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Mr Charles Popple
Chair, Reliability Panel
Submitted online at: www.aemc.gov.au

Dear Mr Popple

Submission: Draft Determination - Review of the Frequency Operating Standard

CS Energy welcomes the opportunity to provide a submission to the Reliability Panel's (**The Panel's**) *Draft Determination – Review of the Frequency Operating Standard* (**Draft Determination**).

About CS Energy

CS Energy is a proudly Queensland-owned and based energy company that provides power to some of our state's biggest industries and employers. We employ almost 500 people who live and work in the Queensland communities where we operate. CS Energy owns and operates the Kogan Creek and Callide B coal-fired power stations and has a 50% share in the Callide C station (which it also operates). CS Energy sells electricity into the National Electricity Market (**NEM**) from these power stations, as well as electricity generated by Gladstone Power Station for which CS Energy holds the trading rights.

CS Energy also provides retail electricity services to large commercial and industrial customers throughout Queensland and has a retail joint venture with Alinta Energy to support household and small business customers in South-East Queensland.

CS Energy is creating a more diverse portfolio of energy sources as we transition to a new energy future and is committed to supporting regional Queensland through the development of clean energy hubs at our existing power system sites as part of the Queensland Energy and Jobs Plan (**QEJP**).

Key recommendations

The power system is undergoing unprecedented change with the uptake of new generation technology as the system transitions to a lower carbon footprint. This transition will bring changes in how power system security is managed. The Frequency Operating Standard (**FOS**) is *the* integral component of power system frequency control, specifying the bands

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within which system frequency should be managed for an effective and efficient power system. Here frequency is the parameter and frequency control the service to deliver the FOS.

Clause 8.8.1(a)(2) of the National Electricity Rules (**NER**) charges The Panel with the responsibility for determining power system security standards including the FOS. The Draft Determination thus reflects The Panel's integral role in power system security.

In its submission to the *Issues Paper*[1], CS Energy outlined its expectations of the 2022 review of the FOS to include an independent and holistic process, independent and impartial technical analysis, and independent and impartial economic analysis.

While CS Energy commends The Panel for responding to stakeholder calls to engage independent technical advice, CS Energy is disappointed with the quality and completeness of the advice and CS Energy's concerns outlined in its submission to the *Issues Paper* remain pertinent.

CS Energy's response to the Draft Determination is structured in terms of The Panel's categorisations:

- Settings for normal operation and the primary frequency control band;
- Settings for contingency events; and
- Accumulated time error.

Comments have been restricted to those aspects of the FOS that pertain to the mainland.

Settings for normal operation and the primary frequency control band

CS Energy agrees that effective Primary Frequency Response (**PFR**) is critical for robust and resilient power system frequency outcomes and accepts the observed and measured degradation of frequency performance during normal operations as detailed in the Draft Determination.

Efficient and effective frameworks are best developed via a holistic approach that diligently examines both the underlying operational needs as well as the economic outcomes and trade-offs of any decisions. It is The Panel's role to develop these economically efficient metrics, balancing the trade-off between security and cost, and to review the performance of these metrics and how to embed them within the standards' framework. Unfortunately, the Draft Determination continues the narrow and reactive approach of the *Issues Paper*, with the analysis for PFR not progressed beyond prosecuting the need (to which there is no argument) and failing to determine what constitutes "good frequency control" in the evolving power system. For example, rather than exploring the diminishing returns of mandatory PFR and setting appropriate metrics, The Panel continues to insist on instituting a narrow Primary Frequency Control Band (**PFCB**) within the Normal Operating Frequency Band (**NOFB**).

CS Energy considers the proposed ± 0.015 Hz deadband to be extremely onerous and unprecedented in the history of the NEM, and that it focuses on the inputs sought rather than frequency control outcomes. Rather than a preoccupation with the PFCB, The Panel

[1] CS Energy, *Submission to the Review of the Frequency Operating Standard – Issues Paper*, June 2022

should be determining how tightly bound the system frequency should be to 50 Hz.[2] For example, a PFCB standard of within ± 0.015 Hz 99% of the time. This outcome can then be effectively operationalised, and appropriate input parameters set. This would have the added benefit of being fit-for-purpose as the power system evolves.

