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6 June 2022

Reliability Panel
C/- Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

Dear Sir/Madam

RE: Review of the Frequency Operating Standard

TasNetworks welcomes the opportunity to respond to the Reliability Panel's Issues Paper on the Review of the Frequency Operating Standard (**FOS**).

TasNetworks, as the Transmission Network Service Provider (**TNSP**), Distribution Network Service Provider (**DNSP**) and Jurisdictional Planner for Tasmania is focussed on delivering safe, secure and reliable electricity network services to its customers at the lowest sustainable prices. As such, TasNetworks is supportive of the Reliability Panel investigating the appropriateness of the scope and settings in the FOS in light of the ongoing energy market transformation.

TasNetworks submission has largely been driven by our role as the Jurisdictional Planner, noting that the Australian Energy Market Operator (**AEMO**) is primarily responsible for frequency control in operational time frames. In this context, we are supportive of moves to strengthen and better define certain aspects of the FOS to help underpin the security and resilience of a rapidly changing power system. Appropriate changes will also assist Network Service Providers (**NSP**) when considering the acceptability of network connection proposals, as well as support AEMO in the management of their various roles including operation of the Frequency Control Ancillary Service (**FCAS**) markets.

A detailed response to each of the four key issues is provided in as an attachment.

In summary, TasNetworks:

- is not presently supportive of altering the settings in the FOS for normal operation;
- supports the introduction of a rate of change of frequency (**ROCOF**) standard in the FOS;
- would support ROCOF standards being developed for credible contingency events and potentially protected events but probably not non-credible contingency events;
- would envisage a ROCOF standard will need to be different for the Tasmanian region;

- while supportive of the review of FOS settings relevant to the Tasmanian region, does not believe that there will be strong justifications for making changes;
- is supportive of the 144 MW cap being maintained for generation related events and a similar cap being applied to maximum load contingency events in Tasmania; and
- is not in favour of removing time error control (or reporting) from the FOS altogether, noting it remains a good metric for measuring performance of a 50 Hz rated power system.

For more information or to discuss this submission, please contact Tim Astley, Network Reform and Regulatory Compliance Team Leader, at Tim.Astley@tasnetworks.com.au or Andrew Halley, Principal Operations Engineer, at Andrew.Halley@tasnetworks.com.au.

Yours sincerely,

Chantal Hopwood

Leader Regulation

Attachment

The Reliability Panel has identified four key issues as part of its 2022 review.

Settings for performance during normal operation

TasNetworks was, and continues to be, supportive of the *Mandatory Primary Frequency Response (**PFR**)* rule change and its objective to restore PFR capabilities across as much of the National Electricity Market (**NEM**) generation fleet as practical. The results of this initiative have been clearly evidenced by the much improved frequency performance now being observed.

With the *Primary Frequency Response Incentive Arrangements* rule change well progressed, there would also appear to be a mechanism to recognise the benefits of such contributions in a financial sense.

Noting these two important outcomes, TasNetworks questions what material benefits would be delivered from making changes to the settings and/or definition of the *normal operating frequency band (**NOFB**)*. While TasNetworks acknowledges that the description of what is acceptable within the limits of the NOFB could be improved[1] (to help capture the learnings of 2015 to 2020), attempts to implement changes to the standard that will have an effect in operational timeframes and (potentially) the market framework, are questionable with so many other competing priorities demanding industry attention.

We would argue that the fundamental issues behind delivering better frequency regulation have been adequately addressed for now, and there would be benefit in allowing the PFR incentive arrangements to be in operation for a period of time to understand their effectiveness and appropriateness. This is especially true when considering the future role of incoming technologies like battery energy storage systems (**BESS**) which are likely to have more readily identifiable 'costs' when delivering such services, for example, potential degradation of battery cells due to increased charge/discharge cycling.

Given these points, TasNetworks is not presently supportive of altering the settings in the FOS for normal operation.

The potential inclusion of standards for Rate of Change of Frequency in the FOS

TasNetworks has long advocated for the introduction of a rate of change of frequency (**ROCOF**) standard in the FOS, and supports the Reliability Panel's intention to consider this issue in detail as part of the 2022 review. We contend that there are significant benefits in having an explicit *System Standard* defined as part of the FOS, rather than having to rely on proxy limits derived from elsewhere in the rules, for example, Schedule 5.2.5.3 (Generating system response to frequency disturbances).

