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17 September 2025

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Dear Expert Panel,

AEMC submission to the National Electricity Market wholesale market settings review draft report

The Australian Energy Market Commission (AEMC or Commission) welcomes the opportunity to provide our expert advice in response to the national electricity market (NEM) wholesale market settings review draft report.

The task of developing recommendations for the future wholesale market is challenging, and we appreciate the efforts the Panel has made to develop a robust draft report. The proposed reforms are a package that, together, if well designed, can play a key role in enabling the cost-effective, efficient and reliable transition to a net-zero NEM.

The attached submission outlines our overall support for the Panel's draft report and addresses the questions you raised in your consultation paper.

Our decision-making is guided by the national energy objectives, which means we seek to promote efficient investment in and efficient use of energy services for the long-term interest of energy consumers with respect to safety, security, reliability, quality, price and the achievement of emission reduction targets.

I would be happy to provide more information on any matters outlined in this submission that may assist the Expert Panel.

Yours sincerely

Anna Collyer
Chair
Australian Energy Market Commission

AUSTRALIAN ENERGY MARKET COMMISSION

SUBMISSION

Submission to the national electricity market settings review draft report

17 September 2025

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About the AEMC

The AEMC reports to the energy ministers. We have two functions. We make and amend the national electricity, gas and energy retail rules and conduct independent reviews for the energy ministers.

Acknowledgement of Country

The AEMC acknowledges and shows respect for the traditional custodians of the many different lands across Australia on which we all live and work. We pay respect to all Elders past and present and the continuing connection of Aboriginal and Torres Strait Islander peoples to Country. The AEMC office is located on the land traditionally owned by the Gadigal people of the Eora nation.

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Citation

To cite this document, please use the following:
AEMC, Submission to national electricity market settings review draft report, 17 September 2025.

Summary

1 The Australian Energy Market Commission (AEMC or Commission) thanks the Expert Panel (the Panel) for the opportunity to provide our expert advice in response to the national electricity market (NEM) wholesale market settings review draft report and recommendations. The task of developing recommendations for the future wholesale market is challenging, and we appreciate the efforts the Panel has made to develop a robust draft report.

2 We look forward to continuing to work with the Panel and stakeholders to ensure the right market settings are in place for a smooth transition that will unlock the benefits of a cleaner, smarter, affordable, and reliable energy system.

The Commission supports the Expert Panel's draft recommendations as important steps promoting the long-term interests of consumers

3 Overall, we support the Panel's draft recommendations and consider them to be important steps in promoting the long-term interests of consumers. The proposed reforms are a package that, together, if well designed, can play a key role in enabling the cost-effective, efficient and reliable transition to a net-zero NEM.

4 **For short-term operational markets,** we agree with the Panel's draft recommendations to build on the existing energy-only spot market. We consider the current market design, with its strong operational signals, will continue to function well in a variable renewable energy (VRE) dominated future.

5 **For medium-term derivative markets**, we support the introduction of a mandatory, always-on and enduring market making obligation (MMO) to ensure that appropriate risk management products are continuously available at the lowest cost. This will flow on to consumer bills by supporting effective retail competition. We agree with the Panel that a liquid, innovative and dynamic contract market is a fundamental requirement for the efficient operation of the electricity market. In our view, an effective contract market assigns risks to those best placed to manage them and supports the spot market to deliver energy when it is needed.

6 **For long-term investment,** we support the Panel's proposal to implement the Energy Services Entry Mechanism (ESEM) to support long-term investment in new bulk renewable energy, shaping and firming by resolving the 'tenor gap' misalignment between the needs of developers and market customers.

7 To be effective, and as our previous analysis has identified, the Commission considers there is also a need for the ESEM **to resolve underlying revenue insufficiency problems that inhibit required investment in new bulk renewable capacity.** These issues are driven by low captured prices for VRE during a period of oversupply prior to the exit of thermal generation. Without this additional support, the Commission is concerned that the costs of the ESEM, which are to be borne by consumers, will be higher than they need to be and/or reliability and emissions reduction targets may not be realised.

Addressing the tenor gap through the ESEM will help promote efficient investment

8 We agree with the Panel that resolving the underlying tenor gap is critical to ensuring investment is delivered in line with reliability needs and to meet jurisdictional emissions reduction targets. Without a credible mechanism to support investments and bridge the gap, investment is likely to be delayed or require higher risk premiums. This will potentially increase overall system costs and require continued reliance on ageing thermal generation.

9 The Panel is seeking feedback from stakeholders on the contract types that would be useful for supporting the entry of new providers of bulk energy, shaping and firming through the ESEM. We have assessed the options proposed by the Panel and considered if they **are cost-effective for consumers, efficiently allocate risks, are financeable, minimise administrative complexity and resolve the 'tenor gap'**. Although most of the proposed contract types could drive the required investment, they all have inherent trade-offs that need to be considered.

10 Our analysis has focused on how the mechanism would interact with market participants, wholesale market signals and consumers. We have concluded that the following contracting options best align with evolving consumer outcomes and market needs by minimising the risk of crowding out market-led investment as well as supporting the tenor gap:

- for **bulk renewable energy** – renewable energy guarantee of origin (REGO) contracts for difference (CfDs) combined with an enhanced renewable portfolio standard (RPS)
- for **shaping** – virtual tolling agreements
- for **firming** – cap contracts.

The ESEM combined with an enhanced renewable portfolio standard, is the best approach to deliver bulk renewable energy to meet emissions and reliability targets

11 **We consider that the most efficient, transparent, flexible and equitable approach to support investment in new bulk renewables is the long-term procurement and recycling of REGO CfDs combined with an enhanced renewable portfolio standard** embedded in the National Electricity Law (NEL) with targets set by the Reliability Panel or AEMC based on jurisdictional emissions targets.

12 Our proposed approach would provide support through a well-understood and financeable mechanism that allows generators and market customers to innovate and contract for their specific energy needs. It offers technologically neutral support for all VRE, irrespective of contract type, promoting contract innovation. It also supports all market-based investments without being contingent on being awarded an ESEM contract.

13 This approach also addresses the tenor gap challenges in a market-based and cost-effective way. The REGO CfD provides a long-term revenue floor for the actual renewable power generation, improving project financeability, without exposing consumers to unnecessary risks. In parallel, the renewable energy portfolio standard ensures enduring demand for REGOs, reducing the scheme financial vehicle's (SFV) liabilities and ensuring that all renewable generators are supported irrespective of ESEM participation.

14 Awarding REGO CfDs without extending a renewable portfolio standard could drive the necessary investment. However, in the Commission's view, it is less efficient due to more reliance on central planning, with the risk of crowding out private investment. It would result in a greater financial liability for the SFV. It would reserve support to a subset of the market who would have to inefficiently recover any medium-term revenue insufficiency from future customers through the ESEM support.

15 In any event, the Commission supports establishing a flexible, independent process to identify the bulk renewable contract type of choice. Enabling flexibility to adapt the specific bulk renewable contract for the ESEM would allow the more ambitious contract structures to be trialled, whilst building in flexibility to adjust the contract type to ensure longer-term emissions reduction and reliability targets are met. We would be happy to work with the Panel as it further develops its thinking on the preferred contract structures.

Our proposed approach also resolves the VRE revenue insufficiency issue we have identified as a critical barrier to solve

16 The Panel's draft recommendations would resolve most of the issues identified by the Commission as part of our *Future of the wholesale market* review, as outlined in our submission to the NEM review consultation paper.

17 However, in addition to resolving the 'tenor gap,' **we consider it critical to improve the revenue outlook for new bulk renewable energy entrants to adequately incentivise entry as thermal generation exits the market**.

18 Our analysis and modelling indicate that, without increasing the revenue for new capacity, the costs of delivering new capacity may exceed what off-takers are willing to pay. This could scuttle projects prior to the 'tenor gap' materialising, resulting in insufficient investment being delivered to meet emissions and reliability targets.

19 We consider it critical to support the value of bulk renewable energy irrespective of when or where it is generated, and to send a strong and credible market-based signal to drive the exit of thermal generation.

We consider that the proposed ESEM contracts with firm volume requirements may not efficiently allocate risks and deliver investment at the lowest cost

20 Although the other proposed contract types could incentivise the necessary investment, the Commission does not consider them to be as efficient, effective or transparent. We consider they could expose renewable developments to undue wholesale market exposure based on unpredictable, uncontrollable, and uninsurable risks over multiple decades. Such risks could exceed the risk tolerances of financiers and threaten the financeability of new capacity.

21 The ESEM should avoid making support contingent on accepting a level of risk that may only be palatable to some. Instead, the Commission prefers universal support for VRE, with developers and customers left to determine appropriate contracting approaches without centralised control.

22 We support the intent of the firm bulk renewables contracts in enhancing retail competition. However, we do not think that goal should undermine the ability of independent renewable developers to participate by making support contingent on their acceptance of undue risks over the contract's duration.

We support the proposed role of the ESEM in underwriting firming investment by procuring long-term cap contracts

23 Long-duration storage and gas-fired generation will play a critical and increasingly important role in enabling a reliable and secure move towards a variable energy-dominated future. Relying on long-term cap contracts, which are established and well-understood derivative products with appropriate risk allocation, should promote retail competition by improving liquidity in forward markets in a transparent and administratively simple way.

The ESEM's focus should favour directing investment in bulk renewables and firming, as market signals effectively incentivise short-duration batteries

24 Centralised underwriting of shaping services should only seek to fill gaps and build on the existing and significant market-based investment. Spot market signals combined with ancillary service revenues are already resulting in large-scale investment in short-duration storage.

25 As such, the ESEM should focus on investment in bulk renewables and firming. Relying on the market to deliver the optimal level of shaping would help alleviate more pressing system needs and greatly simplify the setting of procurement targets.

It is critical that the ESEM is flexible so it can evolve with the future needs of the market

26 Given the pace of the transition and the inability to fully predict long-term system needs, the ESEM needs to be flexible and able to adapt to changing circumstances. If the mechanism is unable to evolve over time as those needs change, it will be ineffective in meeting its targets.

We support the range of other recommendations in the report

27 Overall, the Commission supports the integration of currently unscheduled price-responsive resources into the wholesale market. As the proportion of resources that respond to prices in the NEM becomes increasingly distributed and owned by consumers, effectively integrating these resources into the spot market is crucial to supporting an affordable and reliable supply of electricity for all consumers.

28 We support utilising the *Integrating price-responsive resources into the NEM (IPRR)* voluntarily scheduled resources (VSR) framework to facilitate increased demand side participation in the NEM. The wholesale demand response mechanism (WDRM) also plays an important role in engaging a subset of large loads.

29 While we support the objectives of integrating more price-responsive resources into the NEM, we identified several challenges in making this mandatory when we considered the IPRR rule. It will be important to learn from the implementation of IPRR when it commences in May 2027 to understand what the additional step of mandatory participation will achieve. Providing appropriate further incentives for these resources to participate will assist in driving benefits for the individuals participating and the market, as a whole.

30 We consider the Retailer Reliability Obligation (RRO) complex and ineffective, and that it disproportionately burdens large retailers and market customers. We support the Panel's recommendation that the RRO be phased out following the introduction of a permanent MMO.

31 We support the Expert Panel's proposal that the Reliability Panel provide a longer-term view of the form of the market price settings to support derivative markets. As the *2026 Reliability standard and settings review* is currently underway, we consider the Reliability Panel best placed to determine if any revisions to the current settings would better promote the NEO, following the completion of the current review.

32 We agree with the Panel that coordinating system security and reliability investments through the ESEM, where cost-effective, would help deliver critically needed services in a proactive, timely and efficient way. However, we expect that existing frameworks will continue to deliver the bulk of the security services required to retire thermal generation capacity, securely.

33 The Commission notes the additional observations made related to consumer outcomes and considers them consistent with the findings to date from our ongoing *Pricing Review: Electricity pricing for a consumer-driven future*.

Contents

1 The Commission supports the Expert Panel's draft recommendations

The Australian Energy Market Commission (AEMC or Commission) thanks the Expert Panel (the Panel) for the opportunity to provide our expert advice in response to the national electricity market (NEM) wholesale market settings review draft report and recommendations.

The NEM is undergoing a significant transformation. Governments have clearly set out an ambitious shift to renewables, requiring substantial new investment and the exit of increasingly unreliable and aging thermal generation. A key requirement in the transition is to ensure new assets are in place before old assets retire. The alternative to this is a period of undersupply that risks the reliability and security of the system.

Over the last several years, the AEMC has been looking at the future of the wholesale market in our role as energy advisors to governments. We appreciate the continued engagement with the Panel to constructively advocate for solutions that are in the long-term interests of consumers by unlocking an efficient, reliable, equitable and affordable transition to a net zero NEM.

We have structured our submission as follows:

- **Chapter 1** is an overview of the Commission's support of the Expert Panel's draft recommendations, how they are in the long-term interests of consumers and how they would resolve issues identified by the Commission.
- **Chapter 2** outlines the key design choices we consider would unlock the full benefits of the ESEM in enabling the transition to net-zero.
- **Chapter 3** provides detailed answers to the consultation questions.
- **Appendix A** details our analysis of the proposed contract types for bulk renewable energy.

1.1 We agree with the Expert Panel's conclusion that the energy-only spot market is effective and will continue to be as we transition

We agree with the Expert Panel's conclusion that the core features of the current NEM will continue to work in a variable renewable energy (VRE) dominated future. We therefore strongly support the Expert Panel's proposals to build on the existing energy-only spot market and related financial markets to promote the:

- delivery of critical system needs by targeting the specific barriers to investment in bulk renewables, shaping and firming
- enduring, deep and liquid availability of risk management products to enable price discovery for investment and support well-functioning and competitive retail markets.

Building on the market's strengths is pragmatic, and allows for faster implementation and resolution of some of the urgent challenges we are facing.

The proposed recommendations strengthen operational signals

The objective of the dispatch process is to dispatch the lowest cost mix of generation to meet expected demand. The existing energy-only market, with a high market price cap (MPC), has provided strong signals for generators to provide electricity when demand is high and supply is scarce. We strongly support the Panel's draft recommendations that retain this operational signal. It is important to note that the Reliability Panel is currently reviewing the market settings from 2028 – 2032, with final recommendations due to be submitted to the AEMC by 30 April 2026.[1]

[1] See AEMC *2026 Reliability Standard and Settings Review* project page.

The strength of these operational signals also provides the financial risk that forms the basis of a liquid derivatives market. Derivatives contracts provide investment signals for generators, while providing a mechanism for retailers and market participants to manage their risk. It is important that these signals are maintained and that prices continue to form the basis of investment and dispatch decisions.

A core tenet of an efficient market is that risks are allocated to the parties best placed to manage them. The draft recommendations emphasise the importance of well-functioning, liquid derivatives markets to allow participants to manage their financial risks.

