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PRIMARY FREQUENCY RESPONSE REQUIREMENTS REVIEW
RESPONSE TO THE ISSUES PAPER
Date of Draft Report: 20/02/2023

Delta Electricity operates the Vales Point Power Station located at the southern end of Lake Macquarie in NSW. The power station consists of two 660MW conventional coal-fired steam turbo-generators. Delta Electricity appreciates the opportunity to comment on the draft report and revisions to the Primary Frequency Response Requirements (PFRR) after consideration of previous comments from stakeholders.

Delta Electricity remains concerned that AEMO intend to continue to seek the now defined Frequency Operating Standard (FOS) Primary Frequency Control Band (PFCB) as the mandated default deadband directed by the PFRR. The Rules do not describe this requirement. As AEMO illuminated succinctly on page 21 of the draft report, in bold text, the PFR Rules direct that the maximum allowable deadbands resulting from the PFRR **must not be narrower than the PFCB**. The valid interpretation from the FOS does not direct AEMO to mandate in the PFRR that every Unit seek to provide deadbands set at the PFCB in the PFRR. AEMO specialists continue to seek tighter deadbands even though they are also aware erraticism and oscillatory behaviour exists across the NEM and cannot be produced with the power system models available to AEMO. Efforts to eliminate erraticism in the frequency condition cannot be expected to be driven by individual participants. It must be driven by the central operator and the PFRR is a strong Rules driven document that can support an effort in this capacity. Unfortunately, no revision in this direction appears to be arising from this review.

Regardless of the inadequacy of modelling, which ought not be singularly relied upon in approaches towards effective operation of the power system even though it does provide some guidance, it is also AEMO's task, under Rule 4.4.1(a) to control frequency. Admitting a common mode oscillation exists that is presently uncontrolled but also being cautious in experimentation just because it is unclear that variations in deadbands might be a valid consideration in making some sort of attempt to investigate and eliminate the erraticism, suggests a lack of concern amongst AEMO specialists that the problem carries any seriousness associated with it. AEMO produce the PFRR and can seek, if imagination, initiative and commitment to Rule 4.4.1(a) was included within actions to amend and implement via the PFRR, to, amongst other strategies, assign variations to the deadbands to regions, generating systems and generating units in deliberate attempts to find a smoother overall outcome for the resultant frequency condition.

Delta Electricity was not meaning to suggest that AEMO seek to modify the universal minimum PFR requirements but to recognise that deploying the PFCB rigidly as **the** automatic default PFRR deadband unless individual generators demonstrate specific local Unit reasoning to vary from it as would be required by an unaltered PFRR, is not what the Rules mandate and may not be the best approach considering obligations of Rule 4.4.1(a)

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and that, in fact, wording in the PFRR, in pursuit of efforts to reduce and eliminate overall erraticism, proposing some variations to deadbands above the PFCB at strategic positions in the NEM, initiated, designed and pinpointed by AEMO to suit each installed network and sub-network configuration, and/or proposing a targeted and scheduled assortment of varied deadbands to explore the impacts on the erraticism to learn what might influence it, might actually assist in identifying the causes of the erraticism and therefore take steps towards reducing or eliminating it. Even trials of different deadbands might assist. These steps are arguably required by Rule 4.4.1(a) and the PFRR is a strong Rules driven document whereby AEMO can centrally coordinate such activity.

