



The LDES Council is a global non-profit with over 60 members across 24 countries and works to accelerate the decarbonisation of our world through the application of long duration energy storage (LDES). The LDES Council provides member-driven, fact-based guidance and research to governments, grid operators and major electricity users on the deployment of long duration energy storage for society's benefit by lowering costs to reduce emissions, adding flexibility, and ensuring resilience.

There are a wide range of LDES technologies within four broad families of mechanical, chemical, electro-chemical and thermal. They provide multiple benefits in respect of the decarbonisation of power and heat, operating over time scales that range from multiple hours, days, weeks, months to seasonal, with many individual use cases.

The LDES Council welcomes the opportunity to respond to AEMO Services Limited's consultation on the industry-led Electricity Contract Co-Design for the Electricity Service Entry Mechanism (ESEM). The Council supports the NEM Review's objective of standardised, fungible contracts that close the tenor gap between customer contracting and new-entry investment. Our comments focus on ensuring that the shaping and firming products can accommodate the full range of storage durations the NEM will need as coal retires and renewable penetration rises.

In summary, the Council recommends that the Working Group:

1. Treat the Regional Reference PPA as a bulk-energy product for variable renewable generation, with storage participating primarily through the shaping and firming products
2. Clarify how the existing Shaping Duration parameter within the Dynamic Time of Day Block Spread Swap can accommodate different storage durations, and consider whether standard duration variants could enable diverse storage technologies and durations to compete on a comparable basis.
3. Test the \$600 cap against extended system-stress events, including periods under administered pricing, and consider a lower-strike variant
4. State in the Final Report how firming for extended, multi-day low-renewable periods is expected to be contracted, as this is not currently captured by the core suite
5. Ensure that large flexible loads, including thermal energy storage for industrial heat, are able to participate as buyers of contracts.



LDES Council Responses to listed feedback questions on ESEM (Electricity Service Entry Mechanism) Contract Co-design

A. Bulk Energy: Regional Reference PPA

1. Is the proposed contract structure suitable for a range of bulk energy technologies?

The Council notes that the Regional Reference PPA is designed as a fungible bulk-energy product for variable renewable generation, as it reduces project-specific volume risk and enables buyers to hedge against the performance of a regional reference fleet. The Council does not recommend adapting the Reference Production Index to storage operating profiles, as the Index is appropriately designed around a single generating technology within a region (e.g. wind or solar), while storage is more appropriately contracted through the shaping and firming products.

The Council recommends that the Final Report clarify how the Regional Reference PPA is intended to stack with the Dynamic Time of Day Block Spread Swap and firming product, including how the residual shaping and high-price exposure faced by RRPPA buyers can be managed through those products. This would provide a clear product pathway for storage operators and flexible loads—including thermal energy storage serving industrial heat—to participate as buyers and manage the costs and risks associated with charging or flexible electricity consumption.

2. Does a cap on spot price exposure aligned to the strike price of the firming product (e.g. \$600/MWh) appropriately balance risks for sellers and buyers?

The Council supports capping the RRPPA Floating Price at the strike price of the firming product. This is an appropriate measure to ensure that the bulk energy and firming contracts can be stacked to provide a complete hedge, with the RRPPA covering exposure up to the strike and the cap covering exposure above it. To preserve this, the two parameters should be defined by reference to one another.

3. Is a negative price provision required for the contract noting it is settled against the Reference Fleet's performance and LGCs/REGOs are not included in the swap? If so, is a volume knock-out (no settlement during negative price periods) or a \$0 price floor more preferable?

The RRPPA can provide a useful hedge for storage operators and flexible electricity users, including electrical thermal energy storage. In considering the treatment of negative-price periods, the Council considers a volume knock-out to be a practical approach, as it would remove the buyer's obligation to pay for volumes generated during negative-price



periods. This reflects the different relationship between energy prices and renewable generation incentives in such periods, where generation may continue despite negative market prices due to LGC/REGO or other support mechanisms.

4. Does the Reference Production Index appropriately balance risks for sellers (primarily basis risk) and buyers (long-term value of the product)?

	Strongly favours sellers	Somewhat favours sellers	Appropriately balanced	Somewhat favours buyers	Strongly favours buyers
Risk balance			●		

B. Shaping: Dynamic Time of Day Block Spread Swap

(The proposed product defines daily charge and discharge periods using day-ahead residual-demand forecasts, with up to two charge and two discharge blocks. Importantly, settlement is based on the price spread rather than the actual behaviour of the underlying asset.)