Participants also retain some locational signals under these recommendations to provide generation in the region where it is most valuable, to manage congestion, and limit coincident generation. Any mechanism that dilutes the operational signals the spot market provides dampens these signals and would compromise market efficiency.

1.2 The Expert Panel's draft recommendations are in the long-term interests of consumers and promote the NEO

The objective of the NEM and energy markets worldwide is to deliver secure and reliable power to customers. Energy markets worldwide have selected different market designs based on their priorities, characteristics, and history. Notably, most markets face similar challenges when transitioning to a zero-emission energy system.

1.2.1 Supporting the integration of price responsive resources into the wholesale market would increase market efficiencies and simplify system operations

Overall, the Commission strongly supports the increased participation and improved visibility of currently unscheduled price-responsive resources into the NEM spot market. As the proportion of resources that respond to prices in the NEM becomes increasingly distributed and owned by consumers, effectively integrating these resources into the spot market is crucial to supporting an affordable and reliable supply of electricity for all consumers.

We strongly support further incentives for these resources to participate. The benefits from integrating these resources accrue to the market, and not just to individual participants in dispatch. Additionally, there are well-recognised inherent disincentives to being scheduled in the NEM (for example, meeting the communications and data requirements). Measures to examine and ensure long-term incentives for this type of participation is key.

Our 2024 final IPRR rule did not make participation in dispatch mode mandatory. This was due to the complexity of identifying the resources, the cost to participate and the benefits from requiring participation. While we strongly support the objectives of integrating more resources into the NEM, it will be important to learn from the implementation of IPRR from May 2027, to understand what a mandatory participation requirement could achieve.

1.2.2 Promoting two-sided markets is key to realising the gains provided by large-scale CER investment and integration

Two-sided market arrangements, such as the VSR framework, are the key vehicle to facilitate broad demand-side participation in the NEM. The VSR framework is highly flexible and resilient to future market and technology changes. The WDRM, however, is suited to a subset of large loads, such as data centres.

Small customers, who typically have CER, are not eligible to participate in the WDRM and large customers who have CER would likely face difficulty in meeting a baseline.

1.2.3 The MMO would improve contract market liquidity in forward markets, supporting better outcomes for retail competition

Introducing a mandatory MMO can enhance liquidity in future contract markets. This has the potential to encourage more retailers to engage in the markets and drive competition for customers. This should improve consumer outcomes, as consumers will gain access to more competitively priced offers from a greater variety of providers.

1.2.4 The ESEM would incentivise investment in long-term bulk renewables, shaping and firming prior to the exit of thermal generation

Considering the scale of the investment and coordination challenge, paying for the entry of new capacity prior to the retirement of ageing and increasingly unreliable thermal generation will require support mechanisms. Our future of the wholesale market work noted that there is no single elegant solution to the challenges of the transition. Rather, the characteristics and needs of different services will require specific contracts and support.

Overall, the Commission supports the Panel's proposals to support investment in bulk renewables, shaping and firming to enable the reliable and secure decarbonisation of the generation fleet. The Panel's approach of incentivising investment in a range of services will support this.

We consider that the following options best align with evolving consumer outcomes and market needs by minimising the risk of crowding out market-led investment:

- for **bulk renewable energy** – renewable energy guarantee of origin (REGO) contracts for difference (CfDs) combined with an enhanced renewable portfolio standard
- for **shaping** – virtual tolling agreements
- for **firming** – cap contracts.

See chapter 3 for more details.

1.2.5 The ESEM could provide targeted support to meet the NEM's emissions targets

One key challenge facing the market through the transition is pricing the value that renewables provide in reducing total emissions. There is currently no carbon price in the market, and as per the terms of reference for this review, carbon pricing is not in scope. This creates a challenge that the ESEM can help address by providing targeted support to the VRE capacity needed to meet emissions reduction goals.

1.2.6 The ESEM could reduce financing costs by improving long-term revenue certainty

As the Panel has identified, confidence in the long-term revenue outlook for new entrants is needed for financing the capital costs these projects face. Uncertainty for firming capacity chiefly comes from the lumpiness of revenues for the marginal entrant in an energy-only market. For bulk VRE capacity, confidence is deteriorated by coincident generation dampening captured prices and government intervention to extend the life of existing thermal assets.

Through underwriting derivative contracts for firming capacity and buttressing the revenues of bulk VRE, the ESEM provides improved confidence in long-term revenues for the capacity required to meet long-term emissions reduction targets while retaining reliability at a level consumers value. Furthermore, it does so through a credible, enduring and transparent mechanism, thereby improving investor certainty and delivering required investment.

1.2.7 Supporting bulk VRE through a REGO CfDs scheme could create improved certainty as to coal exit

Our preferred approach for supporting bulk VRE through REGO CfDs combined with an enhanced renewable portfolio standard could improve certainty as to coal exits. As REGO prices would be baked into the short-run marginal cost of VRE generation, the ESEM would result in lower wholesale costs for consumers should the Panel progress with the REGO approach. This phenomenon also places additional pressure on coal-fired generation which, in also fostering increased VRE investment, improves investor confidence in exit timing for coal-fired generation. Uncertainty as to coal exit timing has been a key hindrance to investment in new generation through the transition so far.

1.2.8 The ESEM should retain efficient and critical spatial and temporal signals

This review does not recommend introducing locational marginal pricing in the NEM. However, it is important that the ESEM design retain price and volume risk for generators to avoid exacerbating issues caused by coincident generation and transmission constraints. Furthermore, the ESEM represents an opportunity to consider locational issues in providing targeted support for generation projects, where appropriate.

1.2.9 The ESEM could efficiently coordinate security services alongside reliability

The Commission supports the proposed coordination of security services and reliability investments through the ESEM. We expect that the bulk of system security provision will be delivered through the existing system strength and inertia frameworks. However, the ESEM could support the timely, efficient and transparent delivery of ESS capabilities by minimising the risk of duplication by:

- Mandating technical eligibility standards so that contracted units must have the capabilities as a prerequisite (for example, grid-forming inverters, or clutches on gas-powered generators).
- Financing incremental investments in individual plant as part of the tendering process to ensure the capability is available (for example, black start capability).

1.3 The draft recommendations proposed by the Expert Panel would likely resolve most of the issues identified by the Commission

Governments have made clear the critical need to shift towards renewable energy as the most efficient approach to meeting our emissions reduction targets and ensuring customers have access to an affordable and reliable electricity supply. This transition requires significant new investment and the orderly retirement of aging, less reliable thermal generators. A central challenge in this transition is ensuring that new infrastructure is in place before existing assets are retired. In this context, as part of our *future of the wholesale market* work, we worked with NERA to identify five key challenges the NEM must navigate during the transition.

More details are available in Chapter 3 of our submission to the consultation paper.[2]

[2] See: AEMC, Submission to national electricity market settings review initial consultation, 14 February 2025

1.3.1 Issue 1 – The need for large-scale investment in new capacity is higher than historic levels

The 2024 ISP expects significantly greater investment than historically seen, with up to 10 GW of new wind, solar, gas, and storage capacity being added per year. NERA estimates the annualised build cost of new VRE capacity during the transition will be over $15 billion (in real terms) by 2047 and nearly $20 billion when including gas capacity for firming.

The Panel's proposed ESEM helps to address this challenge by providing investors with confidence in the revenue outlook for new projects, thereby bridging the 'tenor gap' for bulk VRE, shaping and firming. Our preferred contracting approach would build on the strength of and enhance the existing renewable energy target by continuing to provide targeted support for bulk renewable energy to meet the investment challenges associated with the transition.

1.3.2 Issue 2 – Coincident VRE production drives lower captured prices for wind and solar, causing revenue insufficiency for these technologies in particular

NERA's modelling of future capacity in the 2024 ISP finds that new solar or wind plant do not earn enough wholesale market revenue to recover investment costs. This is because, in the context of new VRE entering before coal exit to maintain reliability, coincident generation and temporary over-capacity result in captured prices for VRE that are significantly lower than time-weighted average prices in the future. This 'revenue insufficiency problem' results in the capacity to maintain reliability and meet emissions reduction targets not being delivered.

The ESEM addresses this issue by buttressing VRE revenue with targeted support. Through tying obligations on retailers to buy REGOs to legislated emissions reduction targets, the ESEM ensures that with market entry, sufficient VRE plant can enter to meet emissions reduction goals. This revenue outlook is supported by long-term CfDs on REGOs to provide financeability to prospective new projects, thereby reducing their costs of capital.

Crucially, projects that receive ESEM contracts retain price and volume risk over their energy sales. Therefore, VRE generators are incentivised to either firm their own supply, invest in storage, or sign contracts with firming capacity to manage volume risk. The ESEM affords VRE plant flexibility to contract for their supply, depending on their own capabilities and tailored to the risk-management needs of market participants and retailers.

1.3.3 Issue 3 – Increased reliance on gas-fired firming raises challenges of gas supply

The ISP forecasts that the NEM will become increasingly reliant on gas-fired generation for firming. Modelling of the future capacity mix reveals that in addition to gas consumption for electricity generation increasing generally, the maximum levels of consumption across all monthly, daily and half-hourly time periods will also increase. This creates challenges for the reliability of gas supply and exacerbates issues caused by disruptions or shortfalls.

The ESEM does not directly address this issue. Further consideration of this issue is required elsewhere, which may necessitate targeted solutions. We have and will continue to investigate if better coordination of gas and electricity planning documents would be beneficial.[3]

1.3.4 Issue 4 – Geographic diversity of renewable energy is critical

The ISP implicitly solves for the optimal location of new VRE investment by building across REZs to meet reliability goals and minimise correlated generation. Because the NEM has regional pricing, however, commercial investors in new VRE projects will seek to maximise, rather than diversify, output due to subdued locational signals and network access cannibalisation. This creates challenges for the NEM and suppresses captured prices for VRE.

[3] See AEMC *Better integration of gas and community sentiment into the ISP* project page.

The ESEM affords policymakers the opportunity to help facilitate a more optimal generation fleet by providing targeted support that considers the location of potential projects. This is not a perfectly efficient solution; however, as identified in our *Transmission access reform* review (2024),[4] we consider that selective support schemes combined with jurisdictional REZs can foster the efficient location of new VRE generation.

It is important, however, that the design of the ESEM does not place excessive spot price exposure and volume risk on generators. Without firm access rights, generators' ability to manage their risk during periods of congestion is limited. Excess risk that generators cannot manage damages the investment case for new projects, and compromises access to finance.

1.3.5 Issue 5 – Renewable intermittency places greater importance on adequate long-duration storage and interconnection capacity

NERA's modelling shows several periods in the later modelling years where there is insufficient available capacity, leading to significant load shedding. This is a result of extended periods of low renewables output, resulting in low levels of stored energy. While no system can expect to be perfectly reliable, analysis showed that increased interconnection capacity and longer-duration storage would reduce this risk.

The ESEM is a vehicle through which jurisdictions can decide to provide additional targeted support to reserve firming capacity. This additional reserve capacity could alleviate some of the risk posed by weather-dependent output. Furthermore, jurisdictions could choose to use the ESEM to provide targeted support for long-duration storage, such as through favourable terms on cap contracts.

[4] See AEMC *2024 Transmission access reform* project page.

2 The ESEM could play a key role in enabling the transition to a net-zero electricity system

Overall, the Commission supports the Panel's proposals to support investment in bulk renewables, shaping and firming to enable the reliable and secure decarbonisation of the generation fleet. The ESEM is likely to be an effective tool that would enable the transition in a secure, reliable and cost-effective way in the long-term interests of consumers.

The role of the ESEM in incentivising the delivery of the right mix of resources prior to the exit of retiring thermal generation could ameliorate uncertainty surrounding potential reliability shortfalls. Such an approach could increase confidence, thereby avoiding the need for further jurisdictional intervention to extend the life of emissions-intensive thermal assets.

Our submission seeks to shape the design of the proposed ESEM to minimise market distortions, consumer risks, and overall costs while ensuring the right mix of resources is delivered when and where they are urgently needed.

A strategic reserve, procured through the ESEM at the discretion of jurisdictional governments, could allow for optional insurance against high-impact low-probability events that the market is not intended to protect against, as identified by the Reliability Panel.[5] Subject to the reserve's design minimising distortions and the costs that will be borne by the customers in the relevant jurisdiction, such a mechanism could, in a sensible way, allow for the achievement of reliability outcomes exceeding the reliability standard at the discretion of governments.

2.1 We support flexibility in the ESEM so it can continuously evolve to best meet consumer outcomes and market needs

As outlined above, the Commission considers that the introduction of the proposed ESEM would be an effective support mechanism for improving consumer outcomes. Our analysis has focused on practical considerations such as how the proposed mechanism would interact with the needs of market participants, wholesale market signals and consumers. Aligning the design with the market needs will be essential in ensuring the ESEM meets its targets.

The contract types outlined in the draft report intend to drive investment in critical services. However, each of the proposed contract types for bulk renewables has different implications in terms of how they incentivise investment, who bears the spot, temporal and spatial risks, the level of centralised procurement, and ultimately the outcome for consumers. As part of our analysis, we considered the following contract types (the first three bulk renewables contract types were put forward by the Expert Panel in Appendix C of the draft report):

- For **bulk renewable energy**:
    1. Generation-independent contracts for difference (index CfDs) – a swap based on a specific reference bulk energy profile (the index).
    2. Time block swaps – standardised swap contracts broken up into blocks. The volume risk for sellers of the blocks could be capped (for example, at $300).
    3. REGO CfDs combined with a renewable portfolio standard – the ESEM would award CfDs to new projects to provide a long-term and stable revenue stream.
    4. Power purchase agreements (PPA) – an as-generated swap with no minimum volume requirements and fixed prices.
    5. Time block swap combined with a cap contract to manage wholesale market risks.

[5] AEMC, Review of the form of the reliability standard and administered price cap, Final report, 27 June 2024, p.15.

- For **shaping**:
    1. Price spread swaps – the difference between a given number of the highest and lowest trading intervals every day.
    2. Virtual tolling agreements – the seller provides revenues for standardised time periods and asset use, with the seller retaining control over the asset.
    3. Time-limited caps or floors – equivalent of a cap contract; however, wholesale market risk is limited.
- For **firming** we only considered cap contracts.

