14 February 2025

Tim Nelson, Chair
NEM Review
Department of Climate Change, Energy, the Environment and Water (DCCEEW)
Via email: NEMreview@dcceew.gov.au

RE: NEM Wholesale Market Settings Review Initial Consultation

Dear Tim,

Squadron Energy welcomes the opportunity to respond to DCCEEW's initial consultation on the National Electricity Market (NEM) Wholesale Market Settings Review.

Squadron Energy is Australia's leading renewable energy company that develops, operates and owns renewable energy assets in Australia. We have 1.1 gigawatts (GW) of renewable energy in operation and will be the single biggest contributor to helping Australia meet its 2030 target of 82% renewable energy. Our development pipeline has projects at differing stages of development and includes wind, solar and firming capacity such as batteries and gas peaking plants with dual fuel capability. With proven experience and expertise across the project lifecycle, we work with local communities and our customers to lead the transition to Australia's clean energy future.

Our submission focuses on:

- Identifying the problem to be addressed, namely the need for a clear investment signal for longer duration dispatchable capacity to enter the market rapidly;
- A proposed pathway for capacity mechanism reforms aimed at utilising existing market settings to ensure the timeliness of the changes;
- The importance of structured procurement and transparency for essential system service (ESS) needs to support investment.

Identifying the problem to be addressed

The changing generation mix has challenged the effectiveness of existing market settings

For the first 15-20 years the National Electricity Market (NEM) market and price settings have worked well to incentivise a reliable and efficient energy system for customers. However, a rapidly changing energy mix (increasing variable renewable energy (VRE) and retiring coal assets) challenges the ability of existing wholesale and contract market settings to incentivise the required level of investment in dispatchable capacity and ensure system reliability.

As an 'energy only' market, the NEM only provides revenue for generated energy and system services. Given effect through a gross pool market, generators are dispatched on a merit order basis whereby the next increment of demand is serviced by the lowest cost generator available in the market. The last offer dispatched to balance supply and demand (or the 'marginal unit') then sets the price received by all generators dispatched across that 5-minute settlement period. Generators that are not dispatched receive no revenue. In a world of encouraging competition amongst thermal generators, this approach worked to lower their input costs and drive down clearing prices in the spot market. Additionally, the ability for thermal generators to produce electricity on-demand enabled them to capitalise on periods of high spot prices and recover their total investment costs.

In a high VRE environment, where VRE has close to zero marginal costs, there is the potential for resources to bid very low prices, including into negative price bands, to increase their likelihood of dispatch. Further, as VRE largely generates in response to weather conditions or production incentives and not on-demand, it can be prevented from recovering investment costs during high-pricing periods. This weather dependent characteristic of VRE production can also create significant volatility in the spot market. In particular, high solar penetration creates the risk of prices falling below zero when output is high and also has implications for minimum demand and the level of revenue certainty available to all generators. Behind- the meter solar further exacerbates these challenges given it does not respond to any market signal and there is currently limited means to manage its orchestration.

The combination of these factors has meant that dispatchable sources of electricity generation have been displaced and face limited to no revenues at times of the day or on a seasonal basis. The economics of coal fired power stations have been significantly challenged in this way with numerous closure dates brought forward. Current spot price signals have also become increasingly less effective in supporting revenue certainty for forms of peaking generation such as pumped hydro or gas turbines, while hedging contracts do not appear to provide sufficient support for these investments given their short-term nature. What we are left with is the escalating potential for disruptive coal exits, while replacement dispatchable capacity has a problematic business case.

Coal's delayed retirement remains a barrier to revenue certainty for dispatchable generation

The energy transition depends on timely investment decisions which are troubled by uncertainty. Risk of plant failure or early coal retirement remain the most material risk to customer affordability and reliability outcomes. While we welcome the development of a national Orderly Exit Mechanism (OEM) as a crucial step in providing greater certainty and transparency, recent undisclosed compensation arrangements put in place by state governments to extend Eraring Power Station in NSW and Loy Yang A in Victoria significantly erode investor confidence in the current market at a crucial time of the transition. Market certainty for participants, especially investors, requires transparency where market intervention occurs. We acknowledge the rationale for out of market payments to keep coal on for reliability and security reasons. However, such actions inadvertently make the commercial case for dispatchable capacity even more challenging under existing market settings and dynamics. This is because coal plants are effectively subsidised to generate energy at the same times that new dispatchable capacity would operate. This dulls any market signal to bring on new capacity to fill the gap and further limits revenue certainty.

