

18/11/2021

To: AEMO MASS Consultation

Re: Third-round response to AEMO's DER MASS review

We welcome the opportunity to contribute to AEMO's third-round MASS consultation process.

Concerns around sampling rate determination

AEMO's current determination of a 200ms sampling rate for aggregates of DERs over 200 units is based on a University of Melbourne (UoM) study using data supplied by AEMO, which by AEMO's admission concerns data used in Tesla's Application Note as submitted through the second round of the MASS consultation process.

It is of material interest that:

- Despite being verified as a data source by AEMO in the third MASS consultation forum, Tesla is not mentioned or explicitly cited in the UoM report.
- Both Tesla's Application Note and the UoM study around sampling rate use similar methodologies, are structured similarly in execution and come to the same conclusions with respect to DER MASS sampling rate specifications per VPP aggregate numbers.
- The UoM report very clearly limits the scope of findings to the data provided, offering the following conclusions and recommendations:
 - (MoU report, pp 32-33, item 4) *"Note that this conclusion is fully derived from the analysis of the data provided by AEMO; **studies with more diverse data may be needed to demonstrate the benefits of using NMI-level response profiles for FCAS verification**", and*
 - (MoU report, pp 33, recommendation 4) *"When verifying the response of a fleet distributed across multiple sites, if the trapezoid rule and RoCoF-based method are used, using NMI-level data with 200ms sampling rate can achieve a relatively good performance, for example, in the range [-1.3%, 0.2%] for the 200 sites with response equal to a maximum of 5kW FCAS enablement per site analysed in this report. **It is worth noting, though, that this recommendation is derived based on the data provided by AEMO for the studies conducted here, and further studies would be required to be able to provide more definite recommendations.**"*

The stipulations of these conclusions and recommendations contrast significantly in intent with AEMO's interpretation:

- (AEMO 'Third stage of consultation – stakeholder forum summary') *"However, irrespective of the technology types, if the sample size is large enough, the UoM analysis shows that the error can be significantly minimised"*

The conclusion cited in AEMO's summary is not corroborated in the UoM report prepared for AEMO.

Tesla's source data appears as an Application Note in their original second-round response (Appendix B) with an updated version having modified methodology (with increased error concluding the appropriateness of a 200ms DER MASS sampling specification rather than the 100ms specification concluded in the original submission). The updated Application Note was accepted by AEMO 18 days after the deadline for responses. As AEMO has refused (in writing) to accept revised submissions from others that are less overdue (e.g., from this author), it may be surmised that the decision to accept Tesla's revised Application Note is discretionary in nature. AEMO has provided no rationale for this decision.

The use of laboratory source data and synthetic error in estimating the frequency response behaviour of a DER fleet is critical in determining the net response error underpinning analysis and conclusions on the efficacy of reduced metrology requirements in frequency response service delivery. AEMO has, to these ends:

- Not demonstrated a process by which the statistical risk methodology employed by UoM was tested, accepted and/or validated,
- Not demonstrated that any alternative methodologies were computed and presented for comparison, or
- Not demonstrated that the error simulation method is reflective of response behaviours inherent to internal or external error sources characteristic of DERs within the regulatory scope the MASS.

The use of normal distributions to estimate fleet response characteristics is especially concerning from a number of perspectives, including (but not limited to):

- The assumption that responses are symmetric around a mean creates error cancellation (thus minimising net error),
- The implication that responses meet requirements of the Central Limit Theorem sufficient to justify the use of a normal distribution requires (at a minimum) that samples be independent, random variables – this is not a requirement met in mixed DER fleets, or in fleets where prevailing error sources within a DER fleet are not randomised (e.g., ESS SoC), and
- The implication that average system behaviours should be used to quantify power system capabilities under contingency conditions is not a best-practice assumption. This approach is not generally used in power system design, and is not common to any other system security facility in the NEM.

In the third-round consultation AEMO was not able to describe a fair, industry-inclusive and transparent process by which data was sought for UoM's study on sampling rates. AEMO could not describe a process by which other stakeholders to the MASS review process were afforded opportunities to contribute to suitable data. Such data sources may have included (but are not limited to):

- Injection test data; a possibility extending to DERs beyond inverting devices (whether manufacturer-supplied or independently commissioned)
- Data from production VPPs or DERM vendors having devices within the scope of the DER MASS review under management capable of analogous response,
- Data from overseas market initiatives (some of which AEMO used to inform some of the FCAS arrangements trialed in the VPP Demonstrations trials),
- A series of simulated results from first principles encompassing practical DER device considerations within the scope of the MASS's remit.

It is not credible to suggest that these methods were not known or not available to AEMO; of the more significant opportunities an established Distributed Energy Resource Management (DERM) solution provider has appropriate market registrations meeting the current MASS (though AEMO as the market operator) in significant numbers as to not require any synthetic estimation of fleet response to frequency events. Their dataset – as is known to AEMO – extends significantly beyond the two frequency trip events evaluated in the two studies cited. Rationale for not using such datasets was not provided by AEMO.

It is inevitable that any frequency response data unique from that supplied to UoM for analysis would increase error inherent in results used to inform the specific conclusions AEMO has sought to incorporate in the current draft MASS. This is not a subjective conclusion; it is statistics.

Concerns around data request requirements

AEMO's subsequent data request