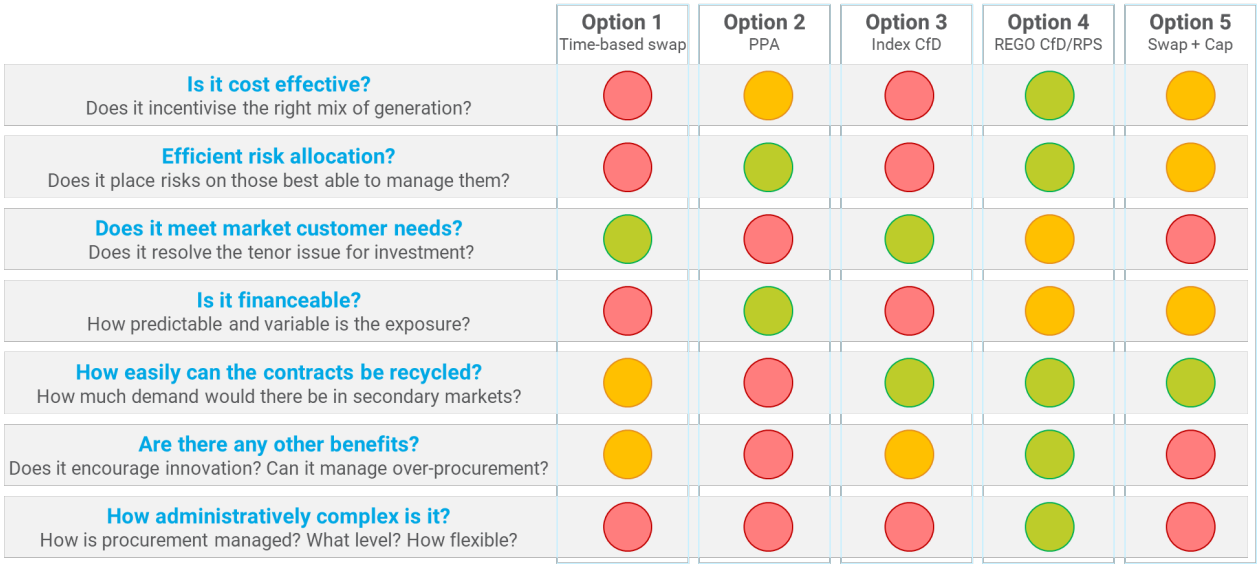
2.1.1 The Commission's assessment of the different contract types focused on cost-effectiveness, risk allocation, meeting market needs, financeability, flexibility and administrative complexity

The contract types for each service will have significant practical implications for implementation, efficiency, the cost of capital of investment, and actual delivery of the required capacity mix to meet reliability targets. We have considered the following principles to ensure that the ESEM successfully delivers on its mission:

- **Cost-effective and technologically neutral** – we should, as much as practicable, send a nationally consistent and equal subsidy for all renewable energy generated.
- **Limit market intervention and distortion** – the ESEM should, as much as practicable, rely on market-based approaches and only intervene if the market is unable to deliver.
- **Efficient risk allocation** – the ESEM should place risks on the party best able to manage them.
- **Meet customer needs** – the ESEM should, as much as practicable, deliver on what customers need and promote efficient retail competition.
- **Contracts must be financeable** – exposure under the contracts must be manageable, relatively predictable and not result in undue burdens that threaten financeability or result in inflated costs of capital.
- **Contracts must be recyclable** – contracts must be capable of being repackaged and recycled into secondary markets. Ideally, they should mirror existing financial products.
- **Promoting flexibility and innovation** – the ESEM should incentivise flexibility and innovation for both generators and market customers to meet specific and evolving needs that reflect risk tolerances and requirements.
- **Minimising administrative complexity** – the ESEM seek to minimise the administrative burden on the SFV and market participants by relying on market-based solutions.

Although most contract types proposed could drive investment, they all have inherent trade-offs that should be considered. Figure 1 below provides an overview of our assessment.

Figure 1 – Overview of bulk renewables contract types against the assessment criteria



The outcome of our analysis concluded that the market would be best served through centralised ESEM underwriting of the following contract types:

- for **bulk renewable energy** – REGO contracts for difference (CfDs) combined with an enhanced renewable portfolio standard for market customers
- for **shaping** – virtual toll agreements
- for **firming** – cap contracts.

Appendix A provides more detail on our analysis of the proposed contracts for bulk renewables.

2.1.2 The ESEM should be flexible to adjust contracting approaches, requirements, and timelines, provided that the focus remains on bulk renewables, shaping, and firming

Given the pace of the transition and the difficulty in predicting long-term system needs, the ESEM needs to be flexible and able to react to changing circumstances to be most effective. Although we view the contract types outlined above as the best approach now, we recognise that customer and investor needs will continue to evolve. Without such flexibility, we risk locking in long-term costs today and burdening consumers with those costs.

As such, to improve regulatory certainty, the NEL should embed overarching and enduring obligations that the ESEM will procure the three distinct services in accordance with the NEO and in the long-term interests of consumers. Specific implementation considerations should be left to the rules or procurement guidelines to allow for adjustment over time.

2.1.3 The most efficient, transparent, flexible and equitable way to underwrite investment in bulk renewables is through REGO CfDs combined with an enhanced renewable portfolio standard in the national electricity law and national electricity rules (NER)

We consider that offering REGO CfDs in combination with a continued renewable portfolio standard strikes the right balance by ensuring risks are well allocated, relying on well-understood mechanisms, and minimising the need for and cost of centralised procurement and intervention.

Bulk renewable developments would either:

- accept REGO revenue based on the relatively consistent and predictable long-term value of the certificates as targets are gradually increased in line with jurisdictional targets, or
- optionally seek ESEM REGO CfDs to increase their long-term certainty.

Such an approach would:

- **minimise any administrative burdens** by reducing the need for market intervention and significantly reducing the need for centralised tendering by relying on market-based delivery
- **simplify the setting of bulk renewables targets** by leveraging an existing approach and the centralised trading of certificates to meet the most efficient renewable capacity mix
- **retain a level of flexibility to meet jurisdictional priorities** by providing a mechanism for governments to optionally award more generous CfDs for specific technologies
- **ensure that all new renewable developments are equitably supported**, not solely those that are awarded with REGO CfDs
- **provide generators with the flexibility to manage their own energy contracts and innovate** to meet the needs of market customers.

Embedding the renewable portfolio standard in the NEL and the NER with targets set by the Reliability Panel or the AEMC based on jurisdictional emissions targets would provide long-term regulatory stability and enduring market-based investment signals while minimising the administrative burden.

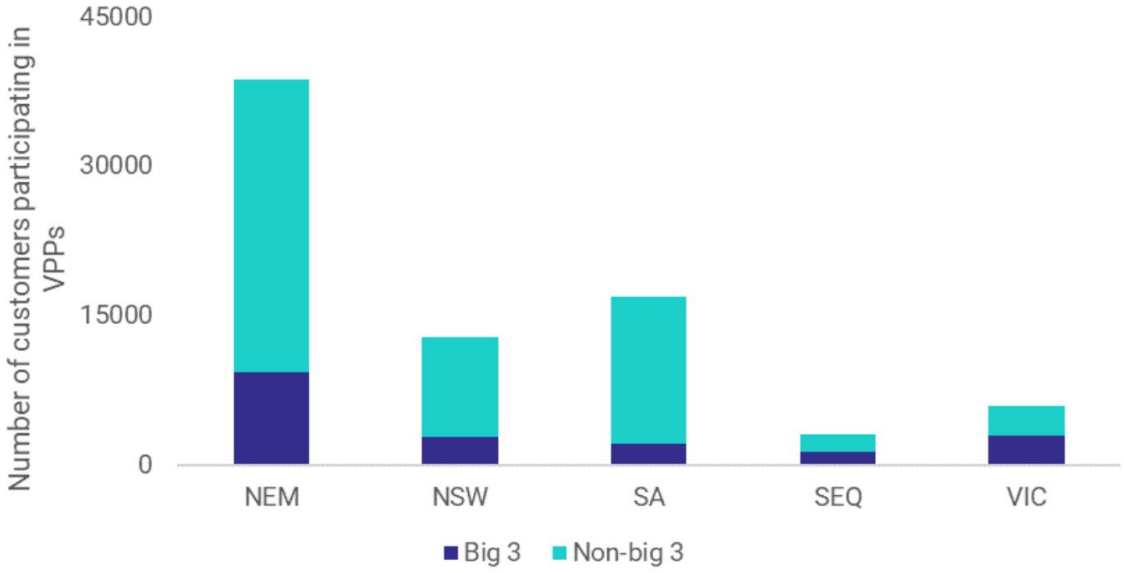
The other proposed bulk VRE contract types could expose renewables to undue risks that they are unable to control in the context of a retail market already undergoing change

We note that the other proposed contract types (generation independent CfDs or time-based swaps) could also incentivise investment and support retail competition by increasing the availability of exchange-traded firm contracts. However, we do not consider them to be as efficient, effective or transparent. We are of the view that they would force renewable developers to take on undue risks over multiple decades that are not possible to control, predict, insure against or easily eliminate.

Such risks would make it difficult to access the capital required to build the renewable capacity essential to meeting our reliability and emissions reduction targets. They would undermine independent renewable developers' ability to compete and make support contingent on accepting undue risks.

We also note that the retail market competition is already evolving in response to the increasing penetration of CER and derivative market changes. Figure 2 below from the ACCC's Inquiry into the NEM July 2025 report illustrates that smaller retailers and non-traditional energy providers supply more than 75% of VPP customers, with the big three generators accounting for less than 25%. Retail business model innovation will continue to reflect the needs of customers, the availability of physical resources and derivative products as we become increasingly reliant on DER and VRE. It is not certain that the retailers of the future will rely on the same resource mix going forward, and heavy-handed government intervention could stifle such innovation.

Figure 2 – Smaller retailers and non-retailer providers supply a majority of VPP customers



Source: ACCC, Inquiry into the National Electricity Market – July 2025, 10 July 2025, p.67.

More details are available in Appendix A.

2.1.4 Centralised underwriting of short duration storage to shape and balance daily supply and demand fluctuations should build on existing market driven investment

Shaping electricity supply and demand to match the intraday and interday system needs is critical to meet reliability and security needs. Historically, shaping has been provided by hydro and gas units that flexibly ramp to meet daily peak system needs. As the power system evolves, we expect utility-scale and small-scale battery storage to outcompete incumbent technologies and play an increasingly important role in ensuring the power system remains balanced.

This transition to a battery-dominated market is already underway, initially driven by lucrative frequency control ancillary service (FCAS) revenues but increasingly incentivised by energy arbitrage. Volatility and the opportunities provided by market price settings are well-suited to delivering continued investment in shaping services without any additional underwriting being required. Moreover, the market has continued to deliver innovative and tailored solutions that best meet the specific needs of market customers. We do not think that government intervention or a one-size-fits-all approach will necessarily improve outcomes for consumers.

As such, we consider that procurement of shaping through the ESEM does not currently need to be a priority. Instead, the market can be relied upon to continue to reflect shaping needs in response to the bulk renewables and firming that are projected to be delivered. We consider the best incentive for shaping to be enduring, market-based and technologically neutral support for bulk renewable energy. Relying on the market to deliver shaping would simplify the setting of targets for the remaining services: bulk renewables and firming.

Such an approach would support the market's efficient operation and rely on operational signals to deliver the optimal quantity of shaping to cost-effectively meet system needs.

If the need for explicit underwriting for shaping services emerges in the future, we are of the view that procurement should only target gaps and intervene if market signals fail to deliver. We consider virtual tolling agreements the most appropriate contract. These arrangements are currently widely used and maintain efficient operational signals to be dispatched in the best interests of consumers and the market.

2.1.5 Underwriting firming through centralised procurement and recycling of cap contracts would efficiently incentivise critical investment while minimising market distortions

The Commission strongly supports the Panel's proposal to underwrite long-duration storage and firming through the procurement of cap contracts. This model aligns with established derivative instruments, reduces consumer risks, and enhances forward market liquidity to support retail competition. It is administratively simple, transparent and compatible with both market participants' needs and policy objectives.

We also consider that the Panel should seek further guidance from potential developers as to the length of contracts they would be comfortable entering. Unlike renewables, input costs for firming are subject to volatile market forces over the contract's duration. Proponents may be unwilling to sign fixed price contracts without equivalent certainty over their fuel costs.

To ensure the Panel's proposal is effective, we consider that there remain opportunities to better consider the interdependencies between gas and electricity markets. It is critical that gas supply, transmission and generation are coordinated to ensure that the resources can effectively operate when required. The Commission has previously investigated approaches for better embedding gas constraints in existing electricity planning documents.[6]

2.2 Bridging the 'tenor gap' could support critical investment in bulk renewables, shaping and firming

The Commission strongly supports resolving the 'tenor gap', which is the misalignment between the long-term investment horizons of renewable developers and short-term contracting preferences of market participants. We consider it critical in facilitating timely and efficient investment in bulk renewable energy, shaping and firming. Without a credible mechanism to support investments and bridge the gap, investment is likely to be delayed or require higher risk premiums. This will potentially increase overall system costs and require continued reliance on ageing thermal generation.

Offering REGO CfDs for renewable developers would effectively resolve the 'tenor gap' issue by providing a revenue floor while maintaining efficient spatial and temporal risk allocation

The ESEM offering REGO CfDs underpinned by a renewable portfolio standard would address the tenor gap challenges in a market-based and cost-effective way. The CfD provides a long-term revenue floor for the actual renewable power generation, improving project financeability without exposing consumers to unnecessary risks.

Importantly, this mechanism retains an efficient allocation of temporal and spatial risk, supporting least-cost outcomes. In parallel, the renewable energy portfolio standard ensures enduring demand for REGOs, reducing the SFV's liabilities and ensuring that all renewable generators are supported irrespective of ESEM participation.

Recycling of REGO CfD tranches in shorter-term derivatives markets improves liquidity and better reflects the timeframes within which retailers and large users typically contract

Enabling the resale of REGO CfD tranches through shorter-term derivatives markets improves contracting liquidity and aligns with the typical procurement horizons of retailers and large energy users (typically 1 – 5 years). It addresses the implications of the underlying demand uncertainty that retailers face due to customer churn in competitive retail markets, particularly among commercial and industrial loads.[7]

[6] See AEMC *Better integration of gas and community sentiment into the ISP* project page.
[7] Origin Energy, submission to the NEM wholesale market settings review consultation, 17 February 2025, p.10, 17-18.

This approach enables the long-term revenue certainty required for project financing while subsequently allowing risks to be reallocated through liquid secondary markets with shorter-term REGO contracts. Importantly, it maintains flexibility for market participants to tailor their procurement strategies while preserving the integrity and efficiency of the underlying investment signal.

2.2.1 In addition to bridging the 'tenor gap' it is critical to increase value for bulk renewable energy to incentivise entry before exit during a period of unavoidable oversupply

As noted above, the Commission strongly agrees with the Expert Panel that the tenor gap is an important issue to resolve. However, based on our modelling and analysis, we also consider that other matters need to be addressed to ensure the ESEM can meet its objectives.

