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Mr Charles Popple
Mr Stephen Clark
Mr Joel Gilmore
Mr Craig Memory
Mr Ken Harper
Mr Keith Robertson
Mr Ken Woolley
Mr Peter Price
Ms Gabrielle Kuiper
Ms Melissa Perrow
c/- Australian Energy Market Commission
GPO Box 2603
SYDNEY NSW 2001



EnergyAustralia

LIGHT THE WAY

EnergyAustralia Pty Ltd
ABN 99 086 014 968

Level 19
Two Melbourne Quarter
697 Collins Street
Docklands Victoria 3008

Phone +61 3 8628 1000
Facsimile +61 3 8628 1050

enq@energyaustralia.com.au
energyaustralia.com.au

Lodged electronically via <http://www.aemc.gov.au>

Dear Reliability Panel Members,

FREQUENCY OPERATING STANDARDS ISSUES PAPER (REL0084)

EnergyAustralia (EA) welcomes the opportunity to comment on the Reliability Panel's (RP's) Issues Paper on the Frequency Operating Standards (FOS) in the National Electricity Market (NEM). EA is one of Australia's largest energy companies with around 2.4 million electricity and gas accounts in NSW, Victoria, Queensland, South Australia, and the Australian Capital Territory. EA owns, contracts and operates a diversified energy generation portfolio that includes coal, gas, battery storage, demand response, pumped hydro, solar and wind assets. Combined, these assets comprise 4,500MW of generation capacity.

EA is dedicated to building an energy system that lowers emissions and delivers secure, reliable and affordable energy to all households and businesses. This requires being a good neighbour in the communities we operate in. We, therefore, recognise the value in working with Aboriginal and Torres Strait Islander peoples as the traditional custodians of this land. We acknowledge and respect their continued connection to all aspects of Country.

EA is appreciative of the RP's efforts to investigate whether current FOS settings are appropriate in light of ongoing and significant market, technological and operational change. Ensuring these settings are fit for purpose will be a vital enabler of a rapid and robust energy market transition.

The Normal Operating Frequency Band Must Balance Security and Economic Concerns, Now And Into The Future

EA strongly supports revising the FOS settings for normal operation. The rationale is most clearly illustrated in Figure 2.2 of the Issues Paper. That is, with all pre and post mandatory Primary Frequency Response (PFR) frequency distributions meeting the FOS, despite their starkly contrasting economic and security implications.

It might be reasonably argued that frequency performance before the implementation of mandatory PFR was undesirable and that current settings are superior from a security standpoint. However, these settings are almost certainly not optimal from an efficiency

standpoint. For example, and as acknowledged by the RP in Figure 2.5, the minimum daily percentage of time within the Normal Operating Frequency Band (NOFB) on the Mainland is now averaging almost 100%, even when contingency and load events are included.

Unfortunately, the economic implications of current settings have never been thoroughly quantified. Greenview Consulting provided cost estimates based on generator survey data after the mandatory PFR changes in 2021. While useful, this was based on the current fleet technology and generation mix. Both will change markedly in future, thus rendering such estimates less valuable and accurate. Moreover, although AEMO has provided guidance on the technical benefits of tighter frequency control, no economic assessment quantifying the value of such settings has occurred.

Even if the economic superiority of current settings could be demonstrated, the effectiveness of mandatory PFR in maintaining stable frequency performance is likely to decline over time. That is, with the continued retirement and replacement of large-scale, frequency responsive synchronous plant with Variable, Renewable Energy (VRE) generation and Distributed Energy Resources (DER). This is a conclusion supported by GHD who see frequency performance deteriorating to levels seen before the introduction of PFR by the mid to late 2020s unless other measures are put in place¹.

These issues and trade-offs have been acknowledged by the Australian Energy Market Commission (AEMC) as part of the PFR Incentive Arrangements rule change. We strongly support this work. However, we highlight the difficulty of incentivising efficient PFR delivery, and optimal frequency outcomes more broadly, when the desired NOFB frequency settings have not been debated or determined.

We, therefore, welcome the RP collaborating with the industry to review the options raised in the Australian Energy Market Operator's (AEMO's) earlier Technical White Paper. We agree that Options 1, 3 and 4 should not be pursued further for the reasons provided on pages 23 and 24 of the Issues Paper. However, we do not consider that Option 2 can be supported.

Although being a transparent metric consistent with current FOS descriptions, it would require an additional frequency band to be created in the FOS and entrench existing PFR settings. As noted above, the value of such settings has not been determined. Keeping them in the absence of a fulsome Cost-Benefit Analysis (CBA) would only risk damaging the RP's well-earned reputation for principled and practical decision making.

Intuitively, striking a balance in frequency performance between the extremes seen before and after PFR will require:

- a widening of PFR settings,
- a narrowing of the NOFB, or
- some combination of both.

