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Mr Ben Hiron
Australian Energy Market Commission
Sydney South NSW 1235

By online submission
AEMC Code: **ERC0263**

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Dear Mr Hiron

Draft Determination – Primary Frequency Response incentive arrangements

AEMO welcomes the opportunity to provide feedback on the Draft Determination considering incentive arrangements for Primary Frequency Response (PFR) in the National Electricity Rules (NER). AEMO strongly supports the reference in the Draft Determination, “Confirmation that the mandatory arrangements will endure beyond 4 June 2023”.

The AEMC’s Draft Determination on the need for tight deadband “mandatory” PFR (MPFR) is a welcome acknowledgement of the engineering requirement of power system control. Given the report¹ AEMO provided prior to the Draft Determination, this submission does not comment further on the need for MPFR.

In addition, the AEMC has determined the existing cost allocation mechanism for Regulation FCAS should be replaced to pay for positive performance measured on a 5-minute basis, for example by units providing MPFR. Those performance payments would be recovered (together with the cost of regulation FCAS payments to enabled providers) from participants with poor performing units and residual load or generation without sufficient metering to determine their contribution. Significant revisions to NER clause 3.15.6A will be needed to provide for the new mechanism. AEMO acknowledges the AEMC’s reasons for these revisions and, with some minor points of difference and clarification, endorses the overall direction.

Our attached detailed submission discusses the design of the payment/recovery mechanism, and notes the complexity of changes to clause 3.15.6A. AEMO agrees that it is appropriate for the detailed methodology to be specified in the necessary rewrite of the regulation FCAS contribution factor procedure. However, until the important design elements are specified, committing to a final rule may present risk in terms of procedure development, system implementation and resourcing. This risk similarly applies to industry participants in assessing the effect of the change to their business. Other recent market reforms (including Five-Minute Settlement, Global Settlement and Wholesale Demand Response) have included development of a high-level design during consultation on the rule, allowing all impacted stakeholders to better understand the change. AEMO notes the recommendation of the Australian Energy Council² to delay the Final

¹ Enduring primary frequency response requirements for the NEM - Technical White Paper August 2021

² AEC, submission to the Draft Determination, 28/10/2021 <https://www.energycouncil.com.au/media/3tzczrj/20211028-erc0263-pfr-incentive-arrangements.pdf>

Determination while more detailed design is completed, and suggests a high-level design prior to finalising the rule may also be appropriate in this instance. This would support the subsequent consultation on the detail to be included in the contribution factor procedure and associated system changes.

With respect to implementation, the ESB Post 2025 Final Report noted that AEMO would work with the industry to develop a NEM Regulatory and IT Implementation Roadmap (Roadmap) that appropriately sequences and seeks to reduce overall implementation costs. AEMO notes that the Roadmap may influence the go live date for the replacement Regulation FCAS incentivisation and cost allocation mechanism.

With a more measured timeline for implementing these changes, AEMO suggests that the existing sunset for tight deadband MPFR will need to be addressed. The preferred approach, consistent with the draft rule, would be to make the MPFR provisions permanent. This would minimise uncertainty and allow clarification of the design assumptions when finalising changes to clause 3.15.6A and specifying a high-level design of the Regulation FCAS incentive mechanism.

Finally, and consistent with AEMO's Discussion Paper³, AEMO endorses the AEMC's proposal that AEMO should assess, monitor, and report on the aggregate frequency response of the system, in MW/Hz, as a NER obligation specified in clause 4.8.16.

Should you wish to discuss any of the matters raised in this submission, please contact Kevin Ly, Group Manager Regulation on kevin.ly@aemo.com.au.

Yours sincerely



Violette Mouchaileh
Executive General Manager, Reform Delivery

Attachments:

1. Detailed submission

³ Primary Frequency Response Incentive arrangements - Discussion Paper August 2021

ATTACHMENT: DETAILED SUBMISSION

1. Need for amending cl 3.15.6A

The Draft Determination notes the requirement for a high ratio of proportional active power response to changes in power system frequency (MW/Hz) and identifies this is best delivered across the capable generation fleet. The AEMC outlines some concerns that inadequate capacity reserves, or headroom, may occur in the future and largely for this reason the AEMC recommends arrangements to incentivise the provision of primary frequency response to accompany the determination on tight deadband MPFR.

In the AEMO Discussion Paper on the feasibility of incentive options, the reason for proposing changes to cost allocation mechanisms was less related to concerns over the future availability of primary control, and more related to improving dispatch incentives.