Without supporting the captured market revenues of generated renewable energy during a period of oversupply, it is likely that the costs for delivery of new capacity could exceed what off-takers are willing to pay. This could impact the delivery of these critical projects before the 'tenor gap' materialises. There are several reasons for this:

- **Supply chain constraints and slow planning approval processes** have resulted in significant cost overruns and delays in the delivery of new capacity.
- **Market participants are sceptical that thermal generators will retire on their announced dates,** thereby diluting the investment signal for replacement capacity and perpetuating a self-fulfilling prophecy as retirements are delayed.
- **Coincident generation of wind and solar energy during a period of oversupply reduces captured prices** prior to the retirement of ageing thermal generators.
- **Delays in transmission infrastructure** increase uncertainty for market customers and generators about whether they will be able to connect to the network or face congestion.

Due to these factors, it is critical that the value of bulk renewable energy be supported irrespective of when or where it is generated and that a strong and credible market-based signal be sent to drive the exit of thermal generation. Historically, in the NEM, this critical need has been fulfilled by the renewable energy target and the associated large-scale generation certificates (LGC). These provided a nationally consistent and technologically neutral incentive. We support a clear, transparent and effective renewable portfolio standard in the NER.

2.2.2 REGO CfDs with a renewable portfolio standard simplifies procurement, minimises government intervention and minimises costs for consumers

We consider that combining REGO CfDs with a renewable portfolio standard is the most effective way to cost-effectively deliver the right mix of new generation. Our view aligns with the recent recommendations from the Productivity Commission's interim report on investing in a cheaper, cleaner and net zero transformation. The report highlighted the need for enduring, broad-based market settings that support lowest-cost clean energy irrespective of technology type or jurisdiction.[8]

In combination, both tools would:

1. **Support renewable investment** irrespective of whether it is awarded an ESEM contract.
2. **Support the value of REGOs to minimise consumer exposure** by reducing the potential liability for the SFV and the need for bulk VRE REGO CfDs.
3. **Allow for flexibility** in awarding CfDs to projects based on jurisdictional priorities while relying on market signals to continue driving most investment.

[8] Productivity Commission, Investing in cheaper, cleaner energy and the net zero transformation – inquiry interim report, August 2025, p.2.

4. **Greatly simplify the setting of procurement targets**. We consider that embedding this approach in the NEL, combined with targets set by the Reliability Panel or the AEMC based on jurisdictional emissions targets, would promote long-term investment certainty.
5. **Better align with the needs of market customers** by making available REGO forward contracts that better align with their understanding of future demand.
6. **Promote competition by supporting investment outside the ESEM**, minimising administrative burdens, improving the reform's focus and promoting flexibility.

Awarding REGO CfDs without extending a renewable portfolio standard could drive the required investment, but it would inherently be less efficient due to more reliance on central planning, with the risk of crowding out private investment, and would result in a greater financial liability for the SFV.

It would reserve support to a subset of the market who would have to inefficiently recover any medium-term revenue insufficiency from future customers through the ESEM support.

2.2.3 It is critical that there is a flexible approach to identifying the preferred contract structure to meet emissions and reliability targets

The Commission supports establishing a flexible, independent process to identify the bulk renewable contract structure. Enabling flexibility to adapt the specific bulk renewable contract would allow the more innovative contracts to be trialled, whilst building in flexibility to adjust the contracts to ensure emissions reduction and reliability targets are met.

3 We have provided responses to the questions raised in the Expert Panel's draft report

This section responds to each of the questions asked by the Expert Panel in its draft report.

3.1 Theme 1 – Ensuring effective operation of the spot market

Question 1 – Additional feedback on recommendation 1 to maintain the real-time regional energy-only spot market?

As outlined in section 1.1 above, we strongly support the Expert Panel's decision to build on the existing energy-only spot market. While increasing levels of renewable energy will bring more binary and volatile pricing, this is an inherent feature that will provide efficient incentives to deliver in the optimal capacity mix. Incremental improvements can address new challenges without moving away from this model.

Question 2 – Is the dispatch mode framework a suitable mechanism to underpin visible and participative price response under a mandatory framework?

The VSR mechanism is effective for allowing some currently unscheduled price-responsive resources to participate in dispatch, but the ability of resources to participate is dependent on their predictability and control. It is important to learn from the implementation of IPRR (from 2026) to understand whether a broad range of resources will be able to use this mechanism to participate.

In IPRR, we outlined that resources with high levels of predictability and control, such as small aggregated batteries, would face lower barriers to participation. The spectrum of predictability and control of price-responsive resources would mean that a mandatory framework would need to consider their ability to participate in the market.[9]

The Commission considered scenarios where the financially responsible market participant (FRMP) is contracting with small customers to orchestrate their devices raise additional challenges that would need to be considered and could be challenging to mandate participation.

Question 3 – How should we structure a mandate for these resources to be visible and dispatchable, given the resources' different features and the different options for participation that currently exist in the NEM?

As noted in our answer to question 2, the 2024 IPRR final rule did not make participation in dispatch mode mandatory.[10] This was due to the complexity of identifying the resources, the cost of participation and the insufficient benefits of requiring participation.

Question 4 – What thresholds should be set to require participation by medium-scale batteries, CER/DER aggregations and large loads?

The different controllability and operating characteristics of medium-scale batteries, CER/DER aggregations and large loads would likely require different thresholds to be considered for each. The Expert Panel should consider a range of issues, including how to define the aggregations and any disincentives that may come from setting thresholds for participation. The Commission is happy to work closely with the Panel on these issues as you develop your final recommendations.

[9] See Figure 2.1 for more information; AEMC, *Integrating price-responsive resources into the NEM*, p. 8.
[10] Additional details are available on the *Integrating price-responsive resources into the NEM* project page.

Question 5 – How should requirements for visibility of price responsiveness in retail contracts be established and does the VSR inactive mode provide sufficient information?

The Panel suggests that these participants could use the "inactive" mode of dispatch to participate. However, we consider that these resources would face difficulty meeting the requirements to be approved as a VSR in the first instance. For example, VSRPs need to provide close to real-time telemetry data for the VSR, which would typically be difficult for spot pass through contract customers.[11] If the Panel recommends that this be used as a standalone solution to provide AEMO with information only, further consideration of the operation of inactive mode may need to be given.

Question 6 – What form and scale of support would deliver the best outcome for VSR participants, the wider market and customers?

A range of support should be considered. The Commission prefers that sustainable benefits be provided through the market that are commensurate with the benefits that the market receives. Failing this, more interventionist support could be considered to address incentives.

There are three potential support considerations that would need to be addressed:

- **Benefits from participation** – the current benefits to VSR participants may not be material.
- **Upfront costs** – high upfront costs to be able to participate (e.g. requirements for forecasting and communications) were a concern for IPRR.
- **Ongoing payments** – if benefits from participation are not sufficient, then consideration for ongoing support may be required.

Question 7 – Additional feedback on recommendation 2 that Energy Ministers require a broader range of price-responsible units to be visible or dispatchable?

Additional feedback on recommendation 2 is covered in our response to question 6.

Question 8 – Additional feedback on recommendation 3 that Governments should focus support for CER on facilitating consumers being able to benefit from being price responsive?

We agree that government incentives for investment in CER should support resources that are enabled to participate in the market through aggregators.

Question 9 – How might the increased use of autobidding and algorithmic machine learning impact dispatch?

We agree that market bodies should collaborate to consider changes that promote the continued efficient and competitive functioning of the energy-only market, including in the realm of autobidding and algorithmic machine learning.

Such techniques are already extensively used in trading and commodity markets, taking real-time data to inform trading decisions that continually adapt to changing market conditions. Pricing algorithms are already a pervasive feature in the NEM. Over time, these algorithms will employ AI and machine learning to a greater extent. Such tools could provide a range of benefits for the NEM, they could:

- increase efficiency and allow decisions to be made more quickly, cheaply, and consistently
- reduce barriers to entry for generators by reducing reliance on people to bid capacity
- support enhanced decision-making beyond what AEMO already achieves.

[11] AEMO's draft VSR guidelines specify that VSRPs with a VSR greater than 5 MW need to provide aggregated VSR data every 4-seconds.

At the same time, the process of 'self-learning' by algorithms may ultimately lead to bidding or pricing strategies that closely resemble collusion, leading to higher prices for consumers.

Such self-learning capability could also result in bidding strategies that seek to maximise profits by pushing the power system to the edges of its operating envelope. Furthermore, the lack of transparency in AI algorithms makes monitoring and enforcement action problematic.

We therefore face a difficult 'trilemma' when managing the risks of algorithmic collusion:

1. Waiting for a collusive outcome to occur is naturally not an acceptable policy response.
2. Detection of algorithmic collusion, even if possible, may be prohibitively expensive.
3. Restricting the use of AI in totality is also unattractive, given its potential benefits.

The Commission agrees with the Expert Panel's recommendation that we should work with the ACCC, the AER and AEMO to develop rule changes and regulatory responses that address risks created by excessive rebidding and algorithmic bidding. Our previously completed work on the subject makes us well placed to lead the work.

Question 10 – What other market information could be made public to help achieve the NEO?

Our general preference is to advocate for greater information and transparency where such information could improve market efficiency and the utilisation of the network. However, we recognise the potential concerns about market power and the risk of collusion.

We would be willing to review the current arrangement going forward. Our analysis would consider any competition and market implications that could materialise were the transparency obligations on batteries increased.

The Commission's 2024 *Enhancing reserve information* rule introduced greater transparency obligations on batteries, including state of charge information.[12] We would be open to analysing whether publishing more information would be in the long-term interests of consumers.

We also recently initiated the *Integrated Distribution System Planning* rule change in June 2025.[13] This rule change seeks to improve the quality and transparency of distribution network data at the low voltage level to enhance network planning and promote the efficient investment in and utilisation of the distribution system. Such improvements to data availability could prove critical to identifying where investments provide the greatest benefit to consumers.

Question 11 – Additional feedback on recommendation 4 that Market Bodies should use the rule change process to ensure the efficient and competitive functioning of the real-time energy-only spot market?

We have no further comments, but we continue to welcome feedback from the Expert Panel, market participants and jurisdictions on how the market can evolve to best meet the long-term interests of consumers.

Question 12 – Would a forward-looking view of the form of market price settings provide greater certainty for buyers and sellers of electricity?

We support the Reliability Panel providing a qualitative outlook on the long-term form of the market settings as part of the regular *Reliability Standard and Settings Review (RSSR)* process. The Commission understands the Expert Panel's rationale in seeking greater clarity of the form of the market settings over a longer duration to help guide the continued evolution of derivative market products.

[12] More details are available on the *Enhancing reserve information* rule project page.
[13] More details are available on the *Integrated distribution system planning* rule project page.

Critically, the Reliability Panel would not be providing any quantitative assessment on the level of the market settings, as they would be based on information that is out of date.

Question 13 – Additional feedback on recommendation 5 that the Reliability Panel should consider adjusting the form of the market price settings over time?

We support the current process by which the Reliability Panel reconsiders the appropriateness of the form and level of the market settings every four years through the regular RSSR process. We do not think any revisions are required to the current robust approach, which has been effective in regularly revising the market standard and settings. The 2026 RSSR is currently underway and is considering the appropriateness of the current market settings.[14] The current framework allows flexibility for the Reliability Panel to carry out reviews, such as the 2024 review on the form of the reliability standard and APC.[15]

Should the Expert Panel final report recommend exploring specific changes to the form of reliability settings, then this would best be done through a review process commencing upon completion of the current 2026 RSSR.

Following the introduction of the NEO's emissions reduction component, the Reliability Panel will likely undertake a review to update the 2021 RSS guidelines. As part of that, the Reliability Panel can engage with stakeholders to determine if process improvements should be made to support long-term investment certainty in the long-term interests of consumers.

3.2 Theme 2 – Maintaining liquidity in the derivatives markets

Question 14 – Which products should an MMO for the NEM encompass?

If introduced, the MMO should be phased in, with product coverage evolving to meet the market's needs. Embedding flexibility in the products covered by the mechanism is key to its enduring effectiveness in supporting retail competition as the power system decarbonises.

The MMO could initially begin with coverage extending to the products covered by the ASX's existing market-making arrangements – that is, baseload calendar quarter futures. If there is greater demand for additional products to be covered by the mechanism in the future, they can be added over time. This would balance the regulatory burden of the scheme with the value it provides in improving liquidity for participants. In the same vein, there could be additional variation in coverage by jurisdiction, depending on what products are valued by the market.

As suggested by the Expert Panel, a collective forum of small and large market participants, the ASX, financial participants, representative bodies and the AER could determine coverage on an ongoing basis through periodic meetings. This would embed flexibility and adaptability into the MMO, ensuring it remains impactful into the future.

Question 15 – What additional design elements should the Panel consider to ensure an MMO provides efficient outcomes for end users?

The MMO should promote and support effective retail competition to ensure efficient outcomes for end users. We also support the phasing out of the Market Liquidity Obligation.

The operation of the MMO, including considerations around the coverage of contracts and the obligations to participate in the market making, should be considered with a view to supporting retail competition as best as possible. This could involve assessing the relative liquidity and access of certain products for all participant types and understanding the extent to which there are barriers to growth for market customers that are derived from inadequacies in the contract market. These issues can be accounted for in the proposed industry co-design forum.

[14] More details are available on the *2026 Reliability Standard and Settings Review* project page.
[15] More details are available on the *2025 Review of the form of the reliability standard and APC* project page.

Additionally, the introduction of the MMO should be predicated on the removal of the Market Liquidity Obligation (MLO) under the Retailer Reliability Obligation (RRO). The MLO is duplicative of the MMO, the latter of which is more expansive and dynamic in its operation. Further, consideration should be given to phasing out the RRO in the near-term, which may be redundant under an ESEM and the potential introduction of a strategic reserve.

Please see our response to question 21 for more information.

Question 16 – How can the proposed co-design process be designed to best accelerate contract market innovation, determine appropriate ESEM contract types, and identify contract types that should be subject to the market making obligation?

We support the establishment of an ongoing contract co-design process in the NEM. Strong governance and regular engagement will be key to its success.

The co-design process should include representatives from across the industry, including retailers of all sizes, generators, financial intermediaries, developers, banks and market bodies to ensure the proposed contract types efficiently and practically allocate risks. Additionally, the process should be governed by a set of key principles that can help drive unity across a diverse set of stakeholders with diverse needs and views.

This co-design process should also monitor the performance of existing ESEM contracts. If ESEM contracts are not effectively delivering on their purpose, the committee should be empowered to investigate why and propose adjustments. In addition, it should monitor the appropriate contracts to be included in the MMO scheme.

Question 17 – What should be the design and governance of an ongoing contract market co-design process in the NEM?

The design and governance of the co-design process are discussed in question 16.

Question 18 – What contract types should the Panel explore, in consultation with industry and market participants, over the next six months for the purposes of market making and the ESEM?

