Australian Energy Market Operator
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AEMO Power System Frequency Risk Review – Stage 2 Draft Report

Delta Electricity operates the Vales Point Power Station situated at the southern end of Lake Macquarie in NSW. The power station consists of two 660MW conventional coal-fired steam turbo-generators. The opportunity attend consultation meetings and to provide comment on the draft report is appreciated.

Delta Electricity understands the frequency risk review, as stated by AEMO in the second paragraph of the draft report's second paragraph, to have the purpose of "review the potential for 'non-credible' power system contingency events to cause frequency changes large enough to initiate generator disconnections and result in widespread transmission outages or a black system".

What does AEMO mean using the term PFR and making inferences of its impact?

The purpose of the report suggests to Delta Electricity that the notion of and reference to primary frequency response (PFR) as currently included is misplaced, under-explained and unintentionally misguided in the draft report at present for the following reasons:

- "Mandatory" PFR represents the PFR now delivered by the new PFR Rules which of course is being progressively rolled out and won't be fully implemented for a few years
- No PFR is an unnecessary inclusion for the immediate future as unless all synchronous generation is to be retired by 2023, the risk review ought not consider that condition
- Pre-"mandatory PFR" Rules should not be considered in anyway similar to no PFR because PFR was still in existence and delivered but due to the adoption of and adherence to AEMO Market Ancillary Services Specification designs and Rules for Frequency Control Ancillary Services in the implemented designs of the frequency controllers of Units, at many installations PFR delivery was set for wider deadbands than that now mandated. Many participants whilst having PFR incorporated into FCAS controllers, meaning the control and some of the PFR could be deselected when the Unit was not enabled for FCAS, did not disable the controllers even when not dispatched to provide contingency FCAS. As many participants still have mechanical-hydraulic governors backed up by stored energy, a lot of very fast PFR remained in the system at the deadbands now mandated.
- Wideband PFR, as recommended to be considered by other participants, may not have been adequately considered in the draft report and may be an essential comparison to fulfil the main purpose of the report.

It is suggested that AEMO think carefully of how the report may be misinterpreted by others, including those within governments and AEMO itself as implying that Mandatory PFR is the only option worth considering in the NEM post 2023 when the mandatory PFR Rules may expire. The amount of Mandatory PFR already engaged has had a marked impact on comparisons of frequency performance measured against the current frequency operating standards. See Attachments 1 and 3. Why doesn't the Frequency Risk Review also balance off the market examinations that the "market" operator ought to also be concerned about and cover the risks that mandatory Rules are obtaining too much PFR impacting potentially on market efficiency?

Other risks to examine

The Frequency Risk Review may also benefit from considering the other quality issues for frequency that have emerged that also could represent a future risk to the NEM. One such risk relates to the unsteadiness of the frequency within the coordinated collective controls of governors, Unit controllers, AEMOs AGC and market systems. The transition towards and growth of inverter technology may be having consequences not yet examined in the report because of its present need to keep its focus on "non-credible" power system contingency events. The attachment 2 displays charts from Delta and AEMOs own reports of the present histogram distribution of frequency and shows that since the commencement of first tranche delivery of Mandatory PFR, a large divergence either side of the nominal 50Hz state has occurred. Whether this is due to the lack of coordination between governor deadbands, deadbands of secondary Unit controllers and AEMO Regulation FCAS delivery is not known but the risk perhaps warrant being drawn out and explored. Perhaps the deadbands assigned by Mandatory PFR Rules and AEMOs IPFRR are too tight? Are the frequency traces in attachment 1 representative of the more volatile frequency reactions that occur since mandatory PFR? Delta Electricity therefore considers that a risk to be examined by AEMO should include that arising from a lack of coordination in the overall control of frequency.

N-2 Impacts of credible and non-credible events

Many contingency events currently experience more like a N-2 impact because of the impact on large installation numbers of small Distribution Energy Resources. There is uncertainty in how many of these installations have frequency and current sensing deactivation trip circuits that cause them to cease generation collectively representing almost as much or more than a single Kogan Creek Unit. For this reason, the report should also consider the possibility that AEMOs current load relief factors remain too high for certain non-contingency scenarios and should be turned negative to reflect the true impact of rooftop PV inverters with pre-2015 AS4777 installations. It is noted that on page 22 of the draft report, AEMO have considered ignoring load relief as a mitigating factor but maybe AEMO ought also to be considering simulations involving N-2 impacts due to DER oversensitive drop-outs of collective generation of the order of another Kogan Creek Unit.