The Discussion Paper suggested this could be done by better allocating costs to those that “caused” them and paying for the provision of good response within the cost allocation of Regulation FCAS. Good performance would be compensated irrespective of whether it came from mandatory droop response or secondary AGC control. Absent this payment mechanism, units with poor dispatch may deliberately worsen their performance, because it would be masked by more primary and secondary control and the inadequate allocation of Regulation FCAS costs. Unlike the period before tight deadband MPFR, poor dispatch performance does not manifest in poor frequency performance, and without improvements to the cost allocation mechanism the Discussion Paper suggested this could manifest into a cross-subsidy: where poor performers impose their costs onto the good performers, mandated to respond with primary control.

Where control of frequency is performed by ubiquitous tight deadband MPFR, the Discussion Paper noted that this has the effect, depending on the performance of AGC-REG, of better aligning dispatch errors to one another, because they can be corrected without noticeable, accumulating deterioration in frequency and accumulation of time error. The implication was that frequency may not be a good measure upon which to credit and debit deviations, and instead deviations could be priced irrespective of frequency.

For these reasons, the recommendations for changes to 3.15.6A in the Discussion Paper were premised on using data to assess dispatch errors (or imbalances) and crediting or debiting these. The credits and debits are indexed to, and scaled against, the prevailing cost of regulation FCAS, a service designed to correct dispatch errors (resolve imbalances). These recommendations were based on the assumption of a high ratio of proportional active power response to changes in power system frequency (MW/Hz) provided by a large proportion of generation plant, not assuming scarcity of primary response.

Whilst the above discussion implies AEMO would prioritise reasons slightly differently to the AEMC, these points of difference do not detract from the need amend the NER (to retain tight deadband MPFR by removing the sunset provision and amending cl 3.15.6A to better improve dispatch incentives), but they may affect how the changes to cl 3.15.6A should be implemented.

The important point to note is that the continued existence of tight deadband MPFR is a prerequisite for the amendments to cl 3.15.6A; the new procedure; and implementation of the new mechanism.

2. Desire to specify a high-level design for regulation FCAS changes

Section 3 of this submission provides some feedback on the proposed changes to cl 3.15.6A in the Draft Rule, including AEMO's views on the general structure and principles for determining performance payments and recovery contributions. However, at this stage AEMO is not able to provide a comprehensive set of recommendations as to how the amendment can be implemented.

Much of the detail of the calculations can and should be addressed in the consulted regulation FCAS contribution factor procedure, but there is implementation risk in committing to a final rule ahead of a high-level design. There is also a resourcing burden on AEMO and participants in relation to system and market reforms that must be managed.

AEMO is concerned there may be an impression that detailed modelling and analysis has been completed and a high-level design is ready to be consulted on. This is not the case, largely because AEMO has prioritised resources to publish two reports, assessing the engineering requirement for tight deadband PFR and comparing options to incentivise PFR. Notwithstanding this, the Draft Determination should galvanise AEMO and industry into committing resources to a high-level design.

From the present starting position, the proposed nine months is likely insufficient to design and consult on a procedure, for the following reasons:

- There is much detail to specify for systems implementation. These implementation issues will largely relate to the close to real-time need for data curation, and the mechanisms necessary to ensure factors can be calculated quickly and accurately, irrespective of the state of the power system, and close to real-time management systems.
- Resourcing and implementing a project in a relatively short timeframe will be challenging due to the specialist nature of the design and the number and nature of other projects impacting inter-related systems.
- Appropriate sequencing of the implementation of significant system changes is required to reduce the overall impact and costs of implementing multiple reforms. The NEM Regulatory and IT Implementation Roadmap being developed with industry may influence the go live date for the replacement Regulation FCAS incentivisation and cost allocation mechanism.

3. Feedback on amendments to cl 3.15.6A

3.1. General structure

Ideally, AEMO considers that cl 3.15.6A could be organised into a simpler structure by removing repetition without compromising interpretation. For example, the proposed drafting separately identifies performance payments and their recovery using contribution factors, and yet the same

method is used for recovering part or the cost of the regulation requirement (TSFCAS). In general, some of the drafting appears more complex than it may need to be, and AEMO notes that simplification would assist AEMO in drafting the contribution factor procedure for consultation.

3.2. Participant factors versus unit/metered element

AEMO currently calculates contribution factors at a Market Participant level, which permits the offsetting of positive and negative performance between facilities within the participant's portfolio of 'appropriately metered'⁴ facilities. As the draft rule does not change the structure of transactions, this implies that AEMO would continue to calculate contribution factors at a participant level.