CS Energy anticipated that the technical assessment engaged by The Panel would be utilised to determine what constitutes good frequency control within the NOFB as well as explore a range of different and feasible options for the FOS, including deadbands wider than ± 0.015 Hz. For this reason, the outputs of GHD's analysis are concerning as the assessment appears to be limited to evaluating the PFCB only through incremental changes to the existing ± 0.015 Hz PFCB. This was achieved by considering the improved power system resilience delivered at what GHD has claimed to be relatively low total system cost.

The Draft Determination states that "*the GHD analysis predicts that wider settings for the PFCB would result in the degradation of frequency performance consistent with operational experience in the NEM during the period 2015 -2020"*[3]. This statement fails to recognise a number of key factors regarding frequency performance that are relevant and important to this consultation. Prior to 2015 the frequency performance was represented by a smooth, normally distributed frequency performance that strongly aligned with the FOS. A key feature was the deadband settings generally within a range of ± 0.030 Hz to ± 0.050 Hz reflecting a coordinated approach for the settings to provide the desired level of frequency performance and where possible avoid undesirable control system interactions.

The Australian Energy Regulator (**AER**) decision in 2015 regarding compliance with dispatch instructions and associated undertaking[4], followed by the Australian Energy Market Commission (**AEMC**) in 2016 deciding not to make a Participant Rule change request[5] resulted in Generator Participants changing their deadbands. This effectively resulted in no primary frequency control in the NOFB. Consequently, there is no surprise in the degradation of frequency performance for the period 2015-2020.

Frequency performance has improved to the extent of maintaining frequency close to 50 Hz under steady state conditions following the implementation of mandatory PFR in August 2020. However, the post PFR implementation frequency performance is not aligned with pre-2015 frequency performance characteristics. There is observed skewness, evidence of up to a ± 0.050 Hz sustained oscillation that on occasions has been observed to have increased up to ± 0.100 Hz. The observed oscillation is most likely a control system interaction between PFR providers. Another key observation is the saturation effect in frequency performance as additional PFR was progressively enabled resulting in diminishing returns in frequency performance. Coupled with the observed oscillation this is deemed as highly undesirable and does not reflect good operating practice.

CS Energy anticipated the independent expert provider, GHD, to address the observed outcomes and inform The Panel to assist in its deliberations on the FOS review. Failing to do so ironically impacts adversely on power system resilience in relation to frequency control. Furthermore, failure to address the observed oscillation will also lead to inefficient outcomes in the proposed PFR Frequency Performance Payments (**FPP**).

CS Energy remains concerned with the conflation of the role of PFR regarding contingency and non-credible contingency events. CS Energy has previously submitted on the need to acknowledge the role of Wide Band Frequency Response (**WBFR**) for frequency deviations

[2] Note during the period 2015-2020 the FOS was effectively not breached during the period but changing performance was observed with frequency distributed towards the edges of the NOFB rather than remain around 50.0Hz under steady state operating conditions.
[3] Reliability Panel, *Review of the Frequency Operating Standard – Draft Determination*, December 2022, p.5
[4] https://www.aer.gov.au/wholesale-markets/enforcement/cs-energy-failure-to-follow-dispatch-instructions-and-offer-obligations
[5] https://www.aemc.gov.au/rule-changes/compliance-with-dispatch-instructions

outside ± 0.50 Hz. WBFR is a form of PFR albeit wide band compared to the narrow band PFCB incorporated in the proposed FOS.

CS Energy thus strongly disagrees with both claims by GHD as follows:

(a) Improved power system resilience

Any narrow setting for PFCB will deliver an increase in system resilience however, in valuing resilience, GHD have incorrectly considered contingent excursions of the order 1000-2000 mHz. Such extreme excursions would not be materially impacted by incremental changes to the PFCB.

Furthermore, since the introduction of mandatory PFR, power system frequency has been exhibiting behaviour that suggests resilience has decreased. As confirmed in the report prepared by Provecta commissioned by the Australian Energy Council (**AEC**) as part of its submission to the Draft Determination,[6] system-wide frequency is displaying:

- A "wobble" in terms of a slow frequency cycling with a period 18-24 seconds, that has not been addressed by AEMO and furthermore it has been indicated that there is no intent to do so; and

- A "skew" in terms of an asymmetry in the distribution.

