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Daniel Westerman
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By email: daniel.westerman@aemo.com.au

Dear Mr Westerman

Request for advice from AEMO on design elements, cost and timing of operating reserve market

I am writing on behalf of the Commission to ask for AEMO's advice on design features and other key elements of a potential new market for operating reserves. Based on this we also ask AEMO to provide updated estimates of AEMO's implementation costs and timetable.

This advice will be a key input to the Commission's consideration of the *Operating reserve market rule change* and *Introduction of ramping services rule change* (ERC0295 and ERC0307 respectively). These two rule change requests each propose the introduction of a market for a new system service that would procure reserve capacity in operational timeframes. Both rule changes seek to address the increasing need for energy reserves as the power system transforms.

The Commission recently extended the time for making a draft determination on these rule change requests to 30 June 2023 to allow, amongst other things, time for:

- data to be gathered from the provision of reserves from under the recently implemented five-minute financial settlement and wholesale demand response market
- further information on the Energy Security Board's progression of post 2025 reforms relating to a capacity mechanism and jurisdictional strategic reserve mechanism, and
- AEMO to prepare this detailed technical advice.

The Commission has not yet formed a view on whether the introduction of a new system service to procure energy reserves would promote the national electricity objective (NEO). The Commission expects the further work and advice noted above will allow it to better consider the appropriate policy response to the issues raised by the rule change requests. The Commission appreciates AEMO undertaking this work to better inform our considerations. We have greatly appreciated the collaborative nature of the work between the organisations to date and are committed to this continuing.

In order for AEMO to provide advice a sketch of a "working model" for an operating reserve market has been **attached** to this request. This model should be considered indicative only. It has been provided for the purposes of providing a starting point for AEMO's advice. It may be subject to change in future in response to this technical advice, further considerations and stakeholder feedback.

This working model suggests core features of a 30-minute co-optimised operating reserve market. Under this model the market operator would procure, on a rolling basis in every five-minute dispatch interval, a certain volume of operating reserves in MW with the capability to be dispatched as energy in the dispatch interval 30-minutes ahead.

Request for technical advice

We request AEMO's advice on the option/s to implement the following three design elements of an operating reserve market:

1. The development of an operating reserve demand curve
2. The implementation of a causer pays cost recovery mechanism for the market
3. The reserves obligation and interactions with dispatch and other processes

We also request updated advice on the direct implementation costs and proposed timing of an operating reserve market given the above considerations.

AEMO's advice will be an important input into the Commission's decision-making process for these rule changes. The advice may also enable a faster implementation of an operating reserve market if the Commission considers it is appropriate to implement one. This is because, if a draft and final determination were to implement a new market, AEMO would have started to turn their minds to implementation considerations, and with these considerations having had stakeholder input through the rule change process.

More detail on each item is outlined below.

Technical advice on key design and implementation matters

1. The development of an operating reserve demand curve based on the following principles

Under the working model, the starting assumption is that the procurement price and quantity of reserves would be set dynamically based on a centrally determined demand curve, called an 'operating reserve demand curve (ORDC)'. The ORDC would be updated every five-minutes and reserves would be procured to the level where offers (volumes and prices) to supply operating reserves would intersect with the ORDC. In principle, the ORDC should reflect the value that consumers place on having capacity in reserve, which is the product of the value of lost load and the probability that load may be lost.

AEMO's advice on how an ORDC, such as that described above, could be established would be welcome. Noting that the method of calculation, and therefore the shape of the ORDC would indicate how often an operating reserve may bind and intervention may occur, which in turn may provide some indication of costs for customers. Any of AEMO's views on implementation considerations and issues that may stem from these design choices, including whether AEMO suggests any changes to the proposed design feature should also be set out. This would input into the Commission's assessment of whether creating an explicit, unbundled operating reserve market would promote the NEO.

We understand that some aspects of this advice will necessarily be preliminary in nature. For example, the AEMC is currently considering a rule change that would result in changes to the ST PASA process. Given that this process is ongoing, we understand that there may be some of the inputs into the calculation of an ORDC, such as uncertainty measures, may change as a result of any implementation process for the ST PASA rule change. We therefore understand the advice will be based on current measures and inputs. It would be useful for it to note potential impacts of future changes.

2. The implementation of a causer pays cost recovery mechanism for the market

The working model is based on the principle that the costs of a new reserves market should be allocated to the causers of the need for the service. The need for the service would be the need for reserves capable of addressing uncertainty in net demand, and the causers are therefore the causers of uncertainty in net demand over a 30-minute timeframe.

Conceptually, the causers could therefore be scheduled and semi-scheduled generation and scheduled load that generate or consume energy at a level that is different from the forecast 30 minutes ahead of that time. However, contribution to uncertainty over a 30-minute timeframe is more difficult to determine than contribution to the need for FCAS, for example. FCAS is needed to balance energy within the dispatch interval and causers are very clearly those that deviate from dispatch instructions within an interval.

