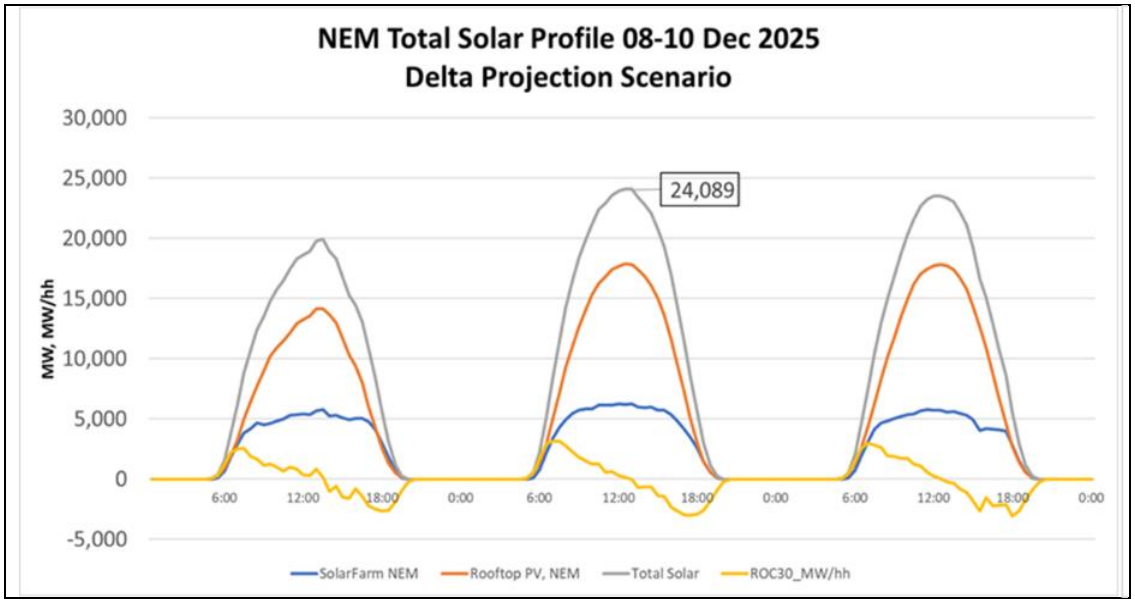
Delta estimates that ramping capacity needs could be as much as 24,000 MW or approximately 68% of current NEM maximum demand in only a matter of a few years. This increased need for substantial GW of backup capacity is consistent with IEA analysis in other markets (see Electricity Security in Tomorrow's Power Systems) although it will be a smaller amount of maximum demand in these markets. Europe sees the least need for additional backup capacity as offshore windfarms have high capacity factors and low levels of variability.

Delta's analysis (see diagram 1) demonstrates that managing the solar profile (let alone the added variability in wind), especially the morning and evening solar ramping, will be a dominant feature in the operation of the near term NEM.

The chart shows daily ramping-in and ramping-out of up to nearly 24,000MW by 2025. To balance supply with demand, potentially AEMO needs to ramp-out, and then ramp-back in, up to 24,000 MW of capacity from synchronous generators, principally hydro and conventional thermal generators. And this could be for sustained periods of days or weeks. For comparison, the 2020 NEM average and maximum demands were 21,408MW and 35,440MW respectively - so 24,000MW represents more than NEM average demand and 68% of NEM maximum demand.

[15] International Energy Agency (2020) *Electricity Security in Tomorrow's Power Systems* https://www.iea.org/articles/electricity-security-in-tomorrow-s-power-systems

Diagram 1 - Wind and solar projections based on Delta Projection scenario



Source: Delta Electricity. The analysis assumes levels of solar generation (both rooftop and grid-scale solar farms) consistent with recent projections by the Clean Energy Regulator (Quarterly Carbon Market report, September 2020, page 4) and AEMO's ISP "Step Change" scenario.

Note: Charts are extrapolations of current dispatch profiles, and these profiles may not be operationally feasible. They illustrate the potential implications for NEM operations under state and territory government targets for new wind and solar. The analysis may change depending on variations in wind and demand patterns. However, while it may change, the magnitude of operational backup and capability required to manage sudden shifts in solar output will still be substantial.

The AEMO Renewable Integration Study (p.56) report underscored the importance of flexibility and the role of dispatchable generation with the report stating:

> *"To effectively integrate higher levels of Variable Renewable Energy (VRE). While maintaining a secure and reliable grid, the system needs access to adequate sources of flexibility that can respond to the constantly varying supply-demand balance, as well as headroom to cover uncertainty. Where there is an increasing need for system flexibility under higher penetrations of VRE, there may be less flexibility available when required in some regions of the NEM, due, for example, to synchronous generation retirements, or displacement of online synchronous generation during high VRE periods"*

There is no question that ramping services are required to support the energy market transition. Existing conventional plants provides these services cost effectively as part of their energy dispatch operations. Premature closure of this plant would compromise the ability for the power system to accommodate increasing levels of weather dependent VRE and the resultant increase in variability and uncertainty in the supply of energy into the grid.. As conventional plant does retire, however, there remains a need for replacement technology that can deliver comparable levels of dispatch flexibility.