It is also noted that other groups within AEMO and the AEMC are concerned about the post-2015 AS4777 installations and that there is a 2020 amendment to AS4777 being prepared and other work being considered to address the emerging risks that collective quantities of these installations may pose to the NEM. However, it is also considered that Mandatory PFR as has currently been implemented will be assisting in softening the impacts reported here if frequency is more rapidly supported.

Delta Electricity would like AEMO to give Delta's suggestions due consideration and if AEMO wishes to discuss this response I can be contacted on (02) 4352 6315 or simon.bolt@de.com.au.

Yours sincerely

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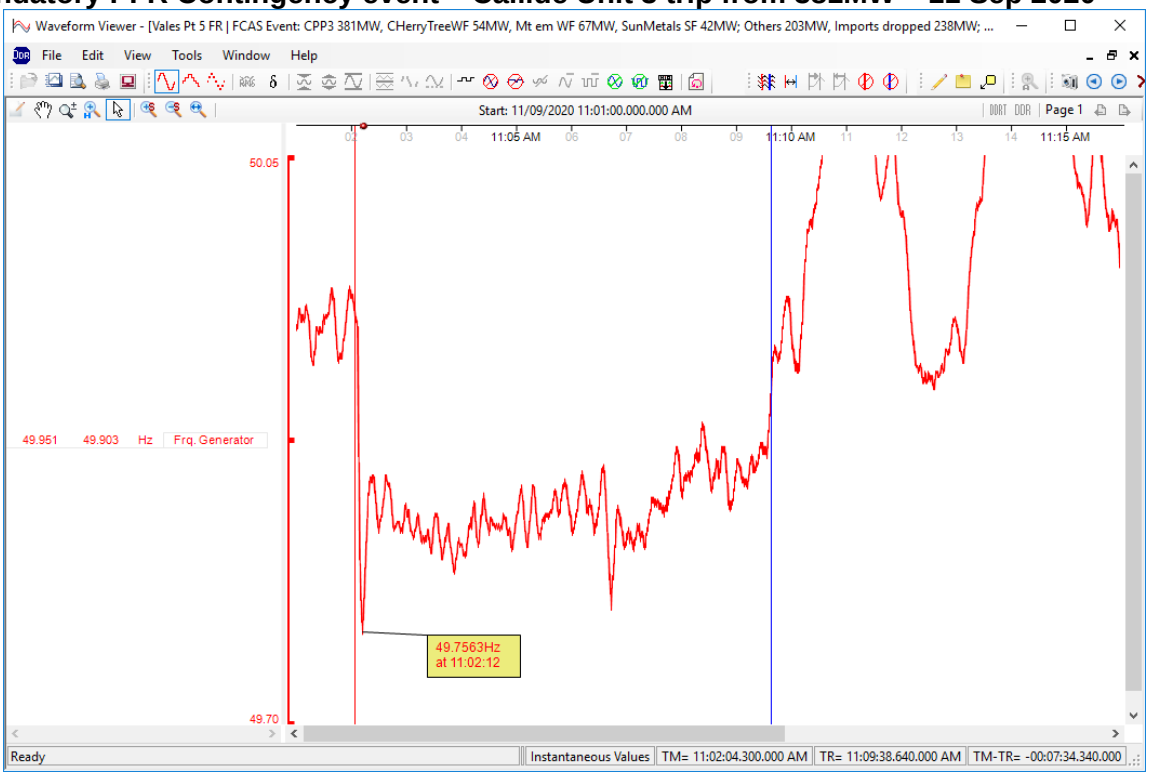
Attachments:

