

Australian Energy Market Commission
PO Box A2449
SYDNEY SOUTH NSW 1235

Lodged online: www.aemc.gov.au

9 June 2022

REL0084 – Review of the Frequency Operating Standard

The Australian Energy Council (AEC) welcomes the opportunity to make a submission to the Reliability Panel's (RP) *Review of the Frequency Operating Standard (FOS)*.

The Australian Energy Council is the peak industry body for electricity and downstream natural gas businesses operating in the competitive wholesale and retail energy markets. AEC members generate and sell energy to over 10 million homes and businesses and are major investors in renewable energy generation. The AEC supports reaching net-zero by 2050 as well as a 55 per cent emissions reduction target by 2035 and is committed to delivering the energy transition for the benefit of consumers.

Timing, Scope and Assessment Framework

In July 2020 the AEC [wrote](#) and presented to the Reliability Panel that the Normal Operating Frequency Band (NOFB) FOS should be immediately reviewed. The frequency at that time was still compliant with FOS (frequency to remain 99% of time in NOFB) yet all parties nevertheless considered the ongoing performance unacceptable, and, as a result, approaches were being adopted to improve it without knowing what the desired objective was.

It remains the AEC's firm that the FOS should have first been reset to an acceptable standard, justified on thoughtful trade-offs, and only then should new approaches have been implemented, targeted at meeting the new standard.

In the AEC's mind the AEMC and Panel have approached the question in the wrong sequence: a heavy-handed rule was imposed on the market in order to obtain an unspecified outcome, and only now, after this has already been applied, is the desired outcome of the rule being considered. It is now unavoidable that the standard is going to be influenced by the currently very tight frequency, despite there being no science to support this as the optimum.

Thus the AEC considers the NOFB FOS to be the most urgent matter and welcomes its belated review.

The AEC also supports the inclusion of these other matters which are appropriate to consider at this time:

- Primary Frequency Control Band (PFCB)
- Rate of Change of Frequency (RoCoF);
- Maximum Contingency Size; and
- Time Error.

The AEC considers the suggested assessment criteria comprehensive and largely appropriate. The AEC notes that all of the Panel's standards involve a tension between power system security and cost. This seems to be encapsulated between criteria one and three, which might be better expressed in one to reinforce the fact that additional security always comes at a cost.

Assessing the value of security economically is never straightforward, but it is essential as the panel must ultimately quantify its judgement. This requires assessing probabilities of a major system disturbance, such as a system black, at different standard levels and multiplying that probability by the cost of the disturbance. If, say, the proponent of a tighter standard is unable to quantify such a probability, then it is not in a position to propose a new standard.

The AEC is unsure if “Appropriate risk allocation” is relevant to standard setting. This criterion seems more correctly applied to market designs that attempt to deliver the standards rather than the standards themselves.

Normal Operating Frequency Band

Like all standards, the NOFB involves a trade-off between security and cost. The Panel needs to find the benefits of a tight frequency standard first qualitatively, and then back that up economically. At the same time, it needs to assess the cost in delivering increasingly tight frequency standards.

The Issues Paper’s narrative raises some issues of concern to the AEC in particular the discussion in page 29.

Firstly, the thinking is clearly being affected by the outcome of the Mandatory PFR implementation, which is drawing the Panel into observing this as a comfortably stable frequency characteristic that should be maintained. Yet as noted above this characteristic is simply the outcome of an oppressive obligation on the current generation fleet without any supporting evidence that it represents the appropriate trade-off. It is almost certainly inefficiently tighter than the optimum. This is the danger of implementing a reform *ahead* of specifying its objective through the FOS.

Instead, the panel should disregard the current performance and approach the question from first principles: if you had no frequency history, what standard would you adopt going forward?

For the cost side of the equation, the AEMC has its 2021 survey information from Greenview Consulting, however this was largely assessed from the costs of controlling frequency from the current, steam-dominated fleet. As the FOS will live on, we should consider the additional maintenance costs as steam plant ages and also the likely providers of future PFR, being large-scale batteries. Fortunately, the latter is simpler to perform: manufacturers provide determinist cycling costs that can be applied to frequency control mileages. If we assume all PFR is battery sourced, it is possible to estimate the cost of different standards.

The benefit side is more complex. As stated previously, it is incumbent on those who prefer tighter frequency performance to identify and quantify exactly what system security benefits result from tighter standards such that the Panel can compare them to their costs of delivery.

Secondly, the discussion seems to unintuitively identify *negative* costs of a tight frequency performance¹. The AEC considers this incorrect:

- The suggestion that generation plant suffers wear and tear “due to excessive movement caused by governor response to frequency deviations” is only considering part of the cost question. This is confused by a historical situation where mileage was concentrated on a small number of generators. Smearing wear and tear over more generators makes it less obvious but does not remove it. Instead, the Panel should assess all mileage as having a cost, even if distributed, ideally using the battery technique described above. This way a

¹ Page 29

proportional relationship can be formed between frequency standard to required mileage, and then required mileage to total cost.

- The third and fourth rationales that a tighter frequency band reduces Frequency Control Ancillary Services (FCAS) markets costs is particularly concerning. This appears to endorse the distortion of existing markets for valuable services as a *benefit* and is quite inappropriate.
- The possibility of the withdrawal of voluntary PFR was an often-claimed concern of AEMO's in proposing its Mandatory PFR rule change. Yet this has no relevance to the Panel's determination of a new standard whose role is to find a balance between security and cost in frequency performances. Whilst the AEC considers the matter irrelevant, it notes as an aside that AEMO's observation has only one logical conclusion: that all PFR should be adequately compensated.

With respect to finding the economic optimum, the AEC supports the proposal as presented by the Panel to the 3 June Frequency Technical Working group that independent advice be obtained to supplement the technical advice already received from AEMO.