AEMO may recall that oscillations between AVRs of Units are tunable. Delta Electricity considers interactions between governors are also but there are inadequate mechanisms in the Rules to do so except via the PFRR. With AVRs, modelling is inherently more accurate and more regularly applied by replacement alterations as these devices are more routinely replaced. It is well known that oscillations occurring between AVRs are more rapid with closer machines, reduce where between intraregional machines and reduce further between interregional machines. Replacements of governor mechanisms are less common and the full control mechanisms less understood particularly since reactions from slower secondary forms of speed control were included in NEM related primary frequency response delivery as is driven by the PFRR. Oscillations due to conflicting governor controllers are probably slower, and definitely more complex, in general than those attributable to AVRs. Slower because the reaction times of the secondary speed reactions from large Units involve the fuel and boiler reactions with 2-3 minute time constants but more complex due to the fact the overall reaction if a conglomerated delivery from reasonably rapid reactions occurring via mechanical-hydraulic and electrohydraulic governor and the release or retarding of stored energy behind throttle valves. There is an initial rapid reaction to a speed change (not an absolute speed or frequency value) followed sometime later by reactions from the boiler upon the steam system and then the load setter, often via a similar mechanism, to the governor, well after the initial reaction and also with reference to an absolute value of frequency. AVRs and power system stabiliser settings also need proper designs to suit the Network and it is doubtful that all stabilisers, expected to detect and prevent oscillations would have similar deadbands in their control circuits in effecting stable control. As governor combined with boiler reactions are a more complex overall response than AVRs including elements with direct instantaneous response from mechanical-hydraulic controllers with zero actual deadband but 30-60mHz deadbands coupled alongside slower reactions with a defined deadband of, in AEMOs directed PFRR +-15mHz, and with great variations in delivery due to fuel quality, burner configurations and atmospheric conditions, it is considered highly unlikely that the theoretical condition AEMO is seeking i.e. tighter deadbands should yield the best overall frequency condition, is correct in application on the complex system. In the absence of adequate modelling guidance and perhaps inadequate or incomplete models of the all the electrical and mechanical aspects of speed control, experimentation with the system assignment of deadbands, which should be simple to arrange now most machines are operating at very tight deadbands, is recommended, but, except via the PFRR, it is probably not achievable and, with this review close to finalisation, unless AEMO is about to attempt to consider this as new information, the option to pursue this possibility sooner rather than later or after a network event illuminates the need to do so, has been lost. If AEMO was to reconsider as a result of this response, it is recommended another review period of the PFRR be immediately proposed. Through an appropriate revision to the PFRR, AEMO, the system operator, could if it saw fit, centrally coordinate a search and eliminate process proactively in pursuit of Rule 4.4.1(a) with the assistance of all participants, from which, AEMO and participants could mutually learn and collaboratively develop methods and adjustments that reduce or eliminate the causes of the erraticism.

In absence of efforts in the direction of reducing the erraticism, Delta Electricity remains concerned that AEMOs approach detailed in the draft report of this review, and the proposed PFFR, will continue to assign the general system frequency erraticism to being unsolvable by AEMO and only a problem should it present so for any participant, in which case AEMO expects the participant to pursue the problem locally within the confines of the Rules and AEMOs PFRR if concerns warrant. In the absence of any centrally coordinated efforts to reduce or eliminate it, frequency unsteadiness will remain uncontrolled. Continued unchecked, it is likely the erraticism, widening peak to peak amplitudes that appear to be occurring at times, tight deadbands from the PFRR combined with NEM apathy in pursuit of Rule 4.4.1(a) to investigate and eliminate the causes of the erraticism, will deliver longer term damage to components of older machines, reduce the life of the fleet and all electrical machines operating in the NEM and potentially induce long term power supply shortages should multiple machines experience a series of cascading failures of governing mechanisms.

Regarding wording that is not required by the Rules to be in the PFRR, Delta Electricity does not agree there is any necessity to include AEMOs preferences for how BESS operate in the PFRR. The preference is best provided by AEMO on a case-by-case basis in private discussion with relevant battery proponents. The draft report is already a historical reference to reflect on but persisting with the inclusion of AEMOs preferences in the PFRR on this specific point whilst not including other preferences on any number of other points for the PFRR could produce the opposite of AEMO's preference. Some participants will see the inclusion as oversight and deliberately avoid complying with it as a result, whilst others, should they be asked one on one, instead of having to interpret AEMOs preferences from the PFRR, may respond favourably to private requests at the appropriate time for the project. If AEMO maintains the viewpoint that the Rules ought to mandate the delivery, then, as suggested previously, a Rule change request to have the industry consult on it is recommended instead of the wording of the proposed PFRR.

Finally, regarding Rules adherence in general and the importance of AEMO ensuring every clause of the PFRR is properly documenting obligations the Rules mandate, the clause 2.3(b) is an example where a more thorough cross-check of the Rules, as requested by Delta Electricity and others in response to the consultation issues, may have revealed that the draft PFRR carries an incorrect assignment of the Rules related to dispatch instructions for regulation FCAS. The Rules actually do not support the clause 2.3(b). In application on generating units like at Vales Point, it is likely that the application of Rule 2.3(a), which is supported by the PFR Rules, will ensure some level of delivery being requested by AEMO in Rule 2.3(b), but in designing, or redesigning Regulation FCAS, there is no obligation for a generating unit to deliver PFR unless dispatched on energy, and not regulation FCAS, greater than 0MW. Clause 2.3(b) is inappropriately required by the PFRR and should either be removed or, with reference to the precise Rule regarding regulation FCAS dispatch instructions, clarified as being an AEMO preference for the best application of the PFRR. However, as stated previously, it is probably best that the PFRR detail strictly what the Rules enforce and how AEMO seeks to apply those Rules where clarity is required for AEMO and all participants, and other preferential actions not supported by the Rules omitted.

If AEMO wishes to discuss any details of this submission, please contact Simon Bolt on (02) 4352 6315 or simon.bolt@de.com.au.

Yours sincerely

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