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Our ref: REL0084
12 July 2022
Mark Stedwell
530 Collins Street
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By email: mark.stedwell@aemo.com.au

cc: ken.harper@aemo.com.au

Dear Mark,

Request for AEMO advice for the Reliability Panel's Review of the Frequency operating standard

This letter documents the scope for technical advice that the AEMC requests from AEMO, to support the draft determination for the Reliability Panel's current *Review of the Frequency operating standard*.

The NER requires that the Panel's determination of the Frequency operating standard (FOS) be made "on the advice of AEMO".[1] Therefore, we request that AEMO prepare a report outlining its advice in relation to the FOS to support the Panel's draft determination. We request that AEMO provide its draft advice to the AEMC by 30 September 2022. A final report, for publication, is requested by 28 October 2022. The final AEMO advice will be published alongside the Panel's draft determination. This advice will inform the Panel's draft determination, which is planned for publication in November 2022.

The following table provides an overview of the project schedule for this review, including the key milestones for provision of the AEMO advice.

Milestone	**Date**
Issues paper and terms of reference published	28 April 2022
AEMO presentation to the Panel – Preliminary advice	Slides due by – 25 July 2022 Panel Meeting – 2 August 2022
AEMO advice report – draft	by 30 September 2022
AEMO advice report – final for publication	by 28 October 2022
Publish Draft determination & AEMO advice	November 2022
Publish Final determination	By 7 April 2023

To inform the Panel's draft determination, we are seeking expert advice from AEMO on the system security and operational implications for each of the issues identified for consideration in the Issues paper, published on 28 April 2022.[2] We also invite AEMO to provide advice and commentary on other matters relevant to the FOS, for the Panel's consideration. The issues identified for consideration are:

1. **Frequency performance during normal operation** including:
   - The target distribution for frequency during normal operation – in the absence of contingency events.

[1] Clause 8.8.1(a)(2) of the NER requires the Reliability Panel to review and, on the advice of AEMO, determine the power system security standards. The 'power system security standards', as defined in Chapter 10 of the NER, includes the Frequency operating standard.
[2] The Issues paper and other project documentation is available on the project page: https://www.aemc.gov.au/market-reviews-advice/review-frequency-operating-standard-2022

- The specification of the primary frequency control band which set a lower bound for the maximum allowable deadband that AEMO may specify for affected generators as part of the Mandatory PFR requirements. The primary frequency control band is currently specified in the NER as 49.985 – 50.015 Hz, or such other range as specified by the Reliability Panel.

2. **Limits on rate of change of frequency (RoCoF) for the power system –**
   The Panel is considering the inclusion of system limits for RoCoF in the FOS to better specify the requirements for frequency control in the context of reducing system inertia and the commencement of market ancillary service arrangements for Fast frequency response contingency reserves.

3. **The settings for contingency events,** including:
   - The existing frequency containment and recovery bands that apply for credible generation, load and network events.
   - The existing frequency containment and recovery bands that apply for non-credible contingency events and protected events.
   - The operational frequency tolerance band that applies during conditions of supply scarcity
   - The existing limit of 144MW for the largest allowable generation event in the Tasmanian system.
   - Whether the generation limit in Tasmania should be extended to apply to network and load events.
   - Whether the FOS should include a limit on the maximum credible contingency event for the mainland system.

4. **The limit on accumulated time error,** including whether the limit on accumulated time error should be further revised or abolished.

Further detailed notes on the requested scope of AEMO advice in relation to the issues for consideration is provided in **Attachment A**.

We appreciate the continued collaboration with AEMO to support the delivery of the Reliability Panel's review of the frequency operating standard and acknowledge the support provided by AEMO to date through the scoping and approach phases of this project.

Consistent with our discussions the Panel also intends to engage an independent consultant to provide advice on specific issues related to the Panel's review. The scope of work for this independent advice includes:

- Task 1 – Modelling and analysis of the costs and benefits of tight frequency control and primary frequency response.
- Task 2 - A review of policy arrangements in other power systems for managing RoCoF.

We note that AEMO staff will collaborate in the delivery of this independent advice, through participation in project steering workshops and review of key deliverables. We will engage with AEMO on the independent advice throughout so that the AEMO advice can be informed by this work.

Ben Hiron will be the person responsible for coordinating the delivery of the AEMO and independent advice for this project. Ben may be contacted on 02 8296 7855 and Ben.Hiron@aemc.gov.au.

Yours sincerely,

Charles Popple
AEMC Commissioner and Chair of the Reliability Panel

Encl. Attachment A – Detailed notes on AEMO advice scope

ATTACHMENT A - DETAILED NOTES ON SCOPE FOR AEMO ADVICE

Further detail on the requested scope for the AEMO advice is detailed below.

