

3 February 2023

Charles Popple
AEMC Commissioner and Chair of Reliability Panel
Australian Energy Market Commission
Sydney South NSW 1235

By Email: Charles.Popple@aemc.gov.au

Dear Mr Popple,

REL0084 – Review of the Frequency Operating Standard 2022 – Draft Determination

AEMO appreciates the opportunity to provide further comment on the Reliability Panel's 2022 review of the Frequency Operating Standard (FOS).

AEMO supports the Reliability Panel's draft determination and has worked closely with the AEMC as part of this review process. At the request of the AEMC and as required under the National Electricity Rules (NER)¹, AEMO provided technical advice to support the development of the draft determination and acknowledges this advice has been reflected in its findings.

Primary Frequency Control Band

AEMO also acknowledges the technical advice provided by GHD² and supports the assessment and conclusions provided. GHD used power system modelling to analyse the operational and economic impacts of widening the PFCB from current defined settings of 49.985 Hz and 50.015 Hz. Their analysis found no technical or economic rationale to modify the current Primary Frequency Control Band (PFCB), as widening the band would result in deterioration of frequency control during normal operation, and system resilience when contingency events occur. AEMO supports this analysis, noting that current PFCB settings have significantly improved control of frequency and resilience to contingencies. AEMO also agrees with the GHD advice that any economic rationale for modifying the PFCB should only be considered after the implementation of the Primary Frequency Response (PFR) incentives rule.

However, AEMO notes the analysis undertaken by GHD on the impact of primary frequency response did not consider modifying the tuning of Automatic Generation Control (AGC), beyond a sensitivity study with reduced gain. This approach potentially underplays the role of secondary response, but in no way detracts from the overall conclusions.

Operational frequency tolerance band during system restoration and S5.2.5.3

In the Issues Paper³ and the terms of reference to AEMO for technical advice, the Reliability Panel consulted on an issue relating to the setting of the Operational Frequency Tolerance Band during system restoration (supply scarcity) at 48-52 Hz, with an associated recovery time of 10 minutes.

¹ NER 8.8.1(a) (2) required that the Reliability Panel to and determine the FOS "on the advice of AEMO".

² Power System and economic impacts due to variation of the Primary Frequency Control Band in the NEM. [GHD advice for the 2022 Frequency Operating Standard Review \(aemc.gov.au\)](#)

³ P50, Reliability Panel AEMC Consultation paper, 2022 Frequency Operating Standard Review 28 April 2022



The Reliability Panel questioned whether this placed an excessive obligation for connecting generators through the application of NER S5.2.5.3. which requires a connecting generator to demonstrate a capability for continuous uninterrupted operation within 48-52 Hz for 10 minutes to achieve the automatic access standard.

In providing advice to the Panel, AEMO stated⁴ in section 4.1.3 “technical requirements for the ‘supply scarcity’ frequency band are sound and required”. Under system restoration conditions FCAS reserves and Emergency Frequency Control Schemes (EFCS) availability may not be adequate to maintain operation within FOS requirements for system normal or island conditions. Load restoration may be slowed waiting for adequate FCAS and UFLS availability, and the delay itself may increase the risk of the restoration failing. As such, the more relaxed containment band for system restoration of 48 Hz to 52 Hz, as described in Table A5, is required.

AEMO notes that there is inconsistency and confusion between the Operational Frequency Tolerance Band (OFTB) described in FOS Table A1, the containment band for system restoration described in FOS Table A5 and NER clause S5.2.5.3. To remedy this, AEMO propose that Table A1 of the FOS be revised to clarify that the OFTB for the mainland NEM is **49.0Hz to 51.0 Hz** for interconnected, island **and system restoration conditions**. The OFTB for Tasmania should remain unchanged as 48.0Hz to 52.0Hz for interconnected and island operation.

