2 Feb 2023

Charles Popple
Reliability Panel
Australian Energy Market Commission

Submitted online

Dear Charles

AEC Submission to Frequency Operating Standard Draft Determination

The Australian Energy Council (AEC) welcomes the opportunity to make a submission in response Frequency Operating Standard (FOS) Draft Determination.

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.

Our submission includes as an appendix some expert opinion from Provecta Consulting's Don Parker on matters in the Panel's advice by GHD Advisory that was relied upon by the Panel for its draft recommendation on Primary Frequency Control Band (PFCB).

The AEC broadly supports the Draft Determination's recommendations on Contingency Events and Time Error. The AEC does not support the leaving the present Normal Operating Frequency Band (NOFB) and Primary Frequency Control Band (PFCB) unchanged.

Frequency Performance During Normal Operation

Normal Operating Frequency Band standard
The AEC has engaged closely on NEM frequency control reform since 2018. The AEC then concurred with the general view that NOFB performance had become unacceptable and reform was required to tighten the normal condition frequency distribution including through the use of some Primary Frequency Response (PFR). However the AEC observed an evident paradox that this unacceptable distribution nevertheless remained compliant with the relevant standard of remaining within NOFB standard for 99% of the time.

Observing this paradox, the AEC wrote to the Panel that it required rectification through an urgent FOS review. This review would identify the new target NOFB outcome (through the Panel's role in identifying the optimal cost vs security trade-off), and, having developed a new target, work could begin on the best means to deliver it.

Instead reform has evolved in the reverse sequence to good regulatory practice. In 2020 a heavy-handed mandatory obligation was placed on a wide range of competitive equipment to achieve an undefined objective, and only then, having dramatically changed the frequency outcome, in 2022-23 is the Panel contemplating desired outcomes.

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Yet the Draft Determination has still not identified that desired outcome. Instead of determining a new economically based outcome standard for the NEM's acceptable frequency distribution, it has instead focused its work on one of the input tuning parameters associated with the mandatory obligation. Indeed it proposes perpetuating the inconsistency between this tuning parameter and the outcome standard.

The AEC considers that the cost-benefit analysis being performed by the Panel should instead target the output standard: the NOFB standard of 99% of the time being within +/-150mHz. This requires re-specification. Like other Panel outcome standards, the NOFB should be set to the optimal trade-off between security and cost, and only then should the means to deliver it be determined.

An example of a such a form of delivery would be mandatory PFR and its associated input parameters, primarily the PFCB. The AEC therefore recommends that the work performed to date by the Panel be redirected into re-specifying the NOFB rather than the PFCB. Work on the PFCB (or any other means to deliver the NOFB) would come later, consequential on the new NOFB.

The draft determination did not engage with the four options for the NOFB suggested by AEMO and presented in the April 2022 Issues Paper. Of those options, the AEC does not support options 1 (qualitative criteria), 2 (additional frequency band within NOFB) nor 4 (mileage standard). It does support resetting the NOFB with adjustments to its width and/or time proportion (99%). Specifying a more sophisticated structure such as option 3 (frequency distribution standard deviation) may be useful.

Having set a clear outcome standard, the Panel could then lay out a process where input parameters, such as the PFCB, could be retuned regularly in order bring the system closer to that outcome. The AEC considers it incorrect to lock in this tuning parameter for five years at this time.

Primary Frequency Control Band

Noting the AEC disagrees with the Panel's approach in adjusting an input parameter without first determining an outcome objective, the AEC has the following comments on the Panel's work on PFCB.

The advice the panel commissioned from GHD appears to have been engaged to assess only PFCB, and in that manner considered only incremental changes to the existing +/-15mHz PFCB. It did this by attempting to balance costs of greater governor control at plant level with the greater resilience of having the system very close to 50Hz pre-contingency.

To assist it in interpreting the GHD report within that limited scope, the AEC sought advice from Provecta. Although only an initial view, Provecta identifies:

- Burdens placed on thermal plant by the narrow PFCB that were not fully identified by GHD; and
- System-wide frequency skew and wobble that appear worsened by the very tight PFCB.

Provecta consider these costs may materially reduce with even a very slight PFCB widening, to say +/-30mHz.

With respect to the benefits, the AEC agrees that, all else being equal, a system with a pre-contingent frequency close to 50Hz should be more resilient in the event of an extreme contingency. However in valuing resilience GHD contemplated extreme contingent excursions of the order 1000-2000 mHz. The loss of resilience resulting from a very small increase in the PFCB to, say, +/-30mHz would presumably be immaterial to this contemplation, and likely to be much less than the material savings that would come about through this relaxation.

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Matters identified by Provecta

In relation to the benefits of a narrow PFCB, GHD has noted it should reduce costs associated with Regulation Frequency Control Ancillary Services (FCAS). The AEC objects to the description of an uncompensated mandatory service displacing a market mechanism as beneficial, but Provecta goes further in noting that the two are not technical equivalents in the way portrayed here, and do not substitute.

AEMO has provided considerable material on the system frequency distribution post the implementation of narrow deadband mandatory PFR. Whilst unquestionably a very tight distribution, there are two notable imperfections to the distribution for which we understand that AEMO is unsure of the cause:

- A "wobble" in terms of a slow frequency cycling with a period 18-24 seconds, and
- A "skew" in terms of an asymmetry in the distribution.