The Council recommends that the Final Report clarify whether the charge and discharge block volumes are intended to be equal. Where equal volumes apply, the seller would effectively retain responsibility for any round-trip efficiency losses outside the contract. This can provide a straightforward product structure, but the treatment should be explicit so that storage technologies with different efficiency characteristics can appropriately account for these losses in their commercial offers.

5. Does the day-ahead residual-demand approach appropriately balance operational risk/ simplicity with long-term value?

Yes, but with flexibility around the characteristics of different storage assets. The dynamic approach is preferable to permanently fixed time blocks because the value of flexibility will evolve as the NEM evolves. The key consideration for LDES is that not all storage can or should operate within the same daily charging and discharging pattern. Short-duration storage may optimise around daily peaks, whereas 8+, 12+, 24+ hour or multi-day resources may provide value across longer system stress events.

The contract should therefore avoid embedding an assumption that the principal value of all storage is intra-day arbitrage. The dynamic time of day product could be an important



component of the ESEM contract suite, but should be viewed as one layer of flexibility, capable of working alongside longer duration firming and other contracts.

The Council recommends that that discharge block duration be an explicit contract parameter, with a small number of standard duration variants (for example 4+, 8+ and 12+ hours), each fungible within its class. This would preserve the objective of a relatively simple product structure while allowing storage resources with different durations to participate on a more comparable basis. The corresponding block-length assumptions should also be clearly stated in the Attachment A product sheet.

6. Does the use of AEMO's forecast data to determine shaping periods result in any material risks to the useability of this contract over the long-term?

Using AEMO forecasts provides transparency and a common reference point, but long-term usability will depend on the **stability, availability, granularity and governance of the forecasting methodology**.

For contracts with potentially long tenors, material changes in forecasting methodology, demand patterns, renewable penetration or market configuration could alter how shaping periods are determined.

The contract should therefore include:

- clear rules governing changes to the forecast methodology;
- appropriate transition arrangements where methodologies change;
- transparent data publication and auditability; and
- a mechanism to review the methodology as the NEM evolves.

This is particularly important for LDES because assets may be contracted for periods spanning substantial changes in the generation mix and demand profile.

7. Does determining nominations at 4pm day-ahead pose any material operational risks?

A fixed nomination deadline provides simplicity and supports a fungible financial product. However, where settlement is based on the contracted periods rather than the physical dispatch of the underlying asset, the timing of the nomination primarily creates basis risk between the nominated periods and the periods that ultimately experience the highest prices. This is particularly relevant for LDES, where system conditions can evolve materially between nomination and dispatch.

The Council therefore recommends distinguishing between the financial nomination obligation and the physical operating capability of the underlying asset. Longer discharge blocks can also provide greater resilience to day-ahead forecast uncertainty, as a wider contracted window is more likely to capture the periods of actual system stress. This



reinforces the value of considering different standard discharge-duration variants within the Shaping product, while retaining a simple and fungible financial structure.

8. Does the Daily Shaping Period that commences at the Trading Interval ending at 09:05 and finishes at the Trading Interval ending at 09:00 the following day pose any material operational risks?

The 24-hour shaping window is operationally understandable and can accommodate daily cycling. A 09:05 start, for example, places the solar charging window early in the period, with the evening and following morning peaks later in the same window. This can work well for assets providing intra-day flexibility.

However, the fixed daily construct should also be considered against assets whose value extends beyond a single daily cycle. For LDES, system stress can span multiple peak periods, overnight periods or consecutive days. The Dynamic ToD product cannot, by itself, represent this multi-day value and should therefore not become a proxy for defining what constitutes useful storage duration.

The Council recommends that longer duration and multi-day flexibility should instead be accommodated through the broader ESEM contract suite, including the firming product. This makes it important that the interaction between the Dynamic ToD and firming products is clearly defined, including how the firming product and associated cap provide coverage for exposure beyond the daily shaping window.

C. Firming: \$600 Cap

9. Is a \$600 cap, compared with a \$300 cap, appropriate to support entry of new firming assets? If not, why?

The Council does not oppose a \$600 cap as a standard product but considers that the choice of cap level will affect the type of firming resources the product can support.

A \$600 cap would mainly provide protection against very high, short-term price spikes. A lower cap, such as \$300, would provide protection across a wider range of high-price periods, including sustained periods of low renewable generation. This is particularly relevant for LDES, which can provide firming over longer periods rather than only during short price spikes.