The contracts that should be included in an MMO are answered in question 14, Section 2 of this document, answers to question 31, and Appendix A, provide details on the types of contracts that the ESEM should procure.

Question 19 – What actions can be taken to improve the accessibility of derivative markets for small retailers?

The ability for new retailers to enter, innovate, and gain market share is fundamental to ensuring the retail electricity market delivers good outcomes for consumers. However, it is important to recognise that retailers have diverse needs depending on their relative size, risk tolerance, customer base and market strategy.

In considering the ways to support smaller retailers in the market, it is important to recognise the diversity of needs of non-vertically integrated retailers. For example, just under 40 per cent of authorised retailers in the market have less than 2000 residential customers.[16] For these retailers, access to more bespoke OTC contracts such as load-following hedges, may be the most optimal contract type.

However, the needs of retailers with between 20,000 and 150,000 customers, who may not be vertically integrated and need derivatives priced competitively to compete with larger retailers, are likely to be different. As such, the consideration for barriers and access to derivatives

[16] AEMC analysis based on AER Retail energy market performance update for Quarter 2 2024-25 and Essential Services Commission Victoria, Energy market dashboard

should account for the relative size and needs of the retailer. A one-size-fits-all contracting approach could entrench existing positions rather than facilitate improved retail competition.

Similarly, when considering changes to prudential working capital requirements, it is important to understand the relative risks and benefits for retailers of different sizes. Adjusting the requirements for a very small retailer could be beneficial for entry into the market. These retailers may also have a higher risk of failure but a lower impact on market stability. Any changes should consider the risk to market stability and be balanced with equity considerations.

Question 20 – Would reforms to AEMO prudential working capital requirements assist in reducing barriers to participation for small retailers?

The impact of prudential requirements for small retailers is discussed in question 19.

Question 21 – Additional feedback on recommendation 6 that Energy Ministers should establish an always-on market making obligation in the NEL?

We support the introduction of mandatory market making arrangements to improve liquidity and price discovery in forward markets and facilitate retail competition.

Overall, the Commission strongly believes that a liquid and dynamic contract market is a fundamental pillar to the efficient operation of the electricity market. A liquid and transparent forward market enables a competitive retail market, supporting new retailers' entry and growth. This, in turn, leads to better outcomes for consumers. As the generation mix changes over time, including the continued rapid update of CER, this will inevitably impact the supply of contracts available to the market, with possible implications for liquidity.

The Commission explored the potential introduction of market-making arrangements in the NEM in the 2019 rule change and decided not to introduce it at that time.[17] This was, amongst other reasons, because the ASX and RRO/MLO schemes had recently been introduced and were expected to improve liquidity, especially in South Australia. We considered that there would likely not have been value in duplicating the function of these schemes. However, since the 2019 rule change and the introduction of these schemes:

- liquidity in ASX-traded contracts in South Australia has not meaningfully improved
- the ASX voluntary market-making scheme has had a limited impact on the market.[18]

Whilst market-making may not wholly solve contract market liquidity problems, replacing both the ASX voluntary market-making and MLO with a single, encompassing arrangement could provide a more reliable, efficient and nationally consistent approach to the issue. An enduring, mandatory market-making scheme has the potential to provide better price transparency and support smaller retailers entering the market. Increasing the trading intervals through an always-on design could further support the desired outcomes from the arrangements.

The market-making scheme should retain some potential to evolve over time to meet the market's needs. This could involve adjusting the scheme's coverage of contracts or the requirements to offer contracts. Both these elements will need to account for the market's needs and should be led by industry under AER supervision.

Question 22 – What information do market participants need to ensure efficient price discovery, and over what time frames is this information needed?

We have no comments on this question. We consider that market participants and financial institutions are best placed to answer.

[17] More details are available on the *Market making arrangements in the NEM* rule project page.
[18] AEMC, Review of the Retailer Reliability Obligation – Final Report, 29 February 2024, p. 34.

Question 23 – What could be done to facilitate more accurate information being provided?

We have no comments on this question. We consider that market participants and financial institutions are best placed to answer.

Question 24 – Additional feedback on recommendation 7 to ensure that sufficient market information is available to support longer-term derivatives market liquidity and price discovery?

We support efforts to enhance longer-term liquidity and support price discovery, with possible options being considered on their respective merits.

The Expert Panel has suggested that the AEMC consider a rule change to extend the MT PASA generation availability projections arrangements from three to five years and make them public. If submitted, the proposal must consider a range of factors, including:

- The relative benefit of extending the MT PASA generation availability projections – including the additionality it could provide over the 10-year ESOO projection.
- The relative accuracy of outage plans for generators and TNSPs for the next five years.[19]
- As the generation in the NEM becomes more weather dependent, the plant outages are less significant than the availability of the actual variable resource (wind or solar).
- The practicalities of running the MT PASA model over a five-year period.

We have not considered how this would work in practice with the current notice of closure requirements.

3.3 Theme 3 – Unlocking long-term investment in new energy services

Question 25 – Are bulking, shaping and firming appropriately defined?

We generally agree with the Panel's characterisation of the three services the market requires. The market's needs, however, may evolve over time. Thus, the ESEM should incorporate some flexibility in the definitions of these services.

In implementing the ESEM, the principles that guide the definitions of these services should be prescribed in the NEL, with further details in the NER. This allows for the definitions of these services and the technologies that provide them to adapt in response to changing needs.

The ESEM's focus should be on bulk renewables and firming investment with centralised underwriting of shaping only seeking to fill gaps that the market would not otherwise deliver. As the Expert Panel has identified, the spot market provides a strong signal for shifting load and generation, as well as arbitrage opportunities for short-term storage. By identifying shaping as a necessary service but only using the ESEM to procure bulk VRE and firming services, this reduces scheme complexity to accommodate projects that provide multiple services.

Question 26 – How could single projects provide multiple services without undue scheme complexity?

It is critical that proponents be able to provide multiple services simultaneously to ensure the ESEM delivers on its objectives. By relying on financial contracts, proponents should be expected to bear the risk of non-delivery of shaping or cap services. Relying on REGO CfDs to underwrite bulk renewable energy would greatly simplify this process by ensuring that energy is not double-counted. For example, a hybrid unit could provide both bulk renewables and shaping

[19] In its submission to the 2020 AEMC rule change, AEMO noted that they observed that "the frequency which outages are submitted reduces beyond the first year, and that presumably this would further reduce for any subsequent period. Furthermore, generators very frequently shifted as they get closer, particularly in response to changes in the timing of planned transmission outages."

and be awarded REGOs for its renewable outputs irrespective of when it is dispatched, thereby optimising to maximise net market benefits.

Question 27 – How can the ESEM provide a technology-neutral level playing field to encourage maximum competition to provide services?

As noted in Chapter 2, we consider that the most technology-neutral, transparent and competitive approach is to combine a REGO CfD with a renewable portfolio standard embedded in the NEL and NER. It would:

- Apply equally to all zero-emission technologies capable of producing eligible energy without the need for centralised administration. Trading of certificates would inherently ensure that the optimal capacity mix is delivered by providing transparent price signals and resolving the underlying entry-before-exit, tenor gap and revenue insufficiency problems.
- Apply equally to all zero-emission technologies irrespective of whether they participate in the ESEM, minimising the need for government intervention. The renewable portfolio standard ensures that all eligible units receive a subsidy, avoiding the risk of crowding out private investment or distorting the market.

The enhanced renewable portfolio standard could be embedded in the NEL and NER, with targets regularly set by the Reliability Panel or the AEMC in line with jurisdictional emissions reduction targets. Such an approach would promote transparency, economic efficiency and administrative simplicity.

Critically, although the proposed firm swaps could enhance retail competition, they should not undermine independent developers' ability to compete by making support contingent on accepting undue risks over the contract's duration. We are concerned that such contracts may improve the access of retailers to firm contracts, but it would come at the cost of reducing competition in the delivery of new renewable capacity. Instead, as explored in section 2.1.1, retail market competition can be expected to continue evolving in response to increasing uptake of CER, increasing VRE deployment and changes to financial markets.

The proposed approaches to procuring virtual tolling agreements or cap contracts could be operated in a technologically agnostic manner and are already widely used.

Question 28 – How might an approach to support the later years of a project's life be tailored to address the varied dynamics across the three services (bulk energy, shaping, firming)?

We agree with the Panel that there is a misalignment between the long-term investment horizons of developers and the short-term contracting preferences of market customers – the 'tenor gap'. Market customers have an incentive to manage risk for three or four years, but beyond that, are too unsure of their commercial and industrial load, to enter into contracts.

Targeting the later years of a project's life, warehousing contracts, and selling them to retailers and market participants is a good approach to addressing the tenor gap while retaining market incentives, provided that the services are well-designed and contracts fit-for-purpose.

Each of these services has different technology classes that are well placed to provide them. Furthermore, the needs of retailers and market customers for each of these services will also vary. This means that the time frames the ESEM should target to address the tenor gap may vary for each of the core services it procures. Flexibility to adapt to market conditions and the needs of participants and investors should be built into the design of the mechanism.

As noted in section 2.1.1 above, we consider that the Panel should seek further guidance from firming developers on the ideal length of contract they would be comfortable entering into. Unlike renewables, firming gas-powered generators have input costs that are subject to volatile

market forces, and they could be unable to lock in long-term price certainty.

While this approach effectively addresses the tenor gap, the ESEM does not directly mitigate the revenue insufficiency problem that new projects face. Including a renewable portfolio standard provides additional revenue support to bulk VRE investment. The portfolio standard also ensures that while the ESEM addresses the tenor gap through underwriting REGOs for the latter years of a project's life, generators receive additional support throughout the project.

Question 29 – For each service, what is the appropriate indicative timeframe for support (e.g. year 8 through 15)?

The design of the ESEM should be flexible to adapt to the needs of investors and market participants. Although the design of the ESEM could prescribe the length of contracts and minimum requirements, we consider it may be simpler and more effective to allow prospective projects to propose their own contract length through the tender process. This is administratively simple and allows projects to reflect their own requirements for financing.

It is important for successful projects to be in-market for a sufficiently long period before they receive ESEM support, to ensure that the services have value to the market and have incentives to make good locational decisions. However, the contracting incentives for retailers and market participants, which may change in the future, should determine the contract period. The design of the mechanism should be able to accommodate this flexibility.

Question 30 – What governance and processes should be established to determine the quantity and timing of each service procured through the ESEM?

Insufficient investment in new capacity creates reliability issues, while excess procurement represents costs to consumers above their willingness to pay for a reliable electricity supply. Any process that determines procurement quantities should leverage existing processes, balance the costs and benefits of additional supply, and maintain a degree of flexibility to ensure that targets promote the achievement of the NEO.

Under the contract type we recommend, jurisdictional targets should determine the quantity of procurement for bulk VRE. The value of the CfD is protected by retailers' obligations to purchase REGOs based on the Reliability Panel's translation of emissions reduction targets.

Under this transparent and market-based approach, risks to the SFV of over procurement are limited, as compared with other contract types, as the level of intervention and distortion is minimised. Furthermore, this contract type targets the additional revenue required to meet emissions targets, while retaining price and volume risk requires new entrants to manage their own risks. Since the value of REGOs is protected by jurisdictional targets, these too should form the basis of the quantity of procurement for the ESEM.

The Reliability Panel currently operationalises the reliability framework to determine the reliability standard and market settings. In this capacity, it is therefore well placed to determine the procurement target for firming contracts that the NEM requires based on consumer willingness to pay. We consider that ASL is well placed to co-optimise firming and bulk VRE procurement to operationalise jurisdictional targets into procurement quantities, taking into account that both REGO CfDs and long-dated caps retain incentives for market participants to enter outside the ESEM framework if they so choose.

As stated above, the AEMC considers investment in bulk renewables and firming to be the priority. Support for shaping services should focus on gaps that the market is not independently delivering.

Box 1 provides some initial observations on how procurement targets could be set, based on our understanding of how the ESEM will provide medium- long-term support for investments made in the shorter-term for bulk, firming and shaping schemes.

Box 1: What factors could influence the optimal level of procurement in ESEM service?

This box provides some initial thoughts on how the framework for determining procurement quantities could be determined. Overall, the ideal Governance arrangements will be dictated by the exact design of ESEM contracts for each service procured and recycled, and the amount of flexibility retained in the setting of procurement targets. To illustrate, if the ESEM financial vehicle retained flexibility around what type of contract was procured for each service (e.g. if this flexibility was needed to reflect the changing nature of the market or technology), or if there was scope for the financial vehicle to transform contracts when they are recycled into the contract market, this would place more importance on independent oversight or decision-making on behalf of the scheme operator.

Shorter-term reliability and investment trends should influence ESEM procurement targets

Although the costs (or revenues) for consumers associated with ESEM contracts are realised when they are recycled into the market, the underlying need for procurement should be driven by shorter-term needs. This is a key benefit of the ESEM design, which requires any service earning an ESEM contract to stand without support over the first few years of the project. This promotes confidence that investments will be made in the right place and at the right time.

This means that the focus of setting targets for procurement could be focused on shorter-term trends, given the long-term outlook for the sector is for an increase in electricity demand as households and businesses electrify. Focusing on near-term reliability and supply gaps, recent trends in new connections and investment, compared to the current value that customers place on reliability, could help inform the combination of bulk, shaping and firming service targets.

Retaining some flexibility in the amount of services procured in each auction round can promote competitive tension

Maintaining some flexibility in the amount that is procured in each auction round would be valuable, provided that it does not affect investor willingness to bid strongly in any individual auction round.

First, the ESEM financial vehicle should have the ability to accept more bids in an auction round where there is a particularly strong pool of tenders, relative to rounds that have less competitive tension. This would ultimately lead to lower costs for consumers.

Second, there will likely be value in co-optimising the level of bulk, shaping and firming services. For example, bulk and shaping services may currently be complements, whereas shaping and firming services may be partial substitutes, and these relationships may change over time. Optimising for the combination of the three services needed by consumers should also lead to lower consumer costs.

Ensuring out-of-ESEM investment would help determine the value of bids

Because ESEM procurement costs are borne in 8-15 years in the future, and there isn't a forward curve for these services, it is difficult to forecast the expected cost (or avoided cost) borne by consumers in accepting a bid.

While the exact bidding behaviour of proponents will be affected by the specific design of the procurement auction (or alternative procurement approach), ensuring that there is entry outside of the ESEM mechanism can also help the ESEM operate more smoothly.

If there is entry outside of the ESEM mechanism, the marginal (or lowest) ESEM bidder would potentially be indifferent between receiving an ESEM contract, and contracting in-market

over the period. This potentially helps the scheme operator project the expected cost or benefit for consumers for different levels of procurement.