There will be a number of critical considerations in developing such a standard, including:

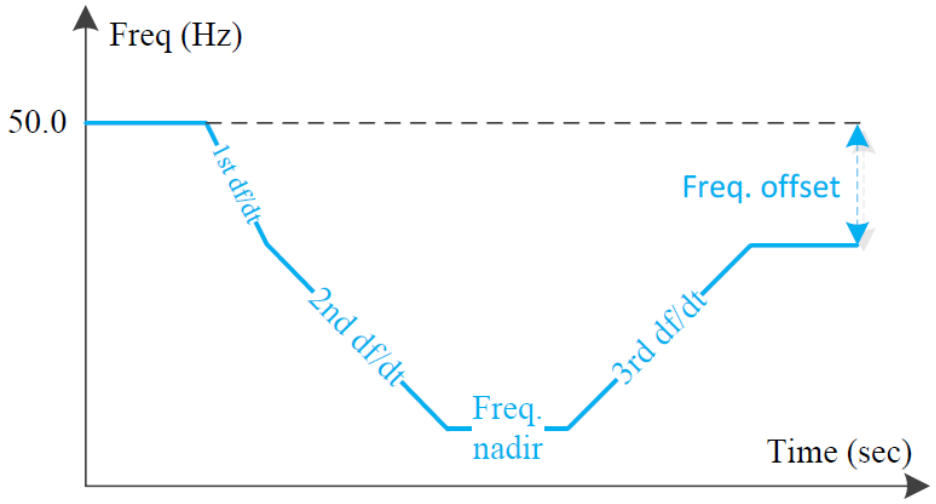
- Defining a consistent method of how to calculate ROCOF (using both simulation results as well as high speed field measurements).

[1] TasNetworks is of the view that that while frequency regulation during 2015-2020 was poor and not consistent with good engineering practice or international norms, it remained largely compliant with a strict interpretation of the FOS.

- The manner in which ROCOF limits are described. TasNetworks would caution against a simplistic approach whereby a ROCOF standard is set by a single number.

  As part of our own work, we have adopted the approach described by the European Association for the Cooperation of Transmission System Operators for Electricity (**ENTSO-E**), whereby multiple ROCOF limits can be used to reflect the dynamics of the power system. As shown in Figure 1 below, timeframes can be defined which reflect how ROCOF can vary due to system dynamics like the fault ride through characteristics of inverter based resources (**IBR**). The timeframes also assist to define what practical countermeasures exist to control it, e.g. only inertial response, combination of inertial response and fast frequency response etc.

Figure 1: ENTSO-E ROCOF profile (under frequency event shown)



- Understanding what are appropriate ROCOF limits to carry forward, taking into account such issues as:
  - Already agreed negotiated access standards for generators;
  - Uncertainty associated with ROCOF withstand capability of older plant which pre-date such considerations in the rules;
  - Potential impacts on distributed energy resources (**DER**), specifically how anti-islanding protection schemes have been implemented; and
  - Design limitations associated with existing emergency frequency control (**EFC**) schemes.
- Defining what contingencies ROCOF limits apply to. Our preliminary view is that ROCOF standards could be developed for *credible contingency events* and potentially *protected events* given that the system impact can be explicitly defined for each (in terms of the expected generation or load loss).

  Setting a ROCOF limit for *non-credible contingency events* could only ever be on a 'best endeavours' basis given the uncertainty about what is actually being disconnected and the overall state of the network.

- Understanding how ROCOF limits can complement and support the definition of minimum inertia requirements and market services, specifically the new '*very fast*' FCAS categories due to be introduced in 2023.

We would welcome the opportunity to have more detailed discussion with the AEMC to discuss Tasmanian specific issues on this topic. As with the frequency operating bands, the ROCOF standard will need to be different for the Tasmanian region noting amongst other issues, the magnitude of our largest credible contingency events relative to typical system size and very high penetration of IBR (in the form of wind generation and high voltage direct current (**HVDC**) interconnection).

The settings in the FOS for contingency events

While TasNetworks is supportive of the review of FOS settings relevant to the Tasmanian region, we do not believe that there will be strong justifications for making changes at this time. The most obvious milestone event at which point more detailed consideration will be warranted, is after the proposed Marinus Link HVDC interconnector obtains committed status.

Even with a significant increase of power transfer capacity between Tasmania and Victoria, early investigations suggest that different contingency bands may still be necessary for the Tasmanian region to help manage critical contingency events. While a significant amount of detailed design work is still to be undertaken, stakeholders should be aware that harmonisation of the frequency standards may not be possible even once Marinus Link is in service.