Much like the initial mandatory PFR changes, loosening PFR settings by itself would seem to put the operational cart before the regulatory framework horse. We are, therefore, pleased to see the RP cannily highlight an option not considered by AEMO. That of Option 5 - narrowing the NOFB. We strongly agree this option should be investigated further, with exact values to be determined via rigorous, independent economic assessment. This should include consideration of:

¹ GHD, Enduring Primary Frequency Response – Power System Operation and Strategic Regulatory Advice, page ii.

- the trade-offs and synergies possible under various wider PFR settings,
- the technical and commercial realities of both current and future generation mixes, and
- customer insights on acceptable frequency performance.

Lacking such analysis, it is unclear how the optimal balance between security, financial, efficiency and operational concerns can be achieved. Nor how the long-term interests of customers can be maximised per the National Electricity Objective (NEO).

Further Investigation Into A RoCoF Standard Is Supported

We agree with the RP that declining levels of synchronous inertia will be an increasing challenge going forward. It is one of the reasons that AEMO and EA are working together to investigate avenues for real-time inertia monitoring and reporting. The implementation of which could provide benefits in both operational and investment timeframes. For example, in terms of more efficient dispatch to support inertia and Fast Frequency Response (FFR) along with further information to underpin business cases for essential system services investment. In particular, if the Australian Energy Council's (AEC's) inertia markets rule change proposal is implemented.

A formal Rate of Change of Frequency (RoCoF) standard could provide another useful tool for keeping frequency stable in the face of declining inertia levels. For example, by improving generator fault ride through, the effectiveness of emergency control schemes and delivery of contingency Frequency Control Ancillary Services (FCAS). However, as highlighted by the RP, it is not clear that these benefits will outweigh the associated implementation, operational and procurement costs.

It is also unclear what specific form the standard should take. Although a Hz/s standard under both credible and non-credible operation seems sensible, the exact settings will need careful consideration. The characteristics of each electrical sub-network can vary widely meaning what may be appropriate in one context may not be in another. The differences in South Australian and Tasmanian RoCoF settings are an excellent example in this regard.

Technical generator considerations also need to be factored in. Setting too high a standard that existing plant would struggle to meet would only exacerbate the risks and costs of a disorderly transition. However, it may also retard investment in new firming generation which would similarly undermine an efficient and effective transition.

We understand several European jurisdictions have imposed a maximum 3Hz/s limit for both these and related network protection reasons. Grandfathering arrangements might also be appropriate to balance competing security, technical and economic factors. However, the extent to which either is required needs further assessment in conjunction with quantification of the other costs and benefits noted above.

It Is Too Soon To Tell If Further Changes Are Required To Contingency Settings

The RP is right to highlight the implications for FOS contingency settings from recent changes introduced by the Operational Resilience rule change. We acknowledge these changes have been made to better support system security and frequency outcomes. However, they are complex, and it is not yet clear how AEMO will apply its newfound powers in practice. In this sense, we consider it too early to tell whether consequential changes to the FOS are also required as a result.

We do, however, support the proposal to re-examine the maximum allowable credible contingency limits on both the Mainland and Tasmania. This includes seeking independent economic evaluation to support any case for change. Doing so will help to clarify whether any glass ceiling exists, and the economic implications thereof, from connection restrictions imposed by Transmission Network Service Providers (TNSPs) and AEMO. For example, from any resultant inefficient under or oversizing of generation plant.

Notwithstanding this support, we caution that any changes need to be technically feasible when considered against both the current and future generation fleet. As above, failure to do so would only result in a more disorderly transition.

Accumulated Time Error Should Be Modified To Improve Its Diagnostic Value

We support the RP investigating the future settings for Accumulated Time Error (ATE). Although acknowledging the potential financial implications from ATE, we note recent corrective action by AEMO has simply seen it reset to zero. That is, without any corresponding financial or physical consequences. This is in preference to a systematic biasing of system frequency by adding an offset which introduces errors into causer pays calculations and works against generator obligations to provide PFR.

In conjunction with the move away from synchronous clocks, these outcomes might suggest ATE is not worth worrying about going forward. However, we contend it has significant diagnostic value. For example, by indicating:

- the amount of skew in control systems,
- overall system frequency drift,
- the need for regulation FCAS procurement, and
- as an additional measure to verify outcomes of any frequency setting changes. For example, as might be seen from this review.

To maximise this value and improve its ease of consumption, we suggest ATE be reported on a rate of change of time error basis. Any large increases would trigger an AEMO investigation, the details of which should be made public to ensure operational transparency. Depending on the root cause, a range of solutions could then be considered and deployed to correct things as required.

Beyond increasing informational quality, these changes would provide more transparency on factors impacting NEM frequency performance and provide further flexibility to AEMO to manage any persistent deviations more efficiently.

We would very much appreciate the opportunity to hear more of the RP's insights on this consultation and look forward to continued collaboration to achieve effective, efficient and equitable FOS. To arrange a meeting, please contact me on 0435 435 533 or via email at bradley.woods@energyaustralia.com.au.

Regards,

Bradley Woods

Regulatory Affairs Lead