Form of standard

The AEC considers finding the optimal level of the standard is the predominant issue and the form of its expression second-order, which should be determined subsequently.

AEMO's recommended Option 2 of a Normal Operating Preferred Frequency Band (NOPFB) of ± 0.05 Hz has not been justified economically and seems to have been proposed as something that would sit somewhat outside current performance. Again the AEC considers this is the wrong way around. Instead the optimum standard should be first derived economically, followed by tuning mechanisms for its delivery such as via the PFCB.

If a NOPFB were introduced, it is not clear what function the residual wider NOFB would then be performing.

Of the options provided, Option 5 is the form of expression most similar to the existing expression and seems the simplest way forward.

Primary Frequency Control Band

The AEC supports the PFCB being set by the Panel rather than through the Rules, where it can be adjusted consistent with other parameters and with respect to observed performance of non-mandatory arrangements.

In September 2020 the AEC [submitted](#) to the Primary Frequency Response (PFR) Incentive Arrangements rule change a recommended pathway for PFR. That pathway accepted that a tight mandatory PFR was to be implemented with a very narrow PFCB, but, following implementation of an appropriate incentive mechanism, the PFCB should be widened such that mandatory PFR operated only as a last resort backstop for major contingencies. The AEC's preference was ultimately for a wide deadband, for example ± 0.5 Hz.

This remains the AEC's view.

The AEC recognises that mandatory PFR has only recently been implemented and no incentive arrangement currently exists. Therefore it seems unlikely the Panel would recommend a widening of

the PFCB in the short-term. However, in the PFR Incentive Arrangements rule change we are now seeing a very promising incentive arrangement design finalising, with implementation set for mid-2024. The AEC considers that design highly consistent with the recommendations of its pathway, laying the groundwork for relaxing PFCB. As per that pathway, the Panel could act conservatively, by overlapping the incentive arrangement with the current PFCB, and relaxing it after an initial phase-in period.

The AEC suggests the Panel now lay out a path for progressive relaxation of the PFCB. For example, a moderate deadband in mid-2025 and a wide deadband in mid-2026.

Rate of Change of Frequency

The AEC supports this investigation and can see attractions in its specification. The AEC agrees with the Panel that it would be a valuable objective for tuning the future very fast FCAS and inertia markets. By doing this, the Panel is correctly sequencing the work: setting the preferred outcome *before* the mechanisms to deliver it are implemented.

It would seem to be beneficial to have one single rate clarifying a known operating envelope, for:

- Connection requirements – noting new generators are already subject to a standard so one effectively already exists;
- The expected response capabilities of under frequency load-shedding;
- The expectations for operating the grid itself through the operation of very fast FCAS and inertia acquisition.

It is recognised that some generators have, for historical reasons, low tolerance to RoCoF which are outside present connection standards. This needs to be taken into account, but should not necessarily set the maximum RoCoF. If a tighter standard is introduced than these plants can tolerate, it would be necessary to grandfather their connection.

Frequency Bands for Credible and Non-Credible Contingency Events

The AEC is generally comfortable with the existing settings for post-contingent frequency and is unaware of any concerns in this regard. The paper has not identified any. It may be appropriate to de-prioritise this area.

One reflection worth pursuing is on the customer side. The Panel should investigate ways of surveying whether large sensitive loads are capable of riding through contingency standards. One outcome of the Review could be a line of research into whether the FOS is adequately understood at that customer end, and if not, how its prominence can be increased.

Maximum Contingency Size

There is a natural desire to plan the grid and connections with larger single contingencies in order to reduce cost, but in doing so this reduces the grid's resilience and/or forces it to be operated more conservatively. Networks and AEMO already apply maximum contingency sizes when planning grid enhancements or connecting generation and load. However only in Tasmania is there a clear, fixed MW maximum.

Given that such limits are already being applied, there are attractions in setting a transparent maximum contingency size that would simplify investment. It seems likely there would be one limit for the mainland NEM and smaller limits in South Australia and North Queensland.

As the paper notes, at the same time such an approach would limit flexibility where it would be appropriate to apply a different limit. This may be a place for the Panel to promulgate recommended

sizes rather than mandated sizes, and that where networks apply a different limit, that they are obliged to publish rationales.

Time Error Standard

The AEC supports the review considering whether an accumulated time error standard remains necessary. The AEC agrees that a consistently biased frequency is indicative of suboptimal control in the power system that requires correction. The AEC strongly supports monitoring time error closely for this purpose. AEMO's existing approach of increasing FCAS regulation volume when time error approaches the standard is one appropriate way to improve control in the short-term.

The AEC however doubts the value in intentionally offsetting the frequency from 50Hz in order to resynchronise electrical time. This seems to have no obvious value, and acts counter to generators obliged to provide very low deadband PFR. It also introduces error into causer-pays calculations.

The AEC does not consider the very rare residual customer use of synchronous clocks to be a relevant concern. Far more accurate time pieces have been available to customers at trivial cost for decades and to which all time-sensitive applications have long-since converted. Furthermore, during large time errors, AEMO already unilaterally resets electrical time without customer complaint.

In order to retain the diagnostic value of electrical time, the AEC recommends that rather than simply abolishing it, it could be replaced with a measure such as rate of change of electrical time. This could be, say no more than delta XX seconds over YY hours. Approaching the new standard would likely trigger similar actions to the current – increasing FCAS regulation quantities, but without intentionally biasing target frequency – and exceeding it would lead to reporting and investigations into how to avoid the causes in future.

Any questions about this submission should be addressed to me directly, by email to ben.skinner@energycouncil.com.au or by telephone on (03) 9205 3116.

Yours sincerely,



Ben Skinner
General Manager, Policy