However, under the proposed arrangements where transactions will occur for both positive and negative performance, it seems more logical for the rule to provide for calculation of contribution factors for each appropriately metered facility. As AEMO already determines performance at a unit level before aggregating to the portfolio level, the effect of determining contribution factors at a unit level is expected to be minimal. There are also benefits in terms of reducing the complexity of calculating local factors and facilitating more reflective pass-through arrangements where necessary, e.g. for participants who act as intermediaries or have pass through arrangements with relevant customers.

3.3. Scaling Factor

The trading interval regulation FCAS cost ($\$_{FCAS}$) under the Draft Rule is to be scaled by a **regulation requirement** (RR), thought of as the amount of response the AGC regulation system needed, which can be more or less than the **enabled amount** (EA) in dispatch. The **scaling factor** is RR/EA . The amount $(RR/EA)*\$_{FCAS}$ is recovered using a "**contribution factor recovery**" approach. A **factor** determines a share of the cost.

The AEMO Discussion Paper recommended scaling the costs (although not using RR) because dispatch errors may exceed EA. Without offsetting errors, MPFR will act to slow the deterioration of frequency. The primary response will respond in proportion to the change in frequency and although secondary control will eventually need to correct any persisting error, primary response could exceed the EA. The purpose of the scaling factor is to allow performance payments to exceed the cost of Regulation FCAS and was thought consistent with introducing payments for mandatory primary response, which could exceed EA.

The Draft Rule introduces a scaling factor to:

- Recover the cost of enabled regulation FCAS – this is to apportion the recovery of enabled regulation between targeted performance (based on 5-minute performance) and a more general energy-based calculation.
- Scale positive performance payments – this is to scale the frequency performance payments based on the total cost of enabled Regulation FCAS and the net performance in the 5-minute period.

⁴ With 4-second metering

AEMO has investigated the feasibility of determining the RR value for each 5-minute period and does not believe this value can be derived in a way which aligns with the policy objective implied in the Draft Determination. Although AEMO does determine a regulation requirement that is used to determine the amount of regulation service to procure, this is calibrated over the longer term to ensure that the Frequency Operating Standard is met. AEMO does dynamically adjust the amount procured to address specific power system needs (including accumulated time error), however this does not directly reflect the actual power system need for regulation at any instant. AEMO also believes a direct link between AGC and the mechanism should be avoided in the NER.

3.4. 4-second performance measure

The draft amendment requires contribution factors to be calculated every dispatch interval and those units or loads with metering have their own factor, and all other elements of the system are represented by a single “**residual factor**”. A factor is expected to be calculated from a measured element’s **deviation** from a 5-minute trajectory, measured at a 4-sec level, summed over the 5 minutes⁵. Contribution factors for each unit can be **positive or negative**, for good or bad performance respectively. Those units with positive factors are credited and those with negatives are debited.

A **performance measure**, either represented directly or via a formula, would need to be published every 4 seconds to allow participants to estimate whether unit performance is good or bad within the dispatch interval.

There is no direct link between the scaling factor (using RR) and the 4-second performance measure, or ‘formula’ specified in 3.15.6A(k1). The formula provides the 4-second performance measure against which each unit’s deviation from trajectory will be assessed. The AEMO Discussion Paper envisaged the performance measure and scaling factor would follow to avoid any mismatch in incentives. It may be worthwhile revising the drafting to allow an interrelationship of the scaling factor, the performance measure (or formula) and residual factor calculations to be developed into a high-level design.

3.5. Publishing the 4-second performance measure *within* the interval

Draft cl 3.15.6A(k1) requires AEMO to provide near real time publication, or to issue a formula so participants can mimic, a 4-second performance measure – this should allow participants to understand if they are on the “right side” of the calculation. This requirement seems appropriate and could be proved in a high-level design.

3.6. Publishing factors *following* the trading interval

At the end of the dispatch interval AEMO is required to **publish** contribution factors and settlement amounts under the **contribution factor recovery** approach - this is $(RR/EA)*\$_{FCAS}*factor$.

Cl 3.15.6A(na) requires AEMO to publish contribution factors as soon as possible after the dispatch interval, which permits participants to monitor their performance and regulation FCAS exposure

⁵ The current method multiplies the deviation by a performance measure, and product is summed over the 5 minutes. There is no requirement to do this in the amending rule.

in close to real time. AEMO anticipates that calculation and publication may occur approximately 5 minutes after the end of a 5-minute trading interval and be communicated through existing market interfaces. It is worth noting that this is expected to be a separate process to that used for dispatch, as dispatch involves publishing market outcomes (e.g., price and targets) at the start of the trading interval.

3.7. Alternative methods – “back-up” factors or “non-factor recovery”

It is important to point out that, by sharpening the cost allocation to dispatch intervals and separately for lower and raise, the possibility of being unable to calculate factors is increased. To reduce excessive system costs and complexity, service standards should not be onerous and multiple processes should be eliminated.