From its external perspective, Provecta observes that there are likely to be issues in:

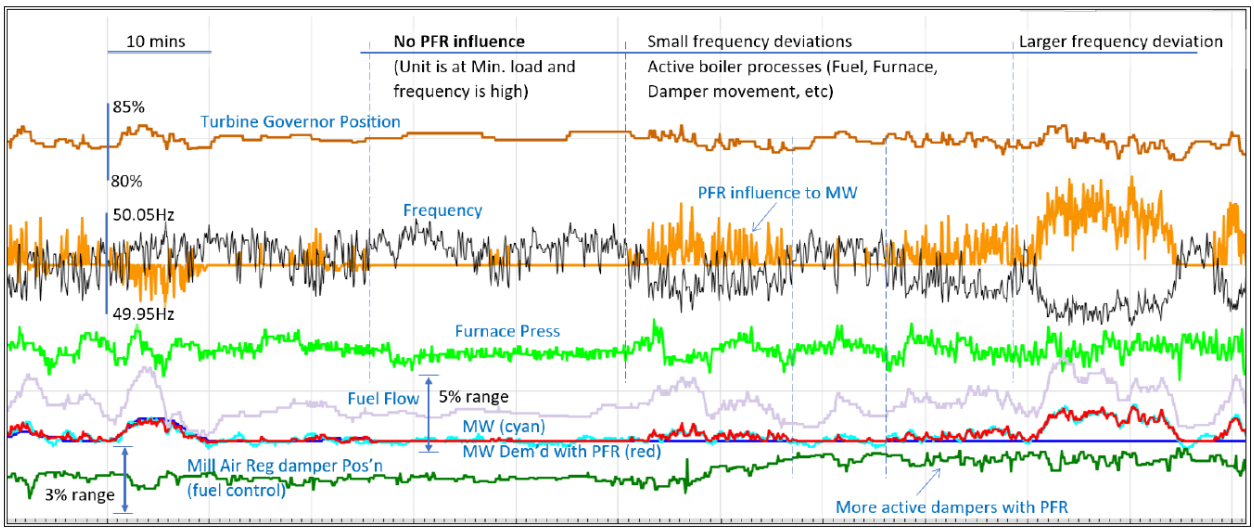
- the setup and tuning of AEMO's AGC controller, and
- Regulation FCAS design and performance.

These issues require additional work that is clearly outside the Panel's role, but are unfortunately materially confusing the Panel's work. Provecta suspects the skew and wobble could be removed by

- Improving the AGC controller and FCAS design and performance, AND
- Either:
    - Slightly increasing the mandatory deadband e.g. +/-30mHz for all generators OR
    - A more sophisticated deadband, e.g. a less severe, 10% droop, between +/-15 and +/-30mHz, then 4% beyond +/-30mHz

With respect to the latter point, Provecta notes that in 2009, when PFR was widely provided on a voluntary basis, generators typically applied deadbands of +/-30 to +/-50mHz and resulted in a frequency distribution not observably wider than exists today with a +/-15mHz.

Steam turbines are experiencing considerable costs, wear and loss of thermal efficiency in caused by the numerous small movements required to support the current PFCB which Provecta consider to have been underestimated. Figure 7 (reproduced below) is real data drawn from a large NEM unit as it moves up from a minimum load point at the middle of the graph. Whilst at minimum load (a period when the frequency was above 50.00Hz) the unit was stable (as mandatory PFR does not require footroom). However upon moving up from minimum load, MW output varies continuously with frequency, and as a result, many mechanical parts of the unit are also moving.



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Provecta is concerned that these real costs were not fully captured by GHD. Provecta took the view that even quite a small relaxation in deadband would likely materially lower them.

Settings for Contingency Events

Rate of Change of Frequency
As per its earlier submission, the AEC supports introduction of a ROCOF standard which may

- Assist connecting parties in understanding expected system performance against the resilience of their own equipment;
- Assist networks in determining acceptable Under Frequency Load Shedding (UFLS) speed;
- Assist in determining parameters for a future inertia market.

Maximum Contingency size
In its earlier submission, the AEC supported investigation of a maximum contingency size to simplify planning decisions and in doing so make the rejection of unacceptably large connection configurations appear less capricious. On consideration of the rationale presented in the Draft Determination, the AEC concurs that the FOS is not necessarily the best place to promulgate a maximum contingency size.

Nevertheless, the AEC considers greater predictability would be useful for investors, such as a published list of maximum acceptable contingency sizes in different locations of the NEM. Whilst this would not be a Panel responsibility, it could be a recommendation from the final determination.

Time Error

As per its earlier submission, the AEC agrees with the Panel that the customer justification for a time error standard is redundant. Attempting to correct for time error through an intentional set point bias seems inconsistent with mandatory narrow deadband PFR, and will confuse deviation payment settlement. For these reasons the AEC supports the Draft position.

However as stated in that submission, time error is a useful diagnostic tool with respect to demonstrating whether there is bias in normal operating frequency performance. The Draft Determination is silent on this matter. If the standard is simply withdrawn, it is likely that time error will no longer be monitored. It may be appropriate for the Panel to promulgate a reporting standard, say, based on exceedance of a delta time error in less than a specific period.

Any questions about this submission should be addressed to the writer, by e-mail to ben.skinner@energycouncil.com.au or by telephone on (03) 9205 3116.

Yours sincerely,

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Australian Energy Council

Appendix: AE04-AECO-RPT001 Review of NEM Frequency Operating Standard GHD consultancy report by Provecta Rev 2 23/12/2022.