In regards to maximum allowable contingency size in Tasmania, TasNetworks remains supportive of the 144 MW cap applied to generation related events. It can be noted that a second generator contingency scheme (**GCS**) has recently been commissioned, allowing all generators, that would otherwise be impacted by this limit, to operate unconstrained when sufficient load tripping services are available. The existence of a practical solution which facilitates unconstrained operation while also addressing operability of the power system, supports the merits of capping contingency sizes.

Furthermore, TasNetworks is supportive of extending the concept to cap maximum load contingency sizes in Tasmania. The arguments for doing so are similar to those for generators, with the availability (and cost) of fast lower FCAS and impact on inertia requirements being two key considerations. It can be noted that TasNetworks is presently seeing unprecedented interest related to the connection of large scale data centres and hydrogen electrolysers, both of which have the potential to increase the maximum contingency size above existing levels unless clear direction is provided through the FOS.

In TasNetworks view, there is a strong linkage between the capping of maximum contingency sizes and the definition of system ROCOF limits. The two issues are intertwined, suggesting that there may be benefits from having maximum contingency sizes in other NEM regions in addition to Tasmania.

We would be pleased to work with the AEMC to explore various issues, including appropriate limits for normal operation and network outage conditions, and the justification for and potential issues associated with generator inter-trip schemes. Importantly, we would not support changes that negatively impact any existing network customers, with limits to be at least reflective of the current situation (as of May 2022). Potential alignment of generator

and load contingency limits at 144 MW is an option which TasNetworks believes is worth considering, subject to consultation with AEMO.

The limit of accumulated time error

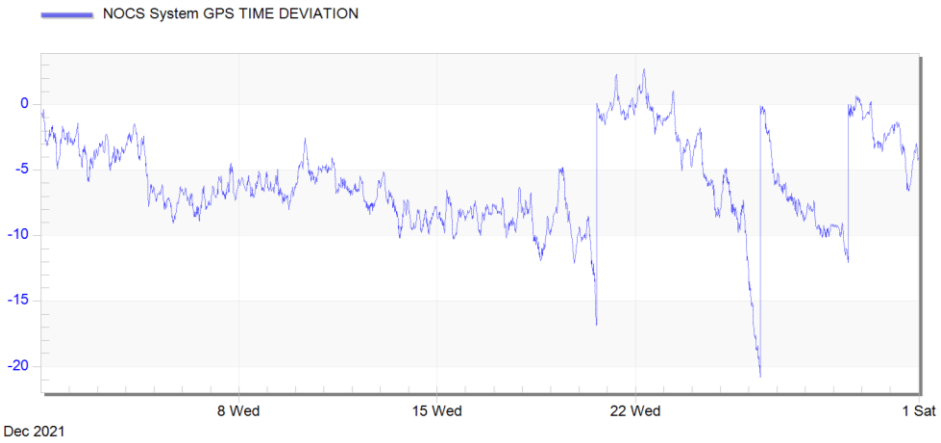
While time error control is not of direct concern to TasNetworks, we would like to offer the following general comments and observations for consideration.

- Current operating practices cannot guarantee that time error will not exceed the limits specified in the FOS.

  As reported by AEMO in its *Quarter 4 2021 Frequency and Time Error Monitoring* report, the 15 second limit for Tasmania was breached twice in December with time error manually reset three times in the same month. The report notes that "*AEMO is not aware of any impact on consumers or generators due to the atypical time error values.*"

  The recorded time error for December 2021 can be seen in Figure 2, with the three vertical transitions indicating manual resets.

Figure 2: Time error in the Tasmanian region (December 2021)



- There seems to be little consequence for breaching what is currently still a formal requirement in the FOS.
- It would not therefore be unreasonable to question the value of any arbitrarily chosen limit noting that both the mainland and Tasmanian limits were aligned at 15 seconds as part of the previous FOS review in 2017.

Notwithstanding the above, TasNetworks remains of the opinion that time error continues to be a necessary metric for operation of a 50 Hz rated power system. There should continue to be an underlying driver to maintain the average long term frequency at 50 Hz to ensure, if for no other practical reason, that the energy market balances out over time.

As a result, we would not be in favour of removing time error control (or reporting) from the FOS altogether, but can see value in considering whether current expenditures on regulation FCAS are really providing value and what other alternatives may be more effective at meeting the operational objective.

With a specific focus on the Tasmanian situation, an example of where potential future improvements may be realised is through design of the Marinus Link controls and better coordination of the automatic generation control (**AGC**) system in this new operating paradigm.