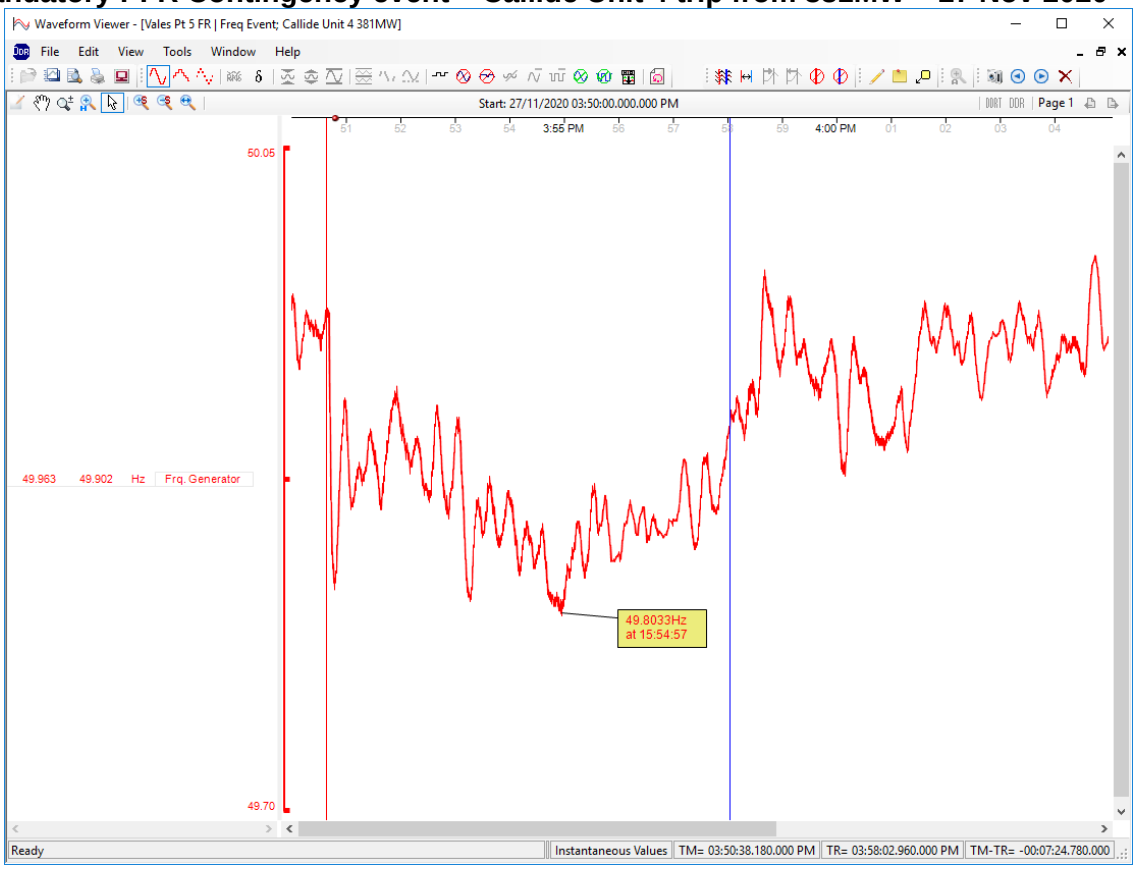
1. **Comparison of two Callide Unit trips pre and post Mandatory PFR adoption**
2. **Trends of NEM Frequency Event Counts outside NOFB – Jan 2012 to November 2020**
3. **Frequency Histograms 2007 vs 2020 (with Mandatory PFR)**