In principle a causer pays approach should result in more efficient outcomes than alternative approaches that would not provide an incentive on causers to reduce the need for reserves. The costs and benefits of a causer pays approach relate to the efficiency gains and the costs and complexity of implementing a causer pays arrangement. We would therefore value AEMO's advice in further specifying the drivers of the need for operating reserves and consequently how "causers" causers of the need for operating reserves should be identified. We would also appreciate any consideration of how practicable it may be to implement a framework to allocate costs to these causers.

Some of the challenges that we have identified in implementing a perfect allocation of costs to the causers, and which AEMO may wish to consider in its advice, include whether and how to:

- establish causer pays factors as a way of partially "smearing" the costs (rather than having individual units pay their real-time contribution to 30-minute uncertainty every five minutes). For example, factors could be based on contribution to uncertainty over a historical period, say the preceding quarter. This would be consistent with the conventional approach to causer pays for regulating FCAS.
- implement generator self-forecasting arrangements over half-hour timeframes as a way of allowing "causers" to manage or mitigate the cost/risk they have been allocated, and
- manage the asymmetric nature of the value of operating reserves that only procure 'raise' services, not 'lower' services, given this could result in consistent under-forecasting over 30-minute time horizons to avoid causer pays contributions, which could undermine the intent of the arrangements (to produce more accurate forecasts).

We appreciate that the preparation of this advice would likely require AEMO to undertake some stakeholder engagement to enable industry implications of causer pays arrangements to be considered. This is a prudent approach and we will help support this engagement in an appropriate capacity.

3. The reserves obligation and interactions with dispatch and other processes

In the working model, the principal obligation on a reserve service provide is to be able to provide energy (or demand response) in the dispatch interval that is 30 minutes after being dispatched as operating reserves. If the capacity enabled in one dispatch interval to provide reserves is not physically capable of being dispatched as energy in the interval 30 minutes later, it would be non-compliant with its reserves obligation.

An operating reserve market would interact closely with a range of current market systems, including dispatch processes such as NEMDE, ST PASA, constraint consideration and pre-dispatch. We would value AEMO's advice on the implications of implementing a new reserve service market given these interactions.

The advice should consider what form of obligation and performance requirements would be necessary or preferable to meet the system need for operating reserves. As part of this we would welcome advice on whether some events should be exempted from the performance obligation if they are outside of the control of the participant, and what types of events should fall into this category.

Note that we are not requesting advice on the penalties and compliance framework more generally. If a new market were to be implemented the Commission, in consultation with the AER, would need to consider whether the penalty should be a civil penalty or a financial penalty only.

As above, we understand there are close considerations between an operating reserve market and intervention frameworks currently under review through the Short Term PASA rule change request and other dispatch reform processes. We appreciate that there may be uncertainty with the provision of technical advice delivered prior to final implementation of these changes, but would still value AEMO's perspectives in the interim.

4. The direct implementation costs of and proposed timing of an operating reserve market

An important part of the Commission's assessment of whether an operating reserve market is likely to promote the NEO is to consider whether the benefits outweigh the direct and indirect costs.

AEMO has previously provided the Commission with its indicative costs and timeframes for implementation of a new operating reserve market. Based on the advice on the above three design elements, we would also appreciate an updated estimate of the costs AEMO would expect to incur to implement an operating reserve market, the timeframes for AEMO to implement and any other notable impacts for AEMO systems or operations.

Timing and publication of AEMO advice

The Commission expects to make a draft determination on these two rule change requests by 30 June 2023. This timeframe has been set so that the Commission can consider further information on the issues facing the evolving power system and a range of changing market framework circumstances.

Stakeholders are increasingly asking for more detailed technical information on system security projects prior to draft rules being made so they can provide early and more informed feedback on the implications of a potential change. Accordingly, the Commission intends to publish AEMO's advice to elicit this feedback in advance of making a draft determination. We also appreciate that AEMO may wish to consult with stakeholders in preparing its advice – AEMO should feel free to do this in any manner it considers appropriate, but we would appreciate AEMC staff being involved in any process undertaken.

For these reasons we request that AEMO provide the advice by 30 June 2022.

Introducing a new market mechanism for the explicit procurement of operating reserves would be a significant energy market reform. Given the complexity of the proposed new market design and other reforms currently under consideration, the Commission believes it is important to thoroughly test the benefits and costs of a potential new operating reserve market. AEMO's advice will be an important input to this assessment and will help the Commission consider whether its implementation is in the long-term interests of consumers.

We look forward to working with you on this.

Yours sincerely

Anna Collyer
Chair

ATTACHMENT: "working model" for a 30-minute co-optimised operating reserve market

There are a range of options available to line up capacity to hold in reserve, but in order for AEMO to provide technical advice a "working model" is set out below. This model should be considered indicative only. It has been provided for the purposes of providing a starting point for AEMO's advice. It may be subject to change in the future in response to this technical advice, further considerations and stakeholder feedback.

Under this model the market operator would procures, on a rolling basis in every five-minute dispatch interval, a certain volume in MW of the capability to be dispatched as energy in the dispatch interval 30-minutes ahead.