Draft cl 3.15.6A(k)(4) contemplates the possibility that, where necessary, AEMO could revert to something like the existing method to calculate factors, i.e., over a longer sample period than a dispatch interval. There are alternatives, such as to:

- move any metered/SCADA element(s) that have bad data into the residual cost allocation (at the extreme everything becomes residual); or
- use the approach chosen for the “non-factor recovery” method (discussed further below).

As drafted, the rule uses multiple recovery methods: contribution factor recovery, non-factor recovery and a longer sample “back up factor” recovery. This may be too many.

AEMO also expects that from time to time there will be unusual or abnormal conditions where the contribution factor outcomes are not appropriate (zero contribution for category of facility), and AEMO expects the contribution factor procedure to have a hierarchy of rules, if back-up factors are required, to ensure all conditions can be handled.

3.8. Asynchronous operation

If a region is **asynchronous** the amending rule requires a new set of contribution factors to be calculated.

The current rules and AEMO’s Regulation FCAS Contribution Factor procedure include provisions for dealing with regions that operate asynchronously. These provisions were originally put in place as asynchronous operation was considered closely related to the need for local requirements. However, with the changing power system, AEMO’s operational experience is that local requirements occur relatively frequently when regions remain synchronously connected.

There are two circumstances where asynchronous operation may be relevant:

- Permanently asynchronous – this situation occurs between Tasmania and the rest of the NEM, as they are connected via a DC link. Under the proposed arrangements AEMO will always calculate both a global factor (which will apply for the entire NEM including Tasmania) and a separate factor for Tasmania.
- Temporary islanding – this situation occurs when regions temporarily become an electrically synchronous island, for example if the Heywood interconnector was out of service. These scenarios tend to be infrequent, and the nature of islanding can be complex

(islanding does not always occur on regional boundaries). The current practice is for periods of temporary islanding to be ignored from the calculation of contribution factors, and to apply local factors for the island consistent with arrangements for synchronous operation.

AEMO proposes that references to asynchronous operation be removed from the rule drafting, and instead the amendment require local factors be calculated for recovery associated with local Regulation FCAS requirements. Methods to do this can be assessed in a high-level design.

3.9. Contribution factors for MNSPs

As drafted the amendment could include contribution factors for MNSPs.

As the only MNSP currently in operation, Basslink has frequency control that does not reflect generating units providing PFR. Basslink's frequency control is designed to simulate the behaviour of an AC connection, by trying to minimise frequency differences between the synchronous areas on either side of the connection. This frequency behaviour may not align with the design of the proposed frequency performance payments and recovery, and so it may not be appropriate for contribution factors to be determined for Basslink. Nevertheless, data from Basslink will need to be accounted for in the calculations for certain requirements and again, approaches can be considered in any high-level design.

3.10. Separate calculation of factors and settlement amount for raise and lower

AEMO supports the separate calculation and application of contribution factors for raise and lower regulation services. The current process already involves separate treatment of raise and lower, with a combined contribution factor being determined as an aggregation step in the process.

3.11. Self-forecast used as a trajectory

If a participant provides a dispatch forecast, a "**self-forecast**", the draft amendment requires AEMO to use this as the base trajectory for measuring deviations.

AEMO does not currently plan to introduce the capability for non-scheduled resources (generators or loads) to provide near-term forecasts for use in the next 5-minute supply/demand forecast. AEMO considers self-forecasts should be used for recovery purposes if (and only if) they form part of the supply/demand forecasts as an input to NEMDE.

3.12. Non-factor recovery

Because the scaling factor (RR/EA) can be less than 1, the contribution factor recovery approach above may not recover the full cost of Regulation FCAS. Under the Draft Rule, the remaining amount is charged to **all generators and loads** for the regions where the FCAS requirement applies (instead of the contribution factor approach). This can be referred to as **non-factor recovery**.

The costs not recovered via the contribution factor approach are distributed based on energy volumes (MWh) from both generation and consumption, irrespective of whether this energy is associated with a metered element that has its own contribution factor.

There are sound principles for distributing these costs widely, and these are explained in the Draft Determination. However, allocating on energy volumes to all metered elements, including those under control with their own factor, may incentivise participants to vary their generation or load to avoid the amount payable under the non-factor recovery. This may undermine the incentive for good dispatch and cause undesirable impacts for power system operation.

Another option would be to allocate this remaining amount only to the residual factor (the elements of the power system that are not measured), or to use a different sample period – the back-up factor approach discussed in section 3.7. It is worth considering the pros and cons of alternative approaches given the potential adverse impacts noted above.