ATTACHMENT 1 – Comparison of Callide Unit trips pre and post-Mandatory PFR

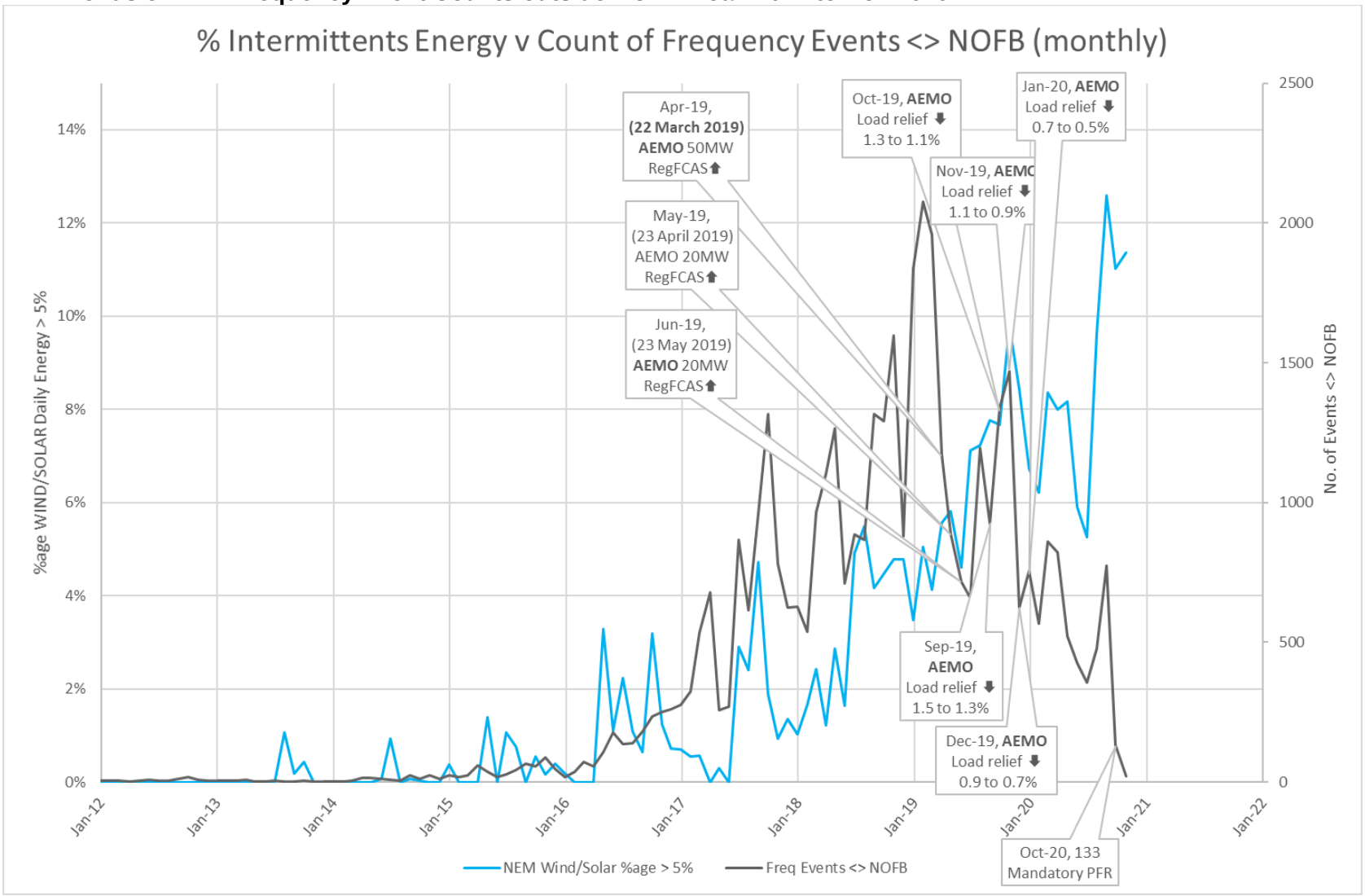
Pre-Mandatory PFR Contingency event – Callide Unit 3 trip from 381MW – 11 Sep 2020



