

Draft frequency operating standard

Revised draft frequency operating standard published to set the operational requirements for control of power system frequency

The Reliability Panel has published a draft determination and draft standard for the review of the frequency operating standard (FOS). The draft FOS includes new requirements that set the operational objectives for control of power system frequency as the system continues to transition and decarbonise.

The Panel considers that the draft FOS promotes the long-term interests of consumers through trading off the benefits of a secure and resilient power system and the cost of achieving this.

This is the second step in an extensive consultation process that is progressing over the course of this review of the FOS. The Panel welcomes feedback on the draft determination and draft FOS and invites stakeholders to participate in the process by:

- participating in a public forum with representatives of the Panel: **15 December 2022**
- lodging a written submission with the Panel: **by 2 February 2023**.

The core elements of the draft FOS

The FOS defines the range of allowable frequencies for the national electricity market (NEM) under different conditions including during normal operation and following contingency events, such as generation, load or network events.

Stable operation of the power system requires that frequency be maintained close to a nominal target of 50Hz. This frequency is essentially a measure of the speed of rotating machinery connected to the power system. When generation is equal to load, the frequency will be stable. However, when there is a mismatch between the demand for and supply of electricity, system frequency will diverge from 50Hz.

Power system equipment, including generators and associated plant may disconnect from the power system if the system frequency becomes unstable and changes too quickly, or varies too far from 50Hz. This can result in the separation of regions from the NEM, disconnection of load and, in the worst cases, the collapse of all or part of the power system, known as a black system event.

As synchronous thermal generation progressively makes way for inverter-connected renewable generation and/or batteries there is expected to be a reduction in levels of system inertia that act to resist changes in power system frequency and keep the grid stable. In the context of this ongoing change, the Panel has reviewed the FOS which specifies the required frequency outcomes that AEMO must meet in the NEM under different operating conditions. On the advice of AEMO, the Panel considers that control of frequency close to 50Hz continues to be crucial to the system being resilient to unexpected power system events that pose a risk to the secure supply of electricity to consumers.

The draft FOS includes additions and amendments to support power system security and deliver reduced costs for consumers over the long-term, these include:

- Updated settings for contingency events — including limits in the FOS for the rate of change of frequency (RoCoF) and the extension of the Tasmanian generation event limit to also include network and load events.
- Confirmation of the allowable ranges for frequency during normal operation, the primary frequency control band (PFCB), and that the target frequency is 50Hz.
- Removal of the limit for accumulated time error.

Required frequency outcomes following contingency events

The draft FOS includes a number of updates and changes with respect to the required frequency outcomes for contingency events, these include:

- **New requirements for allowable post-contingency RoCoF** - this new standard would reflect the system operating limits in the face of the expected reduction in inertia provided by synchronous generators as the generating fleet becomes increasingly dominated by IBR. In the short term, the specification of limits for RoCoF would provide a transparent guide to the operation of the power system and inform how AEMO will use new very fast contingency FCAS products that commence operation in the NEM from 9 October 2023. Over the longer term, these limits would also support the development of future arrangements to provide RoCoF control services including through synchronous and synthetic inertia.
- **Extension of the existing 144MW limit for generation events in Tasmania to also apply to load and network events** - this change would reflect the challenge associated with managing the Tasmanian power system including the expected interest in the connection of large commercial and industrial loads such as hydrogen electrolysers and data centres.
- **No mainland contingency size limit in the FOS** - while AEMO expects increased operational risks associated with the connection of large generators and loads in the mainland NEM, AEMO advised that the existing arrangements in the NEM are sufficient for AEMO and TNSPs to manage these risks.
- **Renaming of the “supply scarcity” operating condition to “system restoration”** - the renamed settings would better reflect the original purpose of the settings to enable the expedited reconnection of load following a significant contingency event.

Required frequency outcomes during normal operation

The Panel’s consideration of the settings in the FOS for normal operation builds on recent work by the AEMC on enduring arrangements for primary frequency response (PFR). The reinstatement of narrow band PFR through the *Mandatory Primary frequency response* rule led to a dramatic improvement in frequency performance from late 2020. Following on from that, the AEMC’s *Primary frequency response incentive arrangements* rule confirmed mandatory PFR as an enduring requirement and established a framework for frequency performance payments. These new incentive arrangements will commence from 8 June 2025 and reward market participants whose plant responds to help control frequency around 50Hz.

The draft FOS confirms and amends the required frequency settings during normal operation, these include:

- **Confirmation of a frequency target of 50Hz** — the draft FOS includes additional confirmation of the 50Hz frequency target in the NEM, consistent with the engineering assumptions that underpin the power system.
- **No change to the normal operating frequency band (NOFB) or normal operating frequency excursion band (NOFEB) for the mainland and Tasmania** — the draft FOS maintains the NOFB as 49.85-50.15Hz and the NOFEB as 49.75-50.25Hz. These bands define the allowable range for power system frequency in the absence of contingency events.
- **Confirmation of the PFCB in the FOS** — the draft FOS confirms the setting of the PFCB as 49.985-50.015Hz, consistent with the current settings in the NEM.

This element of the draft determination is supported by advice from AEMO and the results of power system modelling undertaken by GHD which shows that provision of narrow band PFR by the bulk of the generation fleet delivers effective control of system frequency, increased power system resilience, and reduced aggregate costs for frequency control.

Removal of requirement to correct for accumulated time error

The draft FOS removes the limit on accumulated time error while retaining the requirement for AEMO to monitor and report on time error. This change would remove the obligation on AEMO to maintain time error within a preset range, which would provide AEMO with the flexibility to adjust its systems over time.

Key dates and proposed implementation arrangements

The Panel proposes that, following the publication of the final determination by 7 April 2023, the revised FOS would take effect on 9 October 2023. This aligns with the commencement of the new market ancillary service arrangements for very-fast contingency FCAS. The Panel understands that the new requirements in the FOS for managing RoCoF following contingency events would help AEMO determine pre-contingent inertia levels as an input to determining the required volume of very-fast FCAS.

The Panel recommends that a follow-up review of the FOS be planned to commence in the first half of 2027, allowing for further operational experience with new market and regulatory arrangements in place.

Table 1: Indicative review timeline

MILESTONE	DATE
Publish issues paper and terms of reference	28 April 2022
Public forum — Issues paper	27 May 2022
Close of submissions — Issues paper	9 June 2022
Receive draft AEMO advice	30 September 2022
Publish draft determination and Draft FOS	8 December 2022
Close of submissions — Draft determination and Draft FOS	2 February 2023
Publish Final determination	By 7 April 2023
Proposed implementation date for the revised FOS	9 October 2023

For information contact:

AEMC Director, **Sebastien Henry** (02) 8296 7833

AEMC Senior Adviser, **Ben Hiron** (02) 8296 7855

Media enquiries: media@aemc.gov.au

8 December 2022

The proposed implementation date for the revised FOS is 9 October 2023.

This aligns with the date for commencement of new very-fast contingency services.