Consider modelling external benefits and costs

As noted earlier, we agree that the ESEM should consider any broader contribution of a potential service to Essential System Security needs. At the same time, while access rights for some projects may be coordinated through jurisdictional REZ schemes, this may not be the case for all projects. For these projects, there may also be a case to consider the impact of a new project on the access of incumbent generators, when assessing bids.

There is an inverse relationship between ESEM costs paid by consumers when contracts are recycled and the realised future value of the service

Current demand is the 'impactor' that determines the need to procure bulk, shaping and firming services procured today: e.g. how peaky and inflexible your load is today determines the need for ESEM shaping and firming services.

However, the demand patterns in 8-15 years' may not be an appropriate basis to recover the actual costs ultimately borne (or revenues earnt) from the ESEM, which could change quite materially in the intervening period.

Consider the following example. The ESEM writes a firming contract, striking cap contracts at a price of $30. But in the intervening period, demand becomes a lot more flexible, and the value of caps when the ESEM recycles the contracts is $5.

This $25 needs to be borne by the future customer base. Forcing the consumers who have peakier demand in the future to bear a greater share of these costs is counterintuitive. The costs of the ESEM are higher precisely because the value of the service is lower when the contracts are recycled. Conversely, asking the consumers who value the service the least to bear more of the costs also has drawbacks, because it erodes the value of having more flexible demand.

Question 31 – As per Recommendation 6B, which set of contracts would be useful for supporting the entry of new providers of bulk energy, shaping and firming through the ESEM and useful to manage spot price risk through derivative markets?

As outlined in section 2, we support a simple, flexible and transparent approach that evolves over time and relies on well-understood and established derivatives products. We also support the proposed regular convening of market participants, market bodies, and developers under the guidance of the AER to develop new and innovative contracts.

The long-term interests of consumers are best served through ESEM procurement of:

- for **bulk renewables** – REGO CfDs combined with an extended renewable portfolio standard (embedded in the NEL/NER with targets set by the Reliability Panel or the AEMC)
- for **shaping** – virtual tolling agreements (noting that we consider procurement of shaping services to be a lower priority)
- for **firming** – long-term cap contracts.

Details on our assessment approach and findings are available in Section 2 and Appendix A.

Question 32 – Should any contracts be structured as options?

We consider that there is little merit in opting for an option-style contract for bulk renewables, as it would inherently make the contracts less valuable for market customers and complicate contract recycling. **Cap contracts are already options**. Providing VRE capacity with put options on REGOs serves a similar function to underwriting through CfDs. This similarly:

- targets the additional revenue needed to meet emissions reduction targets

- supports financeability and brings down the cost of capital for new projects, and
- preserving spot signals and flexibility in how projects contract their supply.

Critically, the warehousing and recycling of REGO CfDs depends on whether liquid derivative markets for REGOs are likely to emerge. We consider this possible under an enhanced renewable portfolio standard.

We do not consider an option-style approach appropriate for firming capacity is appropriate. Cap markets are well-established and liquid markets in the NEM and already options contracts. We have not yet seen derivative markets for caps emerge, and there is no reason to think that these should appear in a high-VRE market.

Question 33 – How could Snowy Hydro's capacity be used to kickstart the ESEM contract recycling platform and benefit the NEM overall?

The costs and benefits of using Snowy Hydro's capacity to kickstart contract recycling under the ESEM depend on its specific design. Therefore, we have not provided a clear preference at this stage.

In our view, the Expert Panel should consider and assess the potential impacts of this proposal on competition, which could include:

- Ensure sufficient liquidity in the existing contract markets so that this proposal would not create a transitory reduction in liquidity that disrupts retail competition.
- Ensure and maintain competitive neutrality, which states and territories have a key role in promoting. That is, if Snowy Hydro were to kickstart contract recycling, how would these arrangements ensure that publicly and privately owned businesses competing in a market do so on a level playing field?

Question 34 – How can risks be managed?

The most effective approach to managing risks is to rely on established, well-understood and transparent mechanisms to incentivise new capacity and minimise the level of government intervention. As such, we are advocating for a light-touch approach that represents an enhanced renewable portfolio standard and procurement of long-term and well-understood cap contracts.

Over time and as market needs and understanding evolve, the ESEM could expand procurement to more innovative products. However, we are concerned that relying on untested contract types at inception could have unintended consequences, increase risks, crowd out private investment, risk the delivery of critically needed investment and expose customers to significant costs.

Question 35 – How should energy ministers allocate roles and responsibilities for ESEM implementation and administration?

We can implement the ESEM and deliver material improvements for consumers by leveraging and tweaking existing market bodies and frameworks:

- The AEMC can revise the rules as required under the existing rule change process.
- AEMO should continue being responsible for making forecasts and projections, such as the Integrated System Plan (ISP) and the Electricity Statement of Opportunities (ESOO).
- The AER should be responsible for regulatory oversight, determination of contract types and management of the MMO.
- The Reliability Panel should:
    - continue determining the optimal reliability standard based on the value of customer reliability (VCR) under the existing RSSR process
    - provide advice to jurisdictions on the costs of procuring strategic reserves

    - set annual targets for the renewable portfolio standard.
- AusEnergy Services Limited (ASL, formerly AEMO Services Limited) could be responsible for determining optimised procurement targets to meet the reliability standard and running the ESEM tender process.
- Jurisdictional governments should be responsible for directing procurement quantities for the out-of-market strategic reserve based on advice from the Reliability Panel, given that the costs would inherently be above what customers value according to the VCR.
- A scheme financial vehicle (SFV) could be established to warehouse and recycle contracts.

Question 36 – How should any residual ESEM costs or rebates from the closing out of contracts be allocated to consumers?

Ideally, the costs (or rebates) of the ESEM would be borne in proportion to the need for the service to be procured (causer pays). However, there is an inverse relationship between the costs passed through to consumers and the future value of the service.

The way that consumers consume electricity should influence the investment choices made today, and the services tendered through the ESEM. For example, a peaky and inflexible load would contribute to the need for shaping or firming services. The investments providing these services will earn future revenues through the ESEM, the net costs (or cost savings) relative to future value of the service being passed through to consumers.

It may not be appropriate to use demand profiles in the future, when contracts reach delivery, to recover the actual costs borne (or revenues earned), which could change quite materially in the intervening period. Consider the following example. The ESEM writes a firming contract, agreeing to a cap contract with a price of $30 in 10 years' time. But in the intervening period, demand becomes a lot more flexible, and the value of caps when the ESEM recycles the contracts is $5. The difference – $25 – needs to be borne by the future customer base. Forcing the consumers who have peakier demand in the future to bear a greater share of these costs is counterintuitive. The costs of the ESEM are higher precisely because the value of the service is lower. But conversely, asking the consumers who value the service the least to bear more of the costs also has drawbacks, because it erodes the value of demand-response.

Question 37 – Will a model that procures ESS alongside bulk zero-emissions energy, shaping, and firming support additional ESS provision in a cost-efficient manner?

We support the Panel's recommendation that the ESEM coordinate the procurement of security services and reliability, in coordination with existing frameworks, when opportunities arise at low incremental costs.

Given the low incremental costs of investing in clutches for GPGs to enable them to operate in synchronous condenser mode or grid-forming capabilities for BESS, co-optimising procurement through the proposed ESEM warrants further consideration to avoid duplication of investment.

When undertaking the optimisation and to avoid paying for the same service twice, the ESEM would have to carefully consider additionality and the base case without intervention.[20]

We consider that there would likely be material efficiencies in extending the ESEM coordination to include AEMO-led procurement of security services

The ESEM could support the provision of new SRAS capability that AEMO advises will be required to account for the expected retirement of existing black start-capable generation.[21]

[20] For example, ElectraNet concluded in its system strength project assessment draft report (p.3) that the incremental cost of adding clutches to GPGs is prudent and efficient. Similarly, our understanding is that most utility-scale batteries under construction will be grid-forming and capable of self-remediating any system strength impact.
[21] AEMO has recently published its system restart technical advice to support the Reliability Panel's review of the system restart standard. More details are available on the *Review of the System Restart Standard* project page.

This support could be in the form of targeted co-investment in SRAS capability or minimum performance requirements to support system restoration.

Any procurement under the ESEM would have to maintain the incentive for networks to minimise costs and for market participants to efficiently make use of the services

System security frameworks under the rules have multiple safeguards to ensure that:

- networks seek the most cost-effective portfolio of network and non-network solutions
- market participants are incentivised to invest in equipment or operate in such a way as to efficiently utilise network services.

Responsibilities for the identification, procurement and delivery of security services in the NEM are split between AEMO and the relevant network companies (or jurisdictional planners). Any procurement under the ESEM should leverage existing cost recovery arrangements that are carefully designed to maintain incentives for efficient plant operation and investment.

The existing system security frameworks will continue to do the heavy lifting by delivering most system services needed to securely replace thermal generation

We expect that the existing system strength and inertia frameworks will continue to deliver most of the new system service provision, with the ESEM optimising for incremental and no-regrets investments.

Question 38 – Are there any other alternative approaches that would support cost efficient provision of ESS through the ESEM?

The coordination of system security and reliability through the ESEM can be accomplished either through technical eligibility standards or financing incremental investment. However, given that existing frameworks will contribute most new investment, we continue to collaborate with AEMO to identify and implement any improvements to promote efficient investment.

There are two main ways this could be accomplished (both of which have merit):

- **Technical eligibility standards** could require contracted units to provide security services, or have the capability of doing so, as a prerequisite for participation (for example, grid-forming inverters on batteries or black-start capabilities for GPG).
- **Valuing, financing and rewarding incremental investments** in individual plant through the ESEM could ensure they have the capability to provide security services at low overall cost.

We are closely collaborating with AEMO to explore potential refinements to the procurement frameworks to streamline investment and promote timely delivery

We have an ongoing system security work program, which includes continued collaboration with AEMO and the AER to explore potential refinements to the security frameworks to ensure enough system security services are provided to keep the system secure through the transition.

Question 39 – How could the ESEM help to keep the NEM competitive?

We agree with the Expert Panel that the ESEM tendering approach for shaping and firming should consider competition as part of the assessment. However, for bulk renewables relying on a renewable portfolio standard that provides a universal, transparent and technologically neutral subsidy, most effectively promotes competition in the delivery of new capacity.

As noted in the answer to question 27 above, although the proposed firm swaps could enhance retail competition, they may risk undermining independent developers' ability to compete by forcing them to shoulder undue and unmanageable risks over the contract's duration.

Question 40 – How could a new, longer-term strategic reserves service be established in the NEM?

The Reliability Panel could advise jurisdictions on the nature of forthcoming reliability risk and the costs associated with mitigating said risk. The costs associated with reducing unserved energy by technology type are a central input into the reliability framework, and thus, the Reliability Panel is well placed to provide this advice.

In addition to the role of the Reliability Panel providing advice on the reliability risk and costs, the following points should be considered if designing a jurisdictional strategic reserve:

- The circumstances under which strategic reserves enter the market and are utilised must be explicit, clear and limited to the purpose for which they were procured. Having a clear set of riding instructions will help build confidence for those seeking to invest in generation that will operate in the market
- AEMO should be responsible for dispatch decisions around assets in the jurisdictional reserve. AEMO would be best placed for these decisions as they could balance the use of these reserves in conjunction with other reserves such as RERT.
- Reserve quantities will need to balance the broader impact on private investment. Over procurement of capacity places downward pressure on wholesale prices, thus crowding out private investment and increasing reliance on centralised procurement. This risks the efficacy of the investment signal provided by the market and increases the risk of inefficient entry.
- Jurisdictional governments should ultimately decide on the quantities of out-of-market reserves procured for their respective jurisdictions based on the advice of the panel.

We consider that these risks can be managed if the trigger for the entry of strategic reserves is limited to managing high impact, low probability events, which are rare in the market and thus not best managed by the market price settings.

Question 41 – Additional feedback on recommendation 8 that Energy Ministers establish an ESEM within the NEL to facilitate investment in the NEM?

Overall, we support the establishment of an ESEM in the NEL to facilitate investment in the NEM. To be effective, it is critical that it evolves over time as customer and market needs continue to change. As such, we consider that the references in the NEL should be principles-based, with the detailed implementation left to the rules or guidelines.

We look forward to continuing to work with the Expert Panel and the secretariat to ensure that the implementation approach suits the market's needs.

Question 42 – How could government support schemes recycle energy, shaping and firming from existing contracts to support market liquidity?

We agree that it is important for any Government support for new investment in generation and storage to not 'crowd out' liquidity in derivatives markets. One way this can be preserved is by recycling contracts, whereby the Government – directly or through an SPV – acts as a counterparty to both sides of the market separately. But there are other ways to achieve this, including an enhanced and extended renewable portfolio standard, which uses established, well-understood and transparent mechanisms.

We understand that, under the LTESA contracts, the Consumer Trustee has the notional ability to recycle contracts. In practice, however, it would likely be difficult to exercise this ability in a way that materially supports market liquidity. This is because the contracts under the LTESA are structured as options that can be exercised by the generator at any point before expiry of the option, for that year of support. Consequently, even if an option was exercised, this would

only be done so close to the expiry date, and so it would likely be impractical for the Trustee to sell the contracts forward to the market in a way that supports liquidity. Moreover, the option structure raises the question as to what the value would be for any potential offtaker.

Question 43 – How satisfied are market participants with settlement residue auctions as a financial risk management tool?

In the *Inter-regional settlement residue arrangements for transmission loops* directions paper, we indicated our intent to review interconnector hedging arrangements.[22] We remain concerned that the settlement residue auction (SRA) framework is not working as effectively as it could in the long-term interests of consumers and consider that a review could identify potential improvements for both radial interconnectors and transmission loops.

Given that the NEM uses regional pricing, it is critical for participants to be able to manage the risks of price separation, such as through hedging instruments like Settlement Residue Distribution (SRD) units. However, we remain concerned that the current SRA framework is not working as effectively as it could in the long-term interests of consumers, as:

- Market participants who use SRD units to hedge interregional price risk have told us that SRDUs are not 'firm' – reducing the value they place on these as a hedging instrument, and discouraging interregional trade.
- Significant direct costs accrue to consumers, because negative IRSR is allocated directly to consumers unhedged, and SRD units have historically been sold 'at a loss' for consumers, with a gap allocated to consumers and the payouts received by unit holders.
- Current arrangements expose Transmission Networks to increased cashflow risk.

As proposed in the *Inter-regional settlement residue arrangements for transmission loops* directions paper, an AEMC-led review could examine issues including:

- reviewing the allocation of all negative IRSR
- re-examining the allocation method for SRA proceeds and unsold SRD units
- considering the role of the SRA, SRD units and other financial instruments in the future
- issues raised by this review, as discussed in question 44 below.

Question 44 – Are other options for providing longer term contracting opportunities across interconnectors worth considering?