Today, over 50% of the NEM's 21 GW of coal fired power stations are scheduled to retire by 2030 under the Australian Energy Market Operator's (AEMO) 2024 Step Change Scenario.[1] This +10GW of dispatchable capacity will need to be replaced (in addition to further capacity required to firm the growing VRE penetration to 2030) in a period of 5 years if the 82% renewable energy target is to be taken seriously. In the absence of a clear incentive to bring forward rapid investment in dispatchable capacity, the market is likely to be short of the dispatchable generation needed to ensure reliability during period of low VRE output and/or seasonal, peak demand events. This will likely see further delays in coal-fired power station retirement with a material impact on emissions along with ratcheting cost and reliability implications for customers. [2] Replacement capacity is needed in advance of coal closures to ensure reliability is not compromised for energy consumers and to avoid the price impacts of a disorderly transition.

[1] AEMO, 2024 ISP, p.50.

[2] As an example, the extension of Eraring coal-fired power station to 2027 Is expected to result in an additional 12 million additional tones of greenhouse gas emissions. See: https://www.smh.com.au/environment/climate-change/even-before-eraring-was-extended-nsw-was-set-to-miss-climate-targets-20240513-p5jd76.html

A clear investment signal for longer-duration dispatchable capacity to enter the market is needed now

Unless the pace of investment is significantly increased over the coming years, there will be a supply-demand imbalance, leading to increasing system vulnerability, and poor outcomes for industry and consumers via increased electricity prices and decreased electricity system reliability. The urgency of the challenge is heightened by long-lead times of new energy projects, often taking several years for development, financing and construction.

As noted above, the existing market mechanisms, both in terms of the incentives signalled by the NEM and the relatively short-term nature of the contracts market, are insufficient for ensuring these investments occur in the right proportions and at the right time. Capacity has strong elements of being a public good where the beneficiaries extend to parties not paying for it. Left to the energy-only market it will be under-provided. To address these shortcomings, Commonwealth and State Governments have introduced various schemes to accelerate investment in VRE and dispatchable capacity to mitigate the risks of a disorderly transition.

At the national level, the Capacity Investment Scheme (CIS) is the key pathway through which revenue certainty is provided. By guaranteeing a revenue floor, the CIS de-risks new investment in a highly uncertain market environment by providing some downside protection. Usefully the CIS can target capacity by the type and location that is best aligned with the forecast system reliability needs.[3] It also operates as an out-of-market scheme, limiting interference with the operation of the spot market signals. The CIS has been a critical intervention to accelerate investment in renewable generation and batteries, but it excludes some key firming technologies like gas powered generation (GPG). A commonly held view is it's also not designed to support high capital cost, long life assets like pumped hydro. For these reasons, the CIS is largely seen as supporting batteries which will play an important role in maintaining system reliability but have significant duration limits in the context off the expected volumes of capacity withdrawn as coal power stations retire.

Additional state-based schemes, such as NSW's NSW Long-Term Energy Service Agreements (LTESA) Scheme and South Australia's (SA) Firm Energy Reliability Measure (FERM), are time limited revenue support measures that do capture GPG to varying degrees. The FERM mechanism does so in a more targeted way setting an explicit MW target for dispatchable capacity with a minimum duration of 8 hours, while in NSW Firming tenders the duration contribution of GPG is not clearly valued. Additionally, NSW Firming tenders are only held at the discretion of the NSW Minister for Climate Change, Energy, Environment and Heritage and there has been not recent indication to do so.