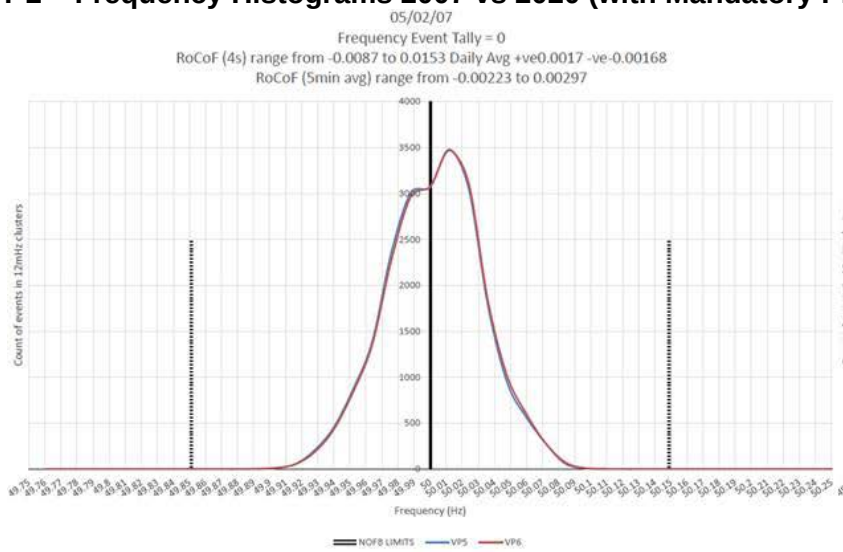
Post-Mandatory PFR Contingency event – Callide Unit 4 trip from 381MW – 27 Nov 2020

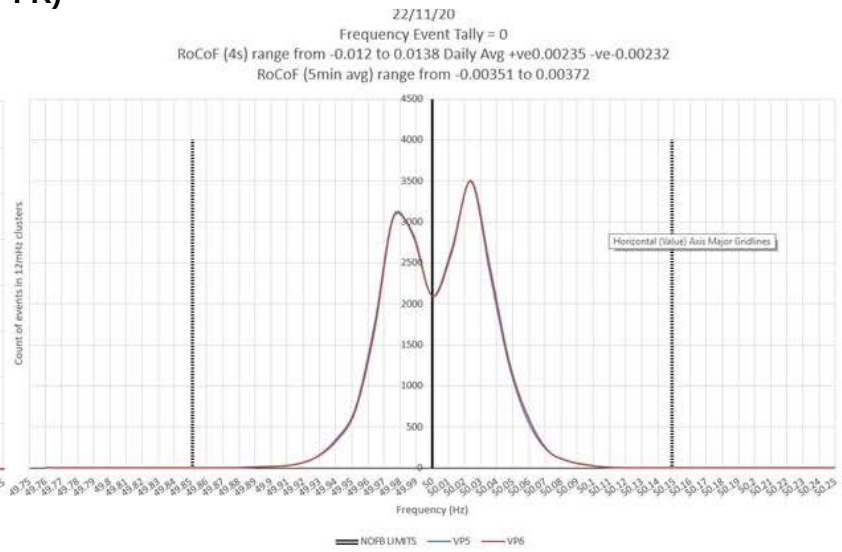


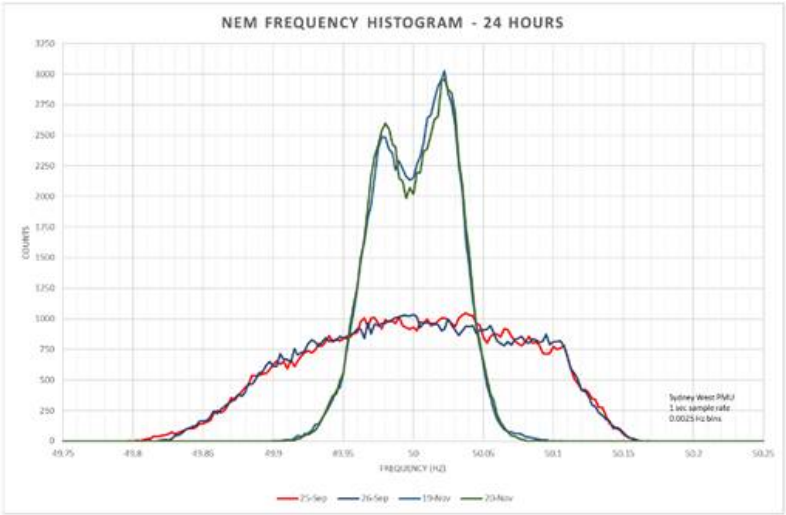
ATTACHMENT 2 – Trends of NEM Frequency Event Counts outside NOFB – Jan 2012 to Nov 2020



ATTACHMENT 2 – Frequency Histograms 2007 vs 2020 (with Mandatory PFR)







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