

2022 Frequency operating standard review

Issues paper for Frequency operating standard review published

The Reliability Panel has published an Issues paper for the review of the frequency operating standards (FOS). The Issues paper outlines a number of issues that the Panel has identified for investigation in light of the ongoing energy market transformation, as conventional synchronous generation is progressively replaced by inverter-based technologies such as wind, solar and batteries.

This is the first step in an extensive consultation process that will be undertaken over the course of the FOS review. Submissions are requested by 9 June 2022.

The FOS is a key component of NEM frequency control frameworks

The FOS defines the range of allowable frequencies for the national electricity market (NEM) under different conditions. This includes during normal operation and following contingency events, such as the unexpected disconnection or failure of a large generator, load or transmission element.

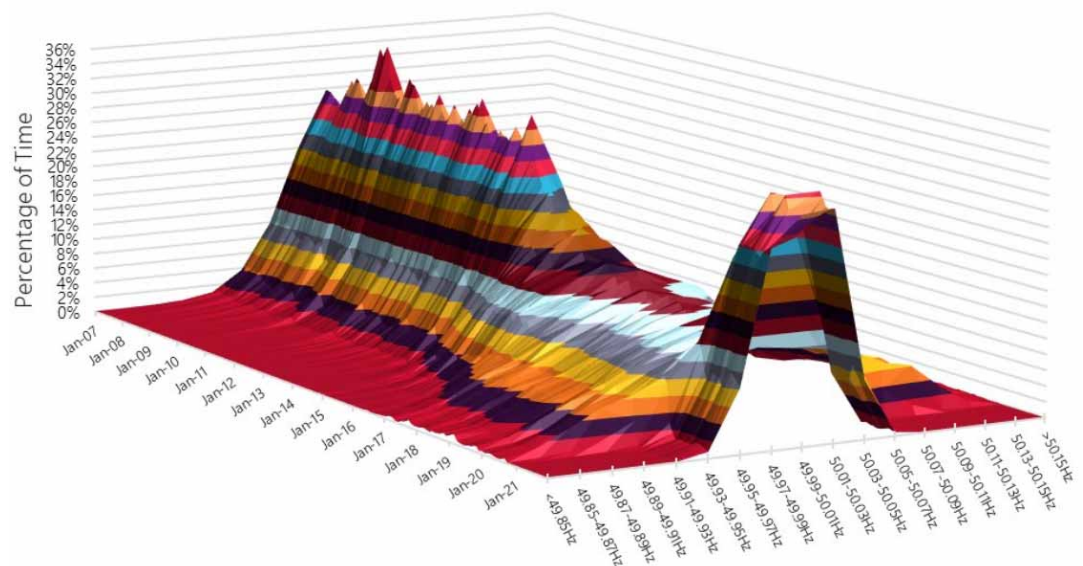
Power system equipment, including generators, transmission lines and associated plant may disconnect from the power system if the system frequency becomes unstable and changes too quickly, or varies too far from 50 Hz. This can result in the separation of regions from the NEM, disconnection of load and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

AEMO is responsible for maintaining the power system within the ranges set out in the FOS. It does this by procuring frequency control ancillary services (FCAS), applying constraints to the dispatch of generation, and through the coordination of emergency frequency control schemes that respond to larger disturbances.

Frequency performance has improved in the NEM

Power system frequency performance in the NEM during normal operation degraded significantly over the period 2015 – 2019. This degradation of frequency performance was observed in a widening of the distribution of frequency during normal operation, an increased incidence of oscillations in the power system frequency, and a decrease in the resilience of the power system to non-credible contingency events.

In late 2020, AEMO commenced the coordinated implementation of changes to generator control systems consistent with the *Mandatory primary frequency response rule 2020*. This has resulted in a significant improvement in the control of power system frequency performance during normal operation, as generators are now more responsive to small changes in power system frequency. This impact is illustrated in the figure below.



Source: AEMO, *Frequency and Time Error Monitoring — Q4 2021*, February 2022, p.6.