While we consider that the NEM's energy only market provides strong operational incentives for generators to provide capacity during times when demand and supply are tight through higher wholesale pool prices, short and infrequent periods of higher prices lead to lower investment incentives for long duration firm capacity due to high startup costs and operational constraints typically associated with these technologies. It is on this basis that there is an urgent need for a mechanism to be developed that is tailored to supporting revenue certainty for longer-duration dispatchable capacity to enter the market.

There is a need for resources that will address short fall gaps and provide the duration of capacity needed to firm VRE, delivering long-term value to the market

[3] Not that this contrasts with mechanisms such as the Long-Term Renewable Energy Target (LRET) where Large-Scale Generation Certificate (LGC) revenue may distort the outcomes of the energy only market and result in more solar and less wind generation than is optimal.

As coal exits and variable renewable energy sources increase/the role of GPG as firming during times of low renewable output is critical. While other stored energy sources such as batteries and pumped hydro can also provide firming services, their duration limitations and/or the delivery challenges (availability and lead time) present commercial challenges and limit their full contribution at present. Nevertheless, the need for the timely deployment of lower emissions technologies with firming capabilities remains and is critical to meet our decarbonisation ambitions. It is therefore important to consider more fully the role of GPG in the context of potential delayed emission reduction associated with coal extensions and delays in the deployment of renewable firming technologies. Put another way, GPG is a flexible dispatchable source capable of being deployed at speed while producing fewer emissions than coal burning. As such, increased investment and support for GPG will help avoid significant delays in coal exits, reducing emissions, until such time as zero emissions technologies and fuel sources are more readily available.[4]

In this context, the current investment case for firming technologies is also an important consideration:

- Long duration storage projects such as pumped hydro/ given cost and engineering complexity, do not align with the risk appetite of private investors and this is reflected in the level of government ownership of these projects. The long lead time of pumped hydro assets also means their contribution to the 2030 target will be limited, while their contribution to the 2050 target will be critical.
- For battery technologies the commercial model currently relies on arbitrage and/or contracted revenue for services such as frequency and voltage regulation to balance the grid. As a technology for providing firming, batteries remain limited by their ability to only do so on a short timescale and/or at a reduced capacity. The implication for battery assets contracted to provide firm capacity is that they only provide a short-term hedge, leaving energy providers highly exposed to wholesale prices during periods of low renewable output and high demand. Many companies will not be willing to take on that level of exposure.
- GPG commercials are also changing under current market conditions - notably, the underlying fuel costs make competing with zero marginal generation cost of renewables a short-term outlook. While the asset lives of GPG can extend for as much as 50 years[5] they are unlikely to have an equivalent economic life as their role in the transition should be considered time limited. This is a central consideration for investors as the long-term value GPG assets will ultimately be eroded, presenting an increasingly challenging investment case.

Importantly, GPG, battery and pumped hydro technologies are largely complementary. Any shortfall in one area will require additional investment in another, and potentially significantly more in some cases, to cover any resulting gaps. In the current environment of limited duration batteries and delayed pumped hydro, GPG provides a means to support the timely retirement of coal-fired power stations, limiting overall emissions, until such a time renewable firming technologies are capable. As such, GPG is crucial to manage the exits and entry of generation, meet our decarbonisation commitments, without compromising on electricity system reliability.

Proposed pathway for capacity mechanism reforms

The NEM needs a mechanism to more specifically value dispatchable and longer duration capacity, to incentivise the investment necessary for capacity requirements, including in new technologies that can

[4] Modern GPG technologies also typically have dual fuel capability and can operate on biofuels or, in future, hydrogen blends.