Thus, it is difficult to see how any contribution to improved power system resilience is realised particularly in view of the above comments.

(b) Delivers lower total system costs for controlling system frequency

GHD has argued that lower total system costs will be achieved through a combination of a reduction in costs due to the narrower PFCB settings as well as lower costs associated with regulation Frequency Control Ancillary Services (**FCAS**).

CS Energy and Provecta do not believe that the costs have been properly considered. Provecta identifies that the burdens placed on thermal plant by the narrow PFCB were not fully identified by GHD and considers that these costs may materially reduce with even a very slight PFCB widening.

CS Energy also considers that it is too early to determine the impact of the current settings on assets, let alone claim a reduction in maintenance costs for units. Each unit's response has been unique, and it is anticipated that the long-term impact of narrow PFCB will vary across the CS Energy portfolio. Some parts of the plant, such as the hydraulic governors and boilers, are definitely "working harder", which may lead to more frequent overhauls and, ultimately a material increase in costs.

Any assessment of costs needs to recognise that it is too soon to accurately identify and articulate the costs associated with power system frequency being held more closely to 50 Hz during normal operation. CS Energy is still determining this cost, although it is expected to not be insignificant.

In terms of the impact of PFR on CS Energy units, it is challenging to assess the maintenance cost due to extra wear and tear, but the more significant risk is that

[6] Provecta report accompanying the AEC submission to the Draft Determination

accelerated wear and tear will potentially cause a fault and a unit trip before preventative maintenance can be carried out during unit overhauls. Furthermore, the AEMC and AEMO should not be relying on participant surveys to conclude that these costs are insignificant in justifying the retention of mandatory narrow deadband PFR, even after performance payments begin in 2025. Participant cost information and risk appetite should be commercial in confidence, and the PFR market design should allow participants to decide to what extent they want to participate, provided a minimum amount of response is provided within ± 0.5 Hz for system security.

The Provecta report supports the CS Energy position that it is not necessary to have all generators responding with the same very narrow deadband to achieve tight control around 50 Hz. Interaction between governors is likely to be contributing to the frequency oscillations resulting in unnecessary and inefficient PFR. Existing coal fired units that will eventually transition will likely experience a change in maintenance strategies as they approach retirement. This may include preferences to reduce income from post 2025 double sided PFR performance payments, by selecting a wider PFR deadband, to strategize provision of PFR and optimise with the associated wear and tear and the risk of plant failures.

Economic efficient level of PFR

The concerns above present a compelling argument for The Panel to consider the economically efficient level of PFR in its review of the FOS. CS Energy implores The Panel to undertake further technical work that reflects a top-down approach and the need to determine an appropriate operational metric for PFR which reflects what is meant by 'good frequency control', how to measure it and how this will change as the power system evolves. The Draft Determination sets a risky precedent in developing a procurement solution before an efficient volume of supply has been defined in a metric.

As elucidated in its submission to the *Issues Paper*, CS Energy considers this analysis needs to include:

- The diminishing returns observed during the ongoing implementation of mandatory PFR;

- The need to examine alternative deadbands within the NOFB. If a PFCB is considered the best approach, assess options that are genuine. For example:

    - Very narrow deadband – between 0 and ± 0.015 Hz;

    - Narrow deadband – between 0 and ± 0.05 Hz. In particular, this was a governor setting pre-2015 and it would be useful to understand the rationale for this setting(s).

    - Moderate deadband – between 0 and ± 0.08 Hz; and

    - Wide deadband – between 0 and ± 0.1 Hz.

- Backcasting analysis with the different deadbands to determine how effectively and efficiently the power system would have performed under these wider bands for identified events. The determination of a NEM power system resilience factor is important and should be overlayed with the FOS and actual frequency performance to provide a meaningful insight to all stakeholders; and

- Whether a distribution of deadband settings with early and late lifters provides a more efficient frequency distribution. This reflects inherent differences in technology capability and may have the additional benefit of reducing the observed 50 mHz oscillation which is likely caused by the current ± 0.015 Hz setting being just wide enough to cover the rotor angle oscillations between generators.