The review will help prepare for the future NEM

This review of the FOS is part of a broader program of regulatory reform relating to essential system services that progresses the Energy Security Board’s (ESB) recommendations in the post-2025 work. This work notes that the shift to new technologies and renewable generation is happening at speed and the need for reform is urgent as we lay the foundations for Australia’s new energy future, ensuring power system security by “strengthening the grid”.

The drivers for this review have been identified through related work undertaken by the AEMC and AEMO. This includes the AEMC’s assessment of rule changes relating to frequency control frameworks in the NEM and AEMO’s *Engineering framework*, which seeks to identify the operational requirements for the future NEM.

The Panel will be considering several changes to the FOS

There are four key issues that the Panel has outlined in the issues paper which it will be considering as part of this review. The issues paper sets out the approach to the review and requests stakeholder feedback on the issues for consideration.

Settings in the FOS for normal operation

Despite the recent improvements in frequency performance, the Panel recognises that there is an opportunity to redefine and improve the way the FOS specifies the requirement for frequency performance during normal operation. Recent advice from AEMO, in its technical white paper - *Enduring primary frequency response requirements for the NEM*, identified a need to revise the frequency operating standards that apply during normal operation to reflect the goal for frequency to be controlled more closely to 50Hz.

The potential inclusion of standards for RoCoF in the FOS

As the dominance of synchronous machines in the power system decreases, the level of synchronous inertia in the power system is expected to reduce. Power system inertia acts to limit the rate of change of power system frequency following a sudden change in the balance of generation and load on the power system, as is caused by contingency events. Therefore, as system inertia decreases, there is an expectation that the rate of change of frequency (RoCoF) following contingency events will increase.

The FOS does not include any limits with respect to RoCoF. The Panel notes that a system standard for RoCoF would help define the requirements for the secure operation of the power system, in the context of declining levels of power system inertia. This would also inform the specification and procurement systems for Fast frequency response (FFR) services which help to respond to contingency events during low inertia operating

conditions. We are interested in stakeholder views on this.

The settings in the FOS for contingency events

An important consideration as the power system transforms is the changing nature of operational risks that must be managed to maintain the system in a secure operating state.

The settings in the FOS for contingency events provide the foundation for the operational measures taken by AEMO to maintain the system in a secure operating state such that it can be resilient to disturbances caused by unexpected equipment failures. The Panel intends to investigate opportunities to update the FOS to help manage the increasing risks to power system security identified by AEMO through the Engineering framework and related studies.

The Panel is considering the following issues related to the settings in the FOS for contingency events:

- The frequency bands for credible contingency events.
- The frequency bands for non-credible contingency events.
- Limits on the maximum allowable credible contingency event.

The limit on accumulated time error

Time error is a measure of the accumulated time the power system has spent above or below exactly 50 Hz. If the real power system frequency is persistently above or below 50 Hz, even by a small amount, then the actual flow of energy in the system may differ slightly from that assumed through the energy market. Over time such variations, left unchecked, can accumulate to have a material financial value.

In order to correct any accumulated time error, AEMO coordinates the delivery of regulating services to run the power system marginally above (or below) the nominal frequency of 50 Hz for a period of time.

In 2017, the Panel determined a revised FOS and increased the limit for accumulated time error in the mainland from 5 seconds to 15 seconds, in line with the limit for Tasmania. This review presents an opportunity to review the appropriateness of this limit and consider further revisions, to balance the benefits of limiting accumulated time error with the costs of dispatching regulation services to undertake time error correction.

Key dates

Table 1: Indicative review timetable

MILESTONE	PROPOSED DATE
Publish Issues Paper and Terms of Reference	28 April 2022
Public forum	May 2022
Close of submissions to the Issues paper	9 June 2022
Publish Draft Determination	November 2022
Publish Final Determination	By 7 April 2023

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The Panel is now seeking stakeholder input to the 2022 FOS review.

Submissions from interested parties are requested by Thursday 9 June 2022.