The Council also notes that \$600 is the current Administrative Price Cap. During periods when administered pricing applies, a \$600 cap would provide limited additional protection. This could leave a gap in coverage during prolonged periods of system stress. The Council therefore recommends that the Working Group consider a \$300 cap/strike as an additional product option alongside the \$600 product or clarify how longer duration



and multi-day firming needs would otherwise be covered. The cap level could also be reviewed over time as market conditions and the value of firming services evolve.

Common Contract Features

10. Are there concerns with weekly settlement approach aligned to the AEMO settlement calendar?

Generally, no, provided prudential requirements remain manageable for new entrants. Alignment with the AEMO settlement calendar provides standardisation and should support operational simplicity. The ESEM should avoid unnecessarily increasing liquidity or collateral requirements for emerging technologies, particularly where projects are still establishing revenue stacks.

11. Are there alternate approaches to manage Force Majeure risk exposure (outside of the contracts) required to support the entry of new assets?

This is particularly important for new LDES technologies and projects. The consultation paper correctly identifies the fundamental difference between traditional physical offtake contracts, where Force Majeure provisions can be linked to a specific asset, and fungible financial contracts, where the contract is not tied to the underlying project.

The proposed ability to buy back positions may provide an important mechanism, but it should be tested against situations where a technology-specific or system-wide event makes replacement hedging unusually expensive or unavailable.

A pooled or other sector-wide risk mechanism could therefore merit further consideration. The objective should be to ensure that Force Majeure treatment does not inadvertently create a disproportionate barrier for newer technologies or projects with limited operating history.

Overarching Feedback

12. Do the proposed contract structures achieve the Working Group's Terms of Reference and evaluation criteria?

	Very poor	Poor	Medium	Well	Very well
Bulk energy: Regional Reference PPA				●	
Shaping: Dynamic Time of Day Block Spread Swap				●	
Firming: \$600 cap			●		



Regional Reference PPA: The RRPPA has strong potential to create a fungible bulk-energy product and reduce project-specific volume risk. LDES Council considers it well suited to variable renewable generation and does not recommend adapting the Reference Production Index to storage operating profiles, as storage services are more appropriately addressed through the shaping and firming products. The key consideration is how the RRPPA can work alongside these products to provide buyers with a clear and effective overall hedge.

Dynamic ToD Block Spread Swap: The product provides a useful, standardised mechanism for managing intra-day volatility and could complement a wider portfolio of energy contracts. Its long-term effectiveness will depend on allowing sufficient flexibility in discharge duration and avoiding an assumption that all storage value can be represented through a single daily charging and discharging pattern. Longer duration variants could help different storage resources participate on a more comparable basis.

\$600 Cap: The cap provides a simple mechanism for firming risk, managing high-price exposure, but its value depends on the type and duration of firming required. It provides greater protection against very high price spikes, while a lower cap such as \$300 could provide coverage across a broader range of sustained high-price periods. As \$600 is also the current Administrative Price Cap. The Council recommends considering a \$300 cap as another product option or clarifying how longer duration and multi-day firming needs would otherwise be covered.

The proposed suite is a constructive foundation for ESEM because it recognises that bulk energy, shaping and firming are distinct services requiring different risk-management instruments. This is consistent with the NEM Review objective of using standardised, fungible contracts while allowing providers to compete to deliver defined electricity services. For LDES, the critical next step is ensuring that fungibility does not become synonymous with technology uniformity. LDES encompasses technologies and configurations with different durations, response characteristics, charging requirements and operating profiles. The contract suite should therefore allow different technologies to compete based on the electricity service delivered, while avoiding reference methodologies that inadvertently privilege a particular technology profile.

13. Are there any concerns with the ability of the contract structures proposed to be subject to a Market Making Obligation (MMO) in the future?

	Significant concerns	Some concerns	Neutral	Expect contracts to perform well	Expect contracts to perform very well
Bulk energy: Regional Reference PPA				●	
Shaping: Dynamic Time of Day Block Spread Swap		●			
Firming: \$600 cap				●	

Regional Reference PPA: The product has potential to support market making, provided the Reference Production Index remains transparent, stable and predictable. This will be important as the composition of the reference fleet evolves over time and market participants build confidence in the index and its relationship to underlying market conditions.