Key features of this model:

The procurement of reserves would be **in-market** and co-optimised with the procurement of energy and FCAS. A market participant can offer capacity into the reserve market that is capable of being dispatched as energy in the dispatch interval 30-minutes ahead. The NEM dispatch engine (NEMDE) would then co-optimise offers for the energy, FCAS and reserve markets. That is, every five minutes NEMDE would dispatch resources to meet the need for each of those services at the lowest total cost of production across all services.

The market would be for a **raise only service** because there is currently no indication that there is value in procuring a reserves lower service. (If this was decided to be implemented it could be designed in such a way that a lower service could be implemented at some future point if that was warranted).

The **procurement price and quantity** of reserves would be set dynamically based on a centrally determined demand curve, called an 'operating reserve demand curve (ORDC)'. The ORDC would be updated every five-minutes and reserves would be procured to the level where offers (volumes and prices) to supply operating reserves intersect the ORDC. The ORDC would reflect the value that consumers place on having capacity in reserve, which is the product of the value of lost load and the probability that load may be lost. AEMO would also procure a "step" in the curve at a higher price that would reflect the level of reserves required to avoid interventions to support reserve levels.

Reserves would be procured every **five minutes**. The level of reserves procured would reflect the reserve requirement (based on a forecast uncertainty measure) for **30-minutes** into the future. Any participant capable of being dispatched for a unit of energy 30-minutes in the future would be an eligible reserve provider. The 30-minute basis for reserve levels reflects the current requirement adopted in contingency planning to return the system to a secure state within 30-minutes. It also broadly reflects the time that sufficient reserve capacity would be able to start-up and/or ramp-up (or down) to provide reserves in response to prices in the energy market.

In the dispatch interval that a participant is enabled for reserves, the participant's bids in the energy market for each dispatch interval over the next 30-minutes must be consistent with providing that level of reserve as energy in 30-minutes' time. In subsequent intervals the reserve provider may change the volumes it is willing to bid to provide energy at different prices, but is not able to lower its maximum available capacity for the interval that corresponds with its reserves commitment (the interval 30 minutes after dispatch as reserves). In order to comply, a unit with a start-up profile longer than five minutes would need to be online and at minimum generation by the necessary time.

If the capacity enabled in one dispatch interval to provide reserves is not physically capable of being dispatched as energy in the interval 30 minutes later, **it would be non-compliant** with its reserves obligation. As a starting point, the penalties could mirror those for non-compliance with FCAS obligations. This includes:

- repayment of revenue received in the operating reserve market, and

- a maximum financial penalty of $100,000.

Further consideration may be needed to determine whether there should be any **exemptions from compliance**, such as cases where non-compliance occurs due to matters outside of the control of the participant. This may place a burden and cost on participants and the AER when enforcing compliance, due to the many shades of grey involved in determining what is in and out of the control of a party (such as a safety or security issue that could have been avoided through better maintenance practices).

In principle, **costs should be allocated to the causers of the need for the service**. The need for the service is the need for reserves capable of addressing uncertainty in net demand, and the causers are therefore the causers of uncertainty in net demand over a 30-minute timeframe. Conceptually, the causers are therefore scheduled and semi-scheduled generation and scheduled load that generate or consume energy at a level that is different from the forecast 30 minutes ahead of that time. However, the identification of causers may not be as simple as it is for regulating FCAS, for example, where the service is the need to balance energy within the dispatch interval and causers are very clearly those that deviate from dispatch instructions within an interval. Contribution to uncertainty is more difficult to determine. Accordingly, there would likely be some complexity in the further specification and identification of causers through detailed procedures to implement these arrangements.

A perfect allocation of costs to the causers would require individual units to pay their contribution to the cost of reserves in each five-minute period based on their real-time contribution to 30-minute uncertainty. This would be very difficult to implement and so a preferred approach is to develop causer pays factors based on contribution to uncertainty over a historical period, say the preceding quarter. This can be thought of as a more "smeared" approach to allocating costs to causers. This would be consistent with the conventional approach to causer pays for regulating FCAS.

The implementation of causer pays requirements would also require the implementation of generator self-forecasting arrangements over half-hour timeframes. Without this, the causer of the issue has no way to manage or mitigate the cost/risk they have been allocated. There is some concern that causer pays arrangements may incentivise consistent under-forecasting over 30-minute time horizons to avoid causer pays contributions, which could undermine the intent of the arrangements (to produce more accurate forecasts). This is because of the asymmetric nature of the value of operating reserves that only procure 'raise' services, not 'lower' services. Even in the future if a lower service is introduced, it is likely to be less costly than a raise service due to the greater flexibility of the fleet to meet needs for lower services. This asymmetry of value creates an incentive for participants to submit a forecast of generation output that is deliberately lower (or consumption that is higher) than what they expect to achieve to reduce the costs they incur through the causer pays cost recovery arrangements.

It is noted that these issues could be addressed and managed in the design and implementation of causer pays arrangements, we consider this aspect of the market design could be difficult to implement. This is not only due to the need to address the asymmetry issue, but also the difficulty of identifying the 'causers' of the need for operating reserves.