1. Frequency performance during normal operation

We request AEMO's recommendation and rationale for:

i) The target distribution for frequency during normal operation and how this could be specified in the FOS.

ii) The system security and operational implications of setting the Primary frequency control band at a range of settings between the current 'narrow' setting of 49.985 – 50.015 Hz and a wide setting of 49.5 – 50.5 Hz.

We recognise the body of previous work undertaken by AEMO on this issue, including its August 2021 Technical white paper - *Enduring primary frequency response requirements for the NEM*. We expect that AEMO's advice to the Panel will build on this previous work to inform the Panel's assessment of the primary frequency control band and the settings which define the target frequency distribution for the power system during normal operation.

2. Limits on rate of change of frequency (RoCoF) for the power system

We request AEMO's advice on the system security and operational benefits of setting limit(s) on the rate of change of frequency following contingency events in the NEM. This includes advice on:

- The technical capability of current power system plant to withstand different levels of RoCoF following contingency events.
- The expected capabilities and limitations of protection schemes, including automatic under-frequency load-shedding, with respect to RoCoF.
- The role that a RoCoF limit would play in the operation of the power system, including with respect to the provision of very fast FCAS and physical and synthetic inertia.
- How RoCoF limits are specified and the reasoning for these formatting or measurement approaches. For example, the value for RoCoF in Hz/s and the time-period over which this is measured and whether RoCoF limits should be varied for different NEM regions and different operating conditions.

We note the suggestion made by TasNetworks that the Panel considers the potential for a post-contingent RoCoF standard for the NEM to include multiple components similar to the approach set out by ENTSO-E in its January 2018 *Rate of change of Frequency (RoCoF) withstand capability* paper.[3] We request AEMO's commentary and advice on this approach to specifying a RoCoF standard as compared to other potential alternative approaches.

We note that we will be receiving complementary independent advice on how other power systems have approached the issue of RoCoF management, including the consideration of the points listed above. The preliminary list of power systems for consideration includes:

a. Western Australia – South-west interconnected system – SWIS
b. Ireland – Eirgrid
c. European grid – ENTSO-E
d. United Kingdom - National Grid
e. United States – NERC
f. United States – ERCOT

We will share this related consultant advice with AEMO and expect AEMO's advice can draw on the learnings from the consultant's RoCoF policy review.

[3] TasNetworks, Submission to the Review of the FOS – Issues paper, 6 June 2022, p.4. Ref: ENTSO-E, 31 January 2018, Rate of Change of Frequency (RoCoF) withstand capability, p.8.

3. Setting for Contingency events

We request AEMO's advice on the following:

i) Whether the existing frequency containment and recovery bands that apply for credible generation, load and network events remain fit for purpose.

In particular, AEMO's advice is requested on:

- opportunities to improve the clarity and consistency of settings in the FOS for credible events.
- the appropriate setting for the operational frequency tolerance band that applies during conditions of supply scarcity, noting that stakeholders have suggested that the current setting of 48Hz – 52Hz places an excessive obligation for connecting generators through the application of NER clause S5.2.5.3.

ii) Whether the existing frequency containment and recovery bands that apply for non-credible contingency events and protected events remain fit for purpose. AEMO's advice is requested on opportunities to improve the clarity and consistency of settings in the FOS for credible events.

iii) The inclusion in the FOS of limits for the maximum size of credible contingency events for the Tasmanian region. This includes advice on:

- whether the existing limit of 144MW for the largest allowable generation event in the Tasmanian region and system remains appropriate. This includes an assessment of the system security and operational implications of raising this limit to 155MW, as proposed by Woolnorth Renewables.[4]
- whether the generation limit in Tasmania should be extended to apply to network and load events. In its submission to the issues paper, TasNetworks expresses support for the application of a similar limit for the largest load event in Tasmania.[5]

iv) Whether the FOS should include a limit on the maximum credible contingency event for the mainland system and whether such a limit should apply for generation, load and/or network events.

4. The limit for accumulated time error in the NEM

We seek AEMO's advice on:

- The security and operational impacts and other related learnings as a result of the Panel's 2017 determination to increase the limit on accumulated time error in the mainland NEM from 5 seconds to 15 seconds.
- AEMO's view on further potential reforms to the limit on accumulated time error, including consideration of potential options including:
    i. Maintenance of the current limit on accumulated time error.
    ii. Removal of the limit on accumulated time error.
    iii. That the limit on accumulated time error apply over a period of time, rather than being an absolute limit. AEMO's advice is sought on how such a time-based limit on accumulated time error may be set. This may be informed by analysis of the rate of accumulation of time error over time in the NEM and what rate of accumulation is considered to be 'good operating practice'.

[4] Woolnorth Renewables, Submission to the Review of the FOS – Issues paper, 9 June 2022.
[5] TasNetworks, Submission to the Review of the FOS – Issues paper, 6 June 2022.