This position was reinforced by the ESB in its April 2021 Post 2025 NEM Market design Options report (Part A, page 50):

> *"The expected increase in net demand variability and forecast uncertainty as the power system transforms raises concerns that participants providing reserves based on the risks they see in the energy market may not be the most efficient approach to meeting the system need for reserves over the long term.*
>
> *Addressing the challenge of providing reserves in the most efficient way requires actions across multiple fronts, including continual improvements to forecasting and resource visibility……This would reduce the rate at which forecast uncertainty will grow (which contributes to the need for reserves), as well as ensuring that a mix of flexible resources is operationally available when needed to meet unexpected ramping requirements (which contributes to the supply of reserves). These requirements will vary across different timescales and increase in magnitude as the penetration of VRE increases (particularly solar PV without significant storage) and the flexibility of the scheduled capacity on the NEM changes.*
>
> *"Consistent with these principles and the increasing value of flexible, responsive resources, the ESB is considering establishing an explicit price signal for reserves that would reflect their real value at any point in time. The ESB is principally considering reserve services as an essential system service…… "*

Ensuring the NEM has the near-term flexibility services it requires

It is recommended that the Inquiry apply two timeframes to consider how dispatchable resources and storage can continue to provide flexibility and security:

1. *Immediate* - providing a backstop of minimum levels of flexibility and system services must be a priority until there is a greater knowledge and experience of electricity system operation without large amounts of thermal generation. That is, what is needed to keep the required large conventional thermal capacity in the market until comparable large-scale replacement is implemented? A precautionary approach would ensure that households and businesses continue to enjoy a safe, secure and reliable supply of electricity.

2. *Long term* - with the market approaching 50% renewables, or more on a sustained basis by 2030, the ESB should continue to progress the market design reforms needed to develop and encourage investment in new technology to deliver future system security service.

It is particularly noted that AEMO has previously commented favourably on the adoption of a staged approach as part of a precautionary approach to energy market transition.[16] The discussion on the staged approach, particularly referred to as the Ireland model, supported gradual withdrawal of dispatchable generation.

[16] See discussion on Staged Approach in AEMO (2019) *Maintaining Power System Security with High Penetrations of Wind and Solar Generation,* https://www.aemo.com.au/-/media/files/electricity/nem/security_and_reliability/future-energy-systems/2019/aemo-ris-international-review-oct-19.pdf?la=en

A policy framework for supporting dispatchable resources in the near term

It is recommended that the Inquiry call for immediate action to de-risk the transition to higher levels of weather dependent VRE and set a clear framework to support proven technology (dispatchable, synchronous generation) by keeping the existing system operational until there is like-for-like replacement. This is critical to:

- minimise the risks through the enormous and unprecedented change occurring in generation composition in the NEM;
- reduce ad hoc interventions by AEMO to direct synchronous generators to turn on to ensure system security. These interventions are costly and discourage investment;[17]
- minimise the risks from timing uncertainty as to:
  - when new capacity will come forward such as Snowy 2.0 and Battery of a Nation;
  - what new technology will come forward with like for like capability for dispatchable generation, especially the feature of being able to provide services over long durations; and
  - whether flexibility needs could be substantially greater than currently expected should further step change in system needs occur such as potentially through the rapid growth in a domestic hydrogen industry; and
- complement the long lead times for more permanent rule changes to come into place and start delivering the new required investment.

It is further recommended that as part of immediate action to support ongoing, proven dispatchable generation, the Committee should set out a policy framework that:

- affirms dispatchable generation remains a short to medium term priority to support the provision of capacity and system security services critical for ensuring the continuation of a safe, secure and reliable supply of electricity to households and businesses while longer term market design options are developed and, then, put in place to support market operations; and
- establishes a competitive mechanism to ensure that minimum levels of proven, dispatchable resources are kept in place until there is confidence that equivalent dispatchable capacity and system services exist to meet capability and quantity metrics in a system with high levels of weather dependent VRE.

Much of the priority policy response work to date has focused on the role of the Transmission Network Service Providers. It is also important that transmission systems remain facilitators to deliver energy services to end use customers, and do not become market players. Therefore, it is also time to move away from reliance on this particular technology type and recognise the broad suite of options that will become available going forward.

[17] FTI Consulting (2020) *Essential System Services in the National Electricity Market: A report for the Energy Security Board,* p.58

Long term market design work to support financial incentives for system services and adequate resourcing should continue

As mentioned above, it is important to continue the market design work to support the electricity market of 2030 and beyond. This market will be dominated by weather dependent VRE, a much stronger reliance on the distribution network as a system operator and far less reliance on dispatchable energy generation.

It will take a long time for the market design rule changes to support this new electricity market composition and have an impact on investment decisions that bring forward the required technologies and services.

It is therefore recommended that, in order to support the long-term market design work, the Inquiry should prioritise policy criteria that:

- maintains rigorous economic assessment of proposed transmission projects and introduces greater cost control measures (including increased cost competitiveness) to ensure customer benefits, minimise risk of stranded assets and recognise that this is only one part of the energy services puzzle; and
- maintain the link between generators and the retail market to support competition. The primary role of networks (transmission and distribution) should be as a facilitator and balancer between the two systems, not a player in the market. Customer focused network pricing which meets customer product demand is critical to underpinning this arrangement.