Dynamic ToD Block Spread Swap: The product could support market making if the methodology for determining shaping periods remains transparent and predictable. The Council recognises that introducing different duration variants could improve participation by a wider range of storage resources, but may also fragment liquidity across variants. The design should therefore seek a balance between accommodating different storage durations and maintaining sufficient liquidity within each product.

\$600 Cap: The cap provides a relatively simple mechanism for managing high-price exposure and could support market making where there is sufficient liquidity. However, its effectiveness will depend on how well the strike aligns with the range and duration of price events that buyers seek to hedge. Maintaining flexibility to review the strike or offer alternative variants could help the product remain relevant as market conditions evolve. The MMO design should recognise that **liquidity may initially develop unevenly across different services and technologies**. Market making should support the development of a fungible market without creating requirements that inadvertently exclude emerging technologies or smaller pools of new capacity.

The ability to combine the ESEM contracts into different revenue structures will be important to attracting a diverse range of new assets and enabling participants to manage different types and durations of market risk.



14. Will the proposed contract structures, in conjunction with other risk management contracts, such as flat swaps, evening peak swaps or caps, be effective for buyers (e.g. retailers, large loads, etc.) to manage financial risks?

Yes, provided the contracts are treated as a complementary portfolio rather than as standalone products. The proposed suite provides useful building blocks across different dimensions of electricity market risk:

- **Regional Reference PPA** — bulk energy and renewable production exposure;
- **Dynamic ToD Spread Swap** — intra-day price-shape exposure;
- **\$600 Cap** — extreme price-event exposure; and
- **other secondary-market products** — more specific load and portfolio hedging requirements.

This approach is particularly relevant for LDES because the value of long duration flexibility is inherently multi-dimensional. An LDES asset may simultaneously provide energy shifting, peak management, renewable integration, firming and resilience over different timescales.

The suite should also work for large flexible loads as buyers. Electrified industrial heat supplied through thermal energy storage, for example, consumes electricity in a profile that closely follows renewable output and can shift consumption away from high-price periods. The Regional Reference PPA, together with a well-designed negative-price provision, could be an effective long-term hedge for these loads, provided contracts sold back into the market are available to large commercial and industrial users in practical volumes, not only to retailers.

The contract suite should buyers to **combine different products** rather than requiring one standard contract to capture all attributes of an LDES asset. At the same time, there is a potential gap between intra-day shaping products and longer-duration firming. As the ESEM develops, consideration should be given to whether the standard contract suite adequately captures value associated with extended periods of system stress — including consecutive high-demand/ low-renewable periods — without forcing those requirements into products designed primarily for daily price volatility. The overarching objective should be a **technology-neutral set of fungible contracts that allow different storage durations and technologies to combine these products according to the electricity services they can reliably provide.**

The Council therefore recommends that the Final Report explicitly address this gap as the ESEM develops. Options could include duration variants within the core products, a



separate contracting mechanism, or appropriate reliability settings. The objective should be to ensure that longer duration and multi-day flexibility is recognised without requiring the dynamic time of day product, which is designed primarily around daily shaping, to perform that role.

LDES Council supports the overall direction of developing a small set of standardised and fungible contracts for bulk energy, shaping and firming services. For these products to support the full diversity of new electricity service providers envisaged under the ESEM, however, fungibility should be based on the service being delivered rather than on assumptions about the technology or operating profile delivering it. Storage technologies can range from short duration daily shifting to longer duration (8 to 24+ hrs and multi-day) applications, with materially different charging, dispatch and revenue profiles. The final contract design should therefore preserve technology neutrality, minimise unintended basis and operational risks, and allow the three products to work together with complementary contracts to capture value across different timescales. This will be important to ensure that the ESEM can support not only today's technologies and market conditions, but the diversity of new flexible resources required as the NEM evolves.

This approach is well aligned with the consultation paper's own stated objective that contracts should be bankable, operationally achievable, efficiently risk-allocated, attractive to buyers and sellers, adaptable to future market conditions, complementary within a set and simple to value.

We strongly encourage the Working Group to ensure that the Electricity Contract Co-design and ESEM consider how storage and flexible demand, including thermal energy storage for industrial heat and future heat-to-power applications, can provide shaping and firming services.

The LDES Council appreciates the opportunity to contribute to the design of the ESEM Contracts mechanism and remains committed to continued engagement with the DCCEE, ASL and relevant stakeholders. The Council would welcome the opportunity to provide further technical, market and policy input as the work progresses to help ensure ESEM supports a robust, practical and investment-enabling framework for LDES deployment in Australia.