Options to promote longer-term contracting across regions are worth exploring in conjunction with reforms to existing interconnector hedging arrangements.

The AEMC review referred to in question 43 could investigate whether 'tranches' of interregional SRD units should be auctioned beyond three years, to support longer forward curves. With that said, our initial analysis suggests that the SRD units currently auctioned two or three years in advance may contain limited forward-looking information, because:

- there has been a consistent term premium for SRD units, in that the prices in earlier auction periods tend to be lower (on average) than the prices realised in the later auction periods, consistent with a higher level of uncertainty faced by the purchasers of these units
- earlier auction results tend to show a very wide range of price outcomes.

This suggests that a longer period for auctions, without reforms to existing market arrangements, may not provide much further information to the market, nor represent value for consumers.

[22] More details are available on the *Inter-regional settlement residue arrangements for transmission loops* project page.

Question 45 – Additional feedback on recommendation 9 that Governments and Market Bodies should pursue a coordinated suite of reforms to ensure regulatory settings, the innovation ecosystem, and existing policies and programs are aligned with the ESEM.

The Commission is prepared to undertake reviews and rule changes to support the effective implementation of the NEM review final recommendations in accordance with our obligations under the NEL to promote to long-term achievement of the NEO.

The Commission agrees with recommendation 9E that energy ministers should look to phase out the Retail Reliability Obligation. However, it will take some time before energy ministers have certainty that the ESEM and MMO are working effectively and therefore consider phasing out the RRO. This will not address the current regulatory burden the RRO is placing on participants. The Commission has recently made twelve final recommendations to improve the operation of the RRO, enabling the RRO to better support reliability as the NEM transitions and with reduced regulatory burden and cost for consumers.

Because much of the RRO is implemented through the National Electricity Law (NEL), most of our proposed recommendations require legislative amendments that need to be approved by Energy Ministers and passed through the South Australian Parliament.

3.4 Theme 4 – Ensuring consumers benefit

Question 46 – Additional feedback on observations made in theme 4.

We do not have any additional feedback and consider the observations consistent with the findings, to date, from our *Pricing Review*.[23]

[23] More details are available on the *Pricing Review: Electricity pricing for a consumer-driven future* project page.

Abbreviations

Abbreviation	Terminology
ACCC	Australian Competition and Consumer Commission
AEMC	Australian Energy Market Commission
AER	Australian Energy Regulator
AEMO	Australian Energy Market Operator
APC	Administered price cap
CER	Consumer energy resources
CfD	Contract for difference
CIS	Capacity Investment Scheme
CPT	Cumulative price threshold
DER	Distributed energy resources
DSO	Distributed
ECMC	Energy and Climate Change Ministerial Council
ESEM	Energy Services Entry Mechanism
ESOO	Electricity Statement of Opportunities
ESS	Essential system services
FCAS	Frequency control ancillary services
GPG	Gas powered generations
IBR	Inverter-based resources
ISP	Integrated System Plan
LGC	Large-scale generation certificate
LTESA	Long-Term Energy Service Agreement
MLF	Marginal loss factor
MLO	Market Liquidity Obligation
MPC	Market price cap
NEL	National Electricity Law
NEM	National electricity market
NEO	National electricity objective
NER	National Electricity Rules
OTC	Over-the-counter
Panel	Expert Panel for the wholesale market review
PFR	Primary frequency response
PPA	Power Purchase Agreement

REGO	Renewable Energy Guarantee of Origin
RET	Renewable Energy Target
REZs	Renewable Energy Zones
RRO	Retailer Reliability Obligation
RRP	Regional Reference Price
SFV	Scheme financial vehicle
SRA	Settlement residue auction
TNSP	Transmission Network Service Provider
VRE	Variable renewable energy
VPP	Virtual power plant
WDRM	Wholesale Demand Response Mechanism

A. How we arrived at our recommendations

As part of this process, we have investigated the suitability of different contract types for underwriting investment in bulk VRE capacity. We have focused our consideration on the contract types the Expert Panel identified in their draft report. We also included consideration of an additional contract type that is similar to those the panel proposed.

We also engaged NERA to model the cash flows associated with swap-style contracts under future market conditions, and the financial risks these contracts impose on new projects.

This section provides an overview of:

- Section A.1 – the contract types we considered for bulk renewable energy.
- Section A.2 – how we assessed each contract option.
- Section A.3 – our assessment of the contract options.
- Section A.4 – NERA's analysis of contract options.

A.1 Contract types we considered

As part of this process, we have investigated the suitability of different contract types for underwriting investment in bulk VRE capacity. We have focused our consideration on the contract types the Expert Panel identified in their draft report. We also included consideration of an additional contract type that is similar to those the Panel proposed.

We also engaged NERA to model the cash flows associated with swap-style contracts under future market conditions, and the financial risks these contracts therefore impose on new projects. These are discussed further in section A.4

Options provided by the Expert Panel

Time block swap

This option is a fixed volume and price swap. Different time blocks in the day have different prices and contract volumes, reflecting expected spot prices, the support VRE needs, and expect generation profiles for wind and solar. If the generator overperforms vs its contracted volume, it receives additional revenue. If a generator underperforms, however, it is exposed to wholesale prices up to the MPC for the amount of their generation shortfall.

Power purchase agreement (PPA)

Under this option, VRE generators receive a fixed long-term price for their generation regardless of the quantity or the timing of their output.

Generation independent contracts for difference (index CfDs)

This works in much the same way as a time-block swap. Generators swap spot prices for the strike price of the contract at a volume determined by a reference generation profile. Generators receive additional revenue for overperforming against this profile but are exposed to spot prices for underperformance.

Renewable guarantee of origin (REGO) CfD w/ renewable portfolio standard

Under this option, renewable generators receive REGOs for generating, which retailers are required to buy. The scheme financial vehicle signs a CfD with the generator for the value of the REGO.

Additional contracts we considered

Swap with firming contracts

Under this option, VRE projects sell a fixed price and volume swap. Projects manage their

volume risk by signing a firming contract with some firming entity. This firming contract caps the price exposure faced by the VRE project during underperformance against the contracted volume. The premium of this firming contract is baked into the strike price of the swap. If the VRE generator can buy long-term firming contracts, this option operates for them in much the same way as a PPA, with similar pros and cons.

A.2 How we assessed each option

We have framed our assessment of each of the proposed contract types using six criteria. These reflect the intention of the ESEM and the inherent features of the future high-VRE market that ESEM contracts should complement. They focus on delivering investment and ensuring consumers benefit from the efficient operation of the market. Our assessment of each option against these criteria is provided in section A.3.

Assessment criteria

We have assessed the contract options for bulk VRE against six key questions.

1. Does it efficiently allocate risk and uncertainty? Does it ensure the right mix of generation is built where and when it is needed?
    - Are the financial, spot market risks and other risks placed with the party most able to manage them?
2. Does it align with the market's needs? Does it fix the 'tenor' issue?
    - Does this contract type help ensure the right quantities and types of generation and storage assets enter the market? Does it provide an investment signal? Is the mechanism flexible to the changing needs of the market?
3. Is it financeable?
    - Does this contract type help ensure that new projects the market needs can receive financing? Are the risks bearable and predictable?
4. How easily can these contracts be recycled? Does the proposal encourage or stymie innovation?
    - Does this contract type align with the risk management needs of market participants and retailers?
5. Are there other associated benefits?
    - For example, do they build on existing markets? Does it provide flexibility or constrain market participants? Do they naturally insure against over-procurement? Does it deliver the optimal capacity/technology mix? Do they encourage hybrid business models?
6. How administratively complex would it be?
    - Is there a risk that complexity might delay investment? How are procurement levels determined? Is it flexible over time?

A.3 Assessment of bulk VRE contract options against our criteria

	Time block swap / Index CfD	Power purchase agreement (PPA)	REGO CfD w. Renewable Portfolio Standard under the NEL/NER	Swap + firming contract
Is it cost effective? Does it incentivise the right generation mix?	 The contract type **divorces output from spot market signals** and **does not reward uncorrelated output**. It relies on centralised determination of the **optimal capacity mix**.	 The **contract type divorces output from spot price signals** and **requires centralised determination of the optimal capacity mix**. Uncorrelated output can be recognised in PPA pricing.	 **Technologically neutral and universal signal** that **incentivises the most cost-effective** mix of resources and **signals the exit of thermal generation** in line with jurisdictional emissions targets.	 **Risks are the same as time block swap**. This option assumes the risk is managed through firming contracts. This represents an additional cost to be recovered.
Efficient risk allocation? Does it place the risk on those best placed to manage it?	 **Risks are asymmetrically allocated**, with VRE projects bearing undue wholesale market exposure to unpredictable, unmanageable and highly variable risks.	 **PPAs incentivise VRE to maximise bulk renewable output**, though with no temporal signal. VRE retains congestion risk, representing a locational signal.	 **VRE generators retain spot market risk and the flexibility to contract according to market customers' requirements** and generators' capabilities. VRE generators not exposed to undue risks.	 VRE **bears wholesale market risk**, which they manage through firming contracts. Ultimately, dispatchable firming capacity bears the risk, **provided renewables can access long-term firming contracts**.
Does it meet customer needs? Does it solve the tenor gap, and are the contracts valuable for customers?	 The contracts distort operational signals, and the extensive risks would require significant risk premiums to resolve the tenor gap. **However, contracts are valuable for customers.**	 **There is and will be low demand for as-generated PPAs with VRE plants.** Coincident generation means retailers have low spot risk while VRE generates.	 **The market retains flexibility to contract according to capabilities and needs**. This support allows the market to manage its own risk while also placing downward pressure on prices. **The value of the REGO reflects the cost of firming VRE**.	 **Market customers likely value price and volume swaps**. However, in a high-VRE market, low daytime prices and increased CER may mean that customers prefer cap contracts. **This approach may crowd out market customers from cap contracts**.

Is it financeable? How predictable and variable is the exposure?	 VRE generator faces **undue, variable and unpredictable risks** over which they have limited control (access, system security constraints). **Such risks would undoubtedly complicate financing and limit competition** in VRE generation.	 These are **very financeable products that are well understood in the market**. They represent low risks for new generators and **manageable downside risks for financiers**.	 This provides an **improved revenue outlook and a minimum revenue expectation** but provides more targeted underwriting than other options. **Value of certificate inherently reflects risks**.	 This is a **financeable contract type, provided VRE can access firming contracts**. If this option is to underwrite significant portions of the VRE fleet, there may not be sufficient firming capacity in the market.
How easily can the contracts be recycled? How much demand would there be in secondary markets?	 Fixed prices and **volumes are useful for participants**. Reference-profile linked volumes would inherently be highly correlated, **less useful for customers** and **more difficult to recycle**.	 **There is and will be low demand for as-generated PPAs**. The scale of entry and coincidence of output mean these **represent little value for buyers**. The RET has supported most investments.	 An **enhanced renewable portfolio standard means the REGO CfDs can be recycled**, or alternatively, there is low risk in holding these contracts to maturity. Recycling aligns with customers' C&I demand churn and uncertainty.	 This should be recyclable. **Market participants value fixed price and volume or index swaps**. However, in a high-VRE market, they may prefer cap contracts.
Are there any other benefits? Does it encourage innovation? Is it flexible?	 There is **no natural hedge against over-procurement**, and the SFV takes on the risk of overbuilding. This grants, however, **significant control over the capacity mix**.	 There is **no natural hedge against over- or under-procurement** with **limited incentive for VRE to shift their load or firm supply** other than congestion.	 Opportunity for the operator to **offer REGO CfDs for technologies or locations with minimal market distortion**. This also places downwards pressure on prices and provides a signal for coal exit certainty.	 This **allows centralised control over the capacity mix**, including the opportunity to help buttress locational signals**. Costs for the SFV are somewhat predictabl**e, thought the SFV **bears the risk of overbuild**.
How administratively complex is it? How high is the administrative burden? How are targets set? How flexible?	 This is an **administratively complex tender process**. Bespoke reference profiles add complexity.	 Complex contract structures and the need to repackage and recycle tranches of PPAs result in **high ongoing transaction and administrative costs**.	 **Administratively simple and builds on existing frameworks** that are well understood in the market. **The renewable portfolio standard minimises the level of intervention required by organically crowding in investment**.	 The complexity of these contract structures and the introduction of a third party **make this administratively costly**.

A.4 NERA analysis of contract options on behalf of the AEMC

We engaged NERA to analyse the financial outcomes arising from different forms of a time-based swap arrangement. The objective of NERA's analysis is to show that the types of financial exposures that developers could face under different contract designs, and the likelihood that such exposures could complicate project financing.

A.4.1 NERA's modelling leveraged modelling previously undertaken for the AEMC's future of the wholesale market review

For each type of swap contracts, NERA has used the outputs from dispatch modelling performed in 2024 on behalf of the AEMC. Using AEMO's 2024 Draft ISP (the final version of which had not been released at the time the modelling was performed), NERA simulated half-hourly electricity market outcomes (e.g. generator output and prices) in the five NEM regions in three future years. NERA's analysis on financial exposure uses the outputs from July 2046 to June 2047.

In essence, NERA compared the revenues that a generator could earn by selling electricity on the spot market, while also being subject to a swap contract based on a pre-defined profile (which differs across the different types of swap models).

If a generator's output matched the profile of the swap perfectly, its cashflows would exactly equal its output multiplied by the strike price of the swap – some would come from energy market revenues, while the complementary amount would come from the value exchanged under the swap.

However, because a VRE generator cannot generally control when its output takes place, it may be subject to unmitigable exposure to the value of the swap, for example:

- if its actual output is lower than the profiled output when the prices are relatively high, it has a potentially large financial exposure
- conversely, if actual output is higher than the profiled output, prices are likely to be relatively low, and any increased spot market revenue would likely be low.

We can isolate the size of this risk by assuming that the average generator of the technology-region pair can produce exactly as much electricity over a given span (in this case, one month) as is covered by the swap. Thus, if a generator were able to produce electricity exactly according to the profile of the swap contract, the spread would be $0/MWh.

We focus on the average across each pair of technologies (wind or solar) and NEM region to isolate the systematic patterns. In practice, an individual generator's exposure will depend on the extent to which its output aligns with that of the average generator. The more uncorrelated the plant's output, the more likely it is to minimise its exposure.