[5] Note that under the round of the NSW LTESA Scheme for firming infrastructure GPG remains eligible on the basis that the Scope 1 emission of the project are supported by commitments to procure and/or surrender Australian Carbon Credit Units (ACCUs) to offset the impact on emissions.

deliver firm and flexible resources as the effectiveness and efficiencies of ageing coal assets decline. Explicitly valuing the signal for capacity could be effected through introducing a separate capacity market, such as in Western Australia's Wholesale Electricty Market (WEM), but more simply can be achieved through a mechanism that complements the existing market. This could be integrated with a NEM-wide common approach to jurisdictional schemes. Building on existing market design can ensure the timeliness of the changes. Based on our views outlined above, we consider the following principles should apply to any capacity market/mechanism design:

- Eligibility should target new entrants - excludes existing coal and gas assets but includes new gas generation assets along with Battery Energy Storage Systems (BESS) and pumped storage.
- Any mechanism should build on existing wholesale and financial markets. This will deliver the mostly timely outcome and matters for emissions, costs, and reliability outcomes in the short and long-term.
- The mechanism needs to assess capacity both in terms of MW and duration of availability and privilege longer-duration dispatchable capacity.
- The mechanism needs to be flexible and able to adapt to changing market conditions and to allow projects to continue to respond to energy only market signal in the longer term.

We consider that an arrangement akin to the Physical Reserve Capacity Market (PRCM) previously proposed by Iberdrola as part of the Energy Security Board's Post-2025 Market Design consultation provides a fit-for-purpose model.[6]

The PRCM could leverage existing market arrangements and would work adjunct to the existing spot and contract markets. It's key design features include:

- A centralised supply assessment whereby AEMO identifies potential market gaps 4 years in advance against the reliability standard or a jurisdictionally nominated target. This would include stating the MW of dispatchable capacity required to be in reserve and any duration requirements.
- Where a market gap persists after T-3 years given no clear indication of a market-led investment response, an auction/tender to provide long-term contracts for eligible resources would commence.
- These contracts could operate as a mechanism to bring on capacity only at times of shortage and take it off market outside of those periods to reduce any market distortion. However, alternatives could include adapting existing mechanisms such as CIS contracts which have had widespread acceptance and would need only with relatively limited amendments required or to on-sell the capacity as a resource to the Reliability and Emergency Reserve Trader (RERT) scheme.
- A key feature of the PRCM is that reserve capacity that assets brought in could transition to the energy only market over time.

Structured procurement and transparency on ESS needs will support investment

Future operation of the power system requires management of significantly different dynamics. The NEM now needs to separately value essential system services from energy provision to encourage alternative sources of supply via market or other procurement mechanisms. These ‘missing markets’ need to be advance of the services becoming scarce. The business cases for investing in resources and technologies

[6] https://www.energy.gov.au/energy-and-climate-change-ministerial-council/working-groups/energy-transformation-enablers-working-group/post-2025-market-design/post-2025-market-design-capacity-mechanism-initiation

that can provide these services, including batteries, synchronous condensers, and other advanced technology, such as by grid-forming inverters, is supported by the establishment of these missing markets.

Recent changes that procure new services to support the transition to higher VRE such as the Fast Frequency Response (FFR), ideally suited to batteries, are an important step. As more coal generation exits the system, further compensated ESS market will be needed to manage the gaps left by coal plants, notably system strength and inertia.

Ongoing technical analysis and research is required to ensure that the needs of the power system in these new dynamics are provided to support a secure system. There's the opportunity for analysis on system strength needs to better complement the Transmission Network Service Provider (TNSP) lead procurement of system strength. Increasing VRE will see increasing system strength costs as coal retires. Under the current procurement approach, system strength is often remediated on a project-by-project basis. Greater coordination of system strength investments, such as synchronous condensers, will provide beneficial outcomes for customers and support investment certainty or project developers. We suggest AEMO's ISP can usefully be enhanced to better plan for and coordinate investments in synchronous condensers alongside the existing TNSP procurement framework.

As the power system transforms, non-network solutions will also be essential to address network needs such as inertia, system strength, Network Support and Control Ancillary Services (NSCAS) and voltage control. Flexible demand in a renewable generation future will be essential and non-network solutions will play a key role in managing daily peaks and troughs where economic. We encourage the ongoing consideration of non-network solutions as part of broader network strategy, planning and design given their ability to balance between reliability and the cost of transmission services for customers.

We look forward to the opportunity to continue to support the rapid transition of the NEM. If you would like to discuss this submission or any related content, please contact Rupert Doney, Director - Policy at [redacted]

Yours sincerely,

[redacted]

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