This would result in the requirement on connecting generators under S5.2.5.3 being consistent with the worst case allowable operating conditions under the FOS. The automatic operating standard under S5.2.5.3 would be that a generator demonstrate capability for continuous operation for the following ranges:

- **47.0 Hz – 52.0 Hz** for 2 minutes (the Extreme Frequency Excursion Tolerance Limit (EFETL) – stabilisation time)
- **49.0 Hz – 51.0 Hz** for 10 minutes (the OFTB – recovery time)
- **49.5 Hz – 50.5 Hz** continuously (the NOFB – during system restoration)

The minimum operating standard under S5.2.5.3 would be that a generator demonstrate capability for continuous operation for the following ranges:

- **47.0 Hz – 52.0 Hz** for 9 seconds (EFETL – transient frequency time)
- **47.5 Hz – 52.0Hz** for 2 minutes (transient frequency limit – stabilisation time)
- **49.0 Hz – 51.0 Hz** for 10 minutes (the OFTB – recovery time)
- **49.5 Hz – 50.5 Hz** continuously (the NOFB – during system restoration)

Importantly, the system operating ranges for system restoration would remain unchanged, including the existing containment bands set out in Table A.3, A.4, A.5, A.6 & A.7.

AEMO notes the containment band for system restoration, set out in the table A.5, requires system frequency to be contained within 48-52 Hz for a maximum of 2 minutes after which the system should move to the stabilisation band, 49-51 Hz.

⁴ P49, AEMO Advice: Reliability Panel Review of Frequency Operating Standard, 2022

Alignment between the definition of generation and load events in Tasmania

AEMO proposes to align the definitions of load event and generation event in Tasmania by reducing the defined contingency event threshold for generation to 20 MW. At present, Table A.8 of the FOS defines the threshold size for a generation event for both the mainland and Tasmania at 50 MW, whereas a load event is defined specifically as 50 MW for the mainland and 20 MW for Tasmania.

Frequency operation in Tasmania is inherently different to the mainland due to a range of characteristics including a different energy mix, significantly smaller power system with lower inertia, relative scarcity of FCAS volume in Tasmania and a significant generation and load contribution from Basslink. The use of the same 50 MW threshold for a generation event is therefore not proportional and consistent in its application between the two regions.

In view of this, AEMO considers that defining the threshold size of a generation event to match that of the 20 MW for a load event is appropriate in Tasmania. AEMO recommends that within Table A.8 of the FOS the definition of generation event be amended to:

For the Mainland:

1. a *synchronisation of a generation unit* of more than 50 MW;
2. An event that results in the sudden, unexpected, and significant increase or decrease in the *generation* of one or more *generating systems* totalling more than 50MW in aggregate within no more than 30 seconds; or
3. the disconnection of generation as the result of a credible contingency event (not arising from a load event, a network event, a separation event, or part of a multiple contingency event), in respect of either a single generating system or a single dedicated connection asset providing connection to one or more generating systems.

For Tasmania:

1. a *synchronisation of a generation unit* of more than 20 MW;
2. An event that results in the sudden, unexpected, and significant increase or decrease in the *generation* of one or more *generating systems* totalling more than 20MW in aggregate within no more than 30 seconds; or
3. the disconnection of generation as the result of a credible contingency event (not arising from a load event, a network event, a separation event or part of a multiple contingency event), in respect of either a single generating system or a single dedicated connection asset providing connection to one or more generating systems.

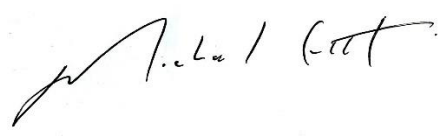
Application of system frequency outcomes during system restoration

Further to AEMO's recommendation to the Panel to rename supply scarcity in the FOS to system restoration⁵, AEMO considers that there may be an opportunity to provide further clarity in the application of Table A.5 through the renaming of Table A.5 to 'Summary of Mainland system frequency outcomes during system restoration of an island'.

Please contact Mark Stedwell on Mark.Stedwell@aemo.com.au should there be any enquiries on the matters outlined in this submission.

⁵ P50, AEMO Advice: Reliability Panel Review of Frequency Operating Standard, 2022

Yours sincerely

A handwritten signature in black ink that reads "Michael Gatt".

Michael Gatt
Chief Operations Officer