A.4.2 Wind generation faces particular challenges under the modelled swap contracts due to highly coincident generation, and inverse correlation with spot prices

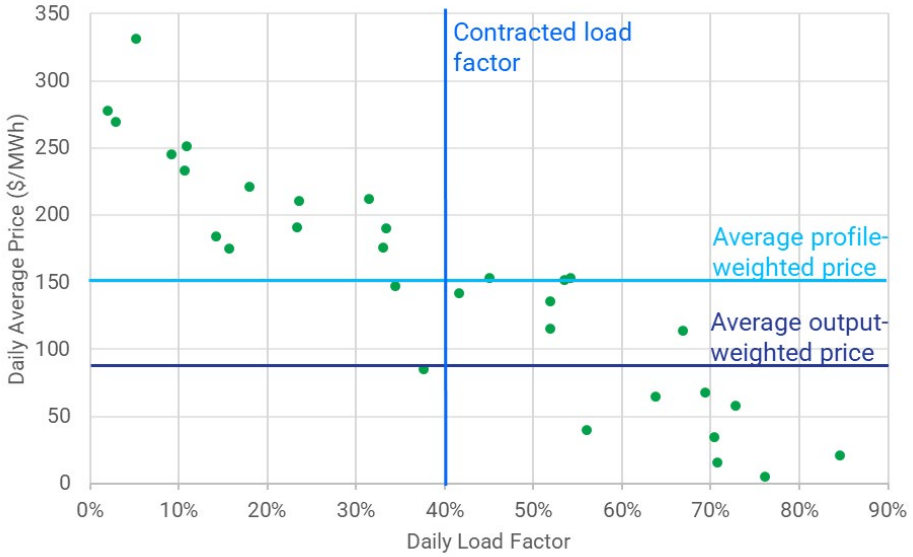
We first focus on a time-based swap, in which the volume of exposure is based on the average output for that technology-region pair in each half-hourly period of the day, over a month. For example, if wind farms in NSW had a load factor of 100% between 04:00 and 04:30 on all even-numbered days of September, and of 0% in all odd-numbered days, the contract would be based on a 50% load factor during the 04:00-04:30 period of September. Each of the 48 settlement periods has its own associated load factor, over the course of the month.

We design the contract in this way to essentially minimise the risk and isolate it to just what is driven by mismatches between the actual production and the average production: both the

contracted volume and the contracted price are based on the modelled energy prices and outputs, but simply averaged across the month rather than taken on an individual half-hourly basis. **It is likely that standardised exchange-traded contracts under the ESEM would be harder for VRE generators to manage, as they would not reflect monthly, resource-specific reference profiles. Instead, production would need to follow a more stable generic profile to meet customer needs and support trading**.

In the figure below, we show the correlation between the profile-weighted average contract price and the daily average load factor, for all 31 days of July 2046, for wind farms in Victoria. The vertical axis represents the average price on each day that wind farms would need to defend against a strike price of $151/MWh (specific for wind farms in Victoria in July 2046), and assuming a contracted load factor of 40%, equal to the average load factor over the month.

Figure 1 – Inverse correlation between average prices and wind load factors (Vic, July 2046)

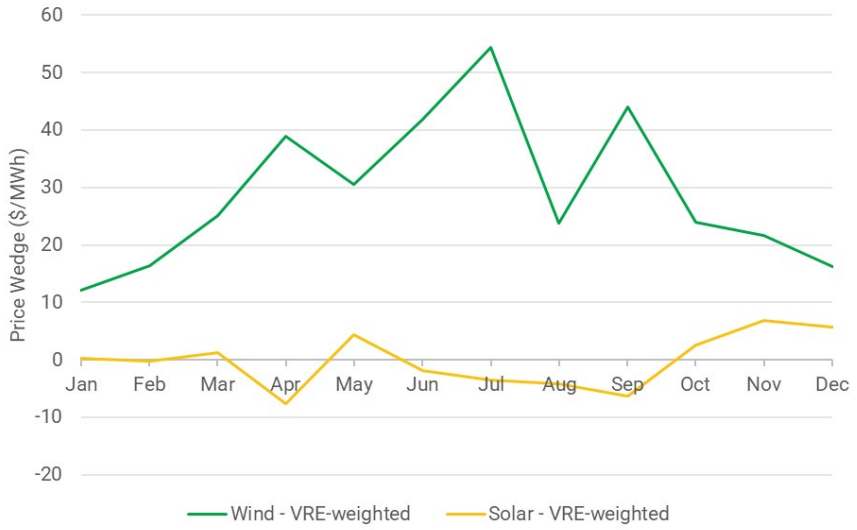


This chart illustrates how, on days when the wind load factor is lower than the monthly average, the price that the operator would need to defend tends to be higher than average, in large part because of the low availability of cheap wind power, which would otherwise dampen prices.

In this particular month, the wedge between the average price received in the wholesale market ($96/MWh, since most output is concentrated during lower-priced periods) and the average price against which the swap is settled is $54/MWh. Put another way, for any given strike price determined under the mechanism, the effective price received by the developer would be $54/MWh lower in this month, due only to the effects of the profiling process.

Below we compare the wedge across all 12 months in Victoria, for both wind and solar.

Figure 2 – Wedge between average price received and price under the swap (Vic, 2046)



Two patterns are visible in the chart above:

- The level of the wedge for wind farms is usually at least $20/MWh, with considerable volatility driven by randomness in market outcomes. For example, the wedge drops from $54/MWh down to $24/MWh and back up to $44/MWh between July and September. Because the wedge represents the difference between the strike price and the effective price received, for any given strike price, the investor could expect to earn $10-55/MWh less in practice. **Given the volatility we see in these numbers, it would be very difficult for an investor to determine a fair strike price that would compensate for this volatility**.
- This is primarily a problem for wind rather than solar, for two reasons
    - First, solar plants follow a much more predictable daily output pattern (i.e. none overnight and peaking in the early afternoon), so the difference between the profiled output and the actual output on any given day differs less (e.g. there is no difference in the nighttime hours).
    - Second, periods of unexpectedly low solar output also correlate somewhat with periods of unexpectedly low demand (e.g. because of reduced cooling demand), so operators are not as exposed to high prices when their output falls below the level assumed by the profile.

A.4.3 Investors would likely require significantly higher strike prices to protect highly variable and sensitive cash flows during periods with very high spot prices

The above analysis is based on prices from relatively normal market conditions. Using the example of July 2046 in Victoria, the analysis is based on a price profile that maxes out at $420/MWh in the most expensive half-hour and averages $150/MWh. In practice, there could be spikes well above that level, for example, due to transient market power during network outages or system security constraints that are largely out of the VRE generator's control.

To test the sensitivity of these outcomes to short-term price volatility, we calculate how the wedge would change if there were a price spike between 5 – 7pm on 13 July. In addition to the **$262m ($15/kW) Victorian wind farms lose over the month of July**, a two-hour price spike to:[24]

- $10,000/MWh – results in an increase in the July wedge from $54/MWh to $77/MWh. This translates to an **additional cost to Victorian wind generators of $108m** (or $6/kW across

[24] The day with the highest average price in that month.

the 17 GW of installed wind in Victoria), all incurred during that two-hour period.

- $20,000/MWh – results in an increase in the July wedge from $54/MWh to $100/MWh. This translates to an **additional cost to Victorian wind generators of $219m** (or $13/kW), all incurred during that single two-hour period.

These effects are strongest in months with larger wedges because there is a bigger difference between the average profile and the actual output. These are the months in which transient exercises of market power are more likely because low wind output could allow remaining thermal generators to exercise market power.

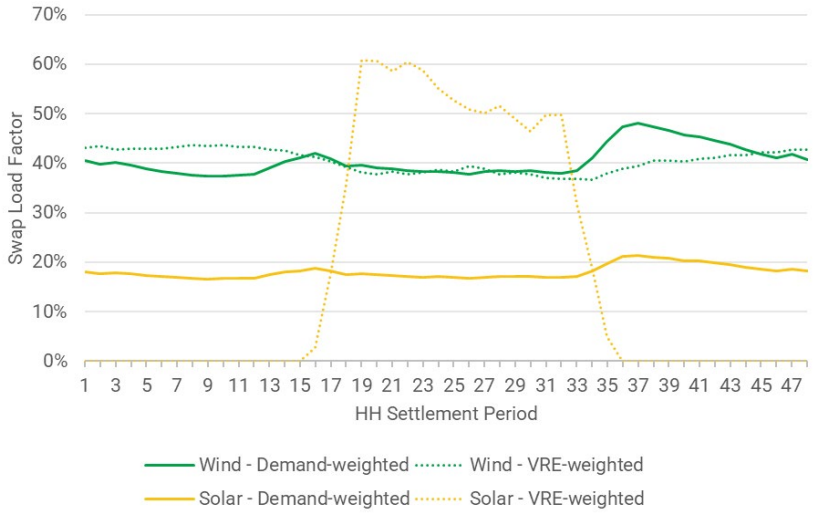
It is impossible to say when and how severe these events would be, either from our perspective today or from the perspective of an investor trying to quantify and mitigate risk decades prior. Any prospective investor or financier would need to have a view on the number, duration, and severity of price spikes. Given the sensitivity of cashflows to these assumptions and the asymmetric risks involved in a worst-case scenario, an investor would likely require a significantly higher strike price to suitably mitigate these risks, or a bank would be unwilling to provide credit.

A.4.4 Demand weighted swaps similarly result in highly variable, unpredictable and undue risks for VRE generators with inevitable implications for investment and financing

Next, we consider how these dynamics could change under a demand-weighted average (DWA) swap contract, in which the profile follows the typical load profile for each half-hourly period of the day, over a month (i.e. mechanically, the deemed profile is defined the same, but it is driven by load rather than typical output from that technology).

As we show below, using Victoria in July as an example, the demand-based swap profile is similar to the wind-based swap profile, as both are relatively flat when averaged over the course of a whole month, but drastically different from the solar-based swap profile.[25]

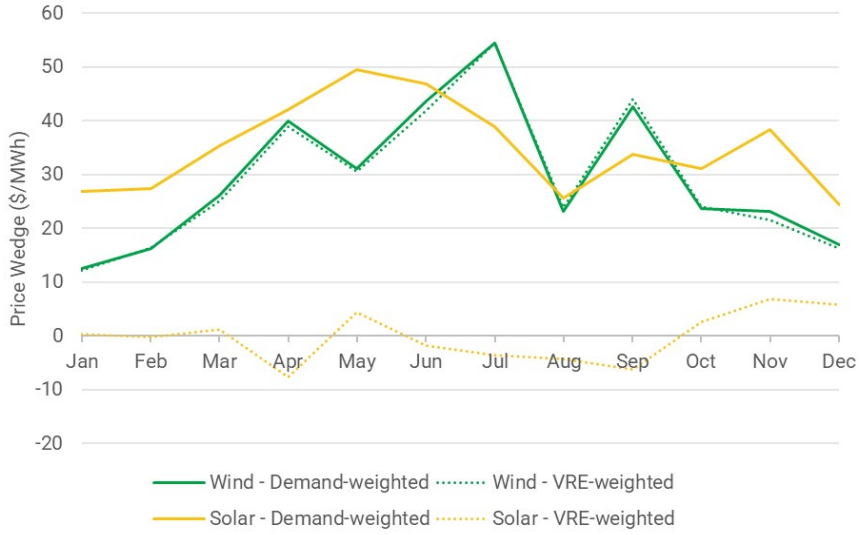
Figure 3 – Deemed Swap Profiles (Vic, July 2046)



As a result, when comparing these results to those of the baseline with an output-based deemed profile, we find nearly identical outcomes for wind plant, but considerably worse outcomes for solar plant (see below). This reflects the added cost on solar plant, as prices tend to be higher in the evening when solar is not productive and therefore cannot mitigate this exposure.

[25] For each technology, we normalise to that technology's average load factor over that month, such that a generator is only exposed to the timing risk rather than being over- or under-hedged on average.

Figure 3 – Wedge between average price received and price under the DWA swap (Vic, 2046)



A.4.5 To some extent, tail risks can be somewhat mitigated by implementing an exposure cap under the contracts

To some extent, the risks described above could be mitigated by implementing an exposure cap for the developer, which would essentially shift the risks of unmitigable market price spikes onto a different party.

For example, suppose a generator has an offtake agreement with a retailer. In practice, this would mean that the offtaker is on the other side of the swap agreement from the generator, and is benefiting from the protection against very high prices (during which time the offtaker would theoretically be paid by the generator the difference between the market price and the strike price). Insofar as generator's exposure to these high prices is capped, then so too is the protection that the swaps could offer to the offtaker. As a result, the offtaker could be exposed to risks that it cannot easily mitigate.

Using the same example as above, if all the wind plant in Victoria had offtake agreements, we can calculate the exposure that an offtaker would be exposed to under different cap levels in the month of July 2046:

- under normal market conditions (with no price spikes)
- with a two-hour **price spike to $10,000**
- with a two-hour **price spike to $20,000**.

Under these "normal market conditions", the offtaker would bear little exposure. However, if there are large price spikes, the additional exposure will be fully borne by the offtaker. The split between the generator and the offtaker under each scenario is summarised in the table below:

Scenario	No cap	With a $300 exposure cap		With a $600 exposure cap	
	Generator	*Generator*	*Offtaker*	*Generator*	*Offtaker*
Normal conditions	-$262m	-$249m	-$13m	-$262m	$0
$10,000	-$370m	-$249m	-$121m	-$265m	-$105m
$20,000	-$481m	-$249m	-$232m	-$265m	-$216m

The offtaker could mitigate some of these risks by purchasing cap contracts that pay out when prices rise above $300/MWh, but there will not necessarily be available counterparties willing to sign cap contracts above what the market already supports. Given the asymmetry of these risks to volatile market outcomes, it is uncertain whether an asset-light retailer would be able to withstand these market outcomes without access to financial instruments that may not be available.

A.4.6 Swap contracts – based on a reference profile or demand-weighted – is likely to present very significant, unpredictable and highly variable risks for VRE investors

Overall, we conclude that a swap contract with a deemed profile, whether that is based on output for that technology or based on load, is likely to present risks that are very challenging for investors in or financiers of VRE to mitigate.

As we demonstrate, there are systematic and unmanageable differences between the prices that generators would be able to capture by selling electricity in the wholesale market and the prices they would have to defend in a swap contract when they are not generating. This is true for wind plant under either style and for solar plant where the deemed profile is linked to demand rather than solar output.

If these differences were systematic and predictable, this option may still be workable, as a reasonable investor would simply bake the value of the wedge into the swap strike price it requires. However, even in normal conditions, the size of the wedge varies substantially from month to month, making it difficult for an investor to determine what strike price would earn it a reasonable return.

In extreme market conditions, when VRE generators are not producing (as is likely to be the case during extreme market conditions), these generators would bear all of the risk with no ability to defend against these large price spikes. Moreover, the size and duration of extreme market conditions is impossible to forecast on an investment time scale, so the conditions that emerge could end up being much more extreme than the two-hour price spike modelled above, the costs of which would flow directly to the generator that is required to make extreme difference payments. **From the perspective of an investor or bank, the size of this asymmetric, unpredictable risk would likely make investment under these conditions prohibitive**.