Review of settings in 2027

The Panel has suggested that the settings for normal operation should be reviewed again in 2027. CS Energy agrees with this but also considers that the sunset clause for mandatory PFR should be extended to allow for the performance of wider deadbands to be examined, and for all participants to have a better understanding and quantification of the impact on their units.

Settings for contingency events

A requirement to manage Rate of Change of Frequency (**RoCoF**)

Given CS Energy has previously been a strong advocate for a RoCoF standard alongside a broader suite of metrics in the NER for system security, it commends The Panel for advancing this work and is supportive of the inclusion of a requirement to manage RoCoF.

CS Energy believes that a clear metric for RoCoF will provide AEMO with a consistent and transparent basis upon which actions to increase the level of inertia on the power system are based as well as set the basis for the procurement of "inertia aware"[7] Fast Frequency Response (**FFR**) volumes. This provides the market with appropriate information on both FFR and inertia needs.

The Draft Determination sets out the operational conditions on which the RoCoF requirement is set: a standard to apply following credible contingency events and one following non-credible contingency events. For the mainland, The Panel has set the requirements following a credible contingency event as the RoCoF being no greater than 0.5 Hz measured over 500 ms (1 Hz/s), and within 0.9 Hz measured over any 300 ms (3 Hz/s) for non-credible contingency events.

The proposed RoCoF standard aligns with current AEMO practice on RoCoF requirements of 1 Hz/s for credible contingency events resulting in South Australia electrical separation. However, for non-credible contingency events such as the loss of the Heywood interconnector, a RoCoF limit of 2 Hz/s has been imposed through South Australia regulation. Further insight to the technical rationale behind the RoCoF limit of 2 Hz/sec for non-credible contingency events would inform if the proposed 3 Hz/s is appropriate. However, CS Energy is comfortable with the proposed 3 Hz/s RoCoF for non-credible contingency events based on the information provided in the Draft Determination.

No limitation on size of contingency events in the mainland

CS Energy does not consider there to be clear justification for changing the settings for system recovery following contingency events that would place a limitation on the size of contingency events in the mainland. Operationally, what is relevant is the not the cause of a contingency event but its likelihood and potential impact as encapsulated in the FOS. To manage this, AEMO can exercise powers of directions to reduce the potential risk of an identified contingency size to match the available FCAS.

[7] AEMO, *Market Ancillary Services Specification Consultation*, May 2022, p.21

Change in name of the requirement for system restoration

CS Energy agrees with the intent in renaming the settings for "supply scarcity" but disagrees that it should be to "system restoration" as this is associated with system black which is not necessarily the case and most likely an electrical island outcome where there is a shortfall of available FCAS. CS Energy suggests that "load restoration" would be a more appropriate name for the settings as it is the key objective.

Accumulated time error

CS Energy agrees with the Panel's decision to remove the quantitative limit on accumulated time error in the FOS while retaining a requirement for monitoring and reporting obligations. It will be important for Participants to have clarity on how AEMO will operationalise this removal. For example, will accumulated time error be allowed to accumulate indefinitely or will it be reset periodically and if so, based on what considerations.

Final recommendations

As previously stated, CS Energy is supportive of the role PFR plays in normal operations but considers the current PFCB as extremely onerous and unsubstantiated. Options to better align the settings in the FOS with expectations for effective and efficient control of power system frequency need to be explored fully which has not been done to date. This assessment must incorporate and balance both legitimate technical and economic considerations.

CS Energy thus implores the Panel to:

- Extend the sunset clause for the current mandatory PFR response by two to three years, allowing for the necessary work to examine alternative deadband sizes;
- During this period, an appropriate operational metric for PFR can be developed which clearly defines acceptable frequency control;
- Explore wider deadband settings within the NFOB and their efficacy. CS Energy strongly supports a stepped approach in determining the appropriate PFR deadband with the ±0.015 Hz deadband specified as an *absolute* minimum level and not the default level; and
- Review the FOS in two to three years to ascertain the costs and benefits of a wider deadband setting on frequency management, and its performance.

If you would like to discuss this submission, please contact me on 0407 548 627 or ademaria@csenergy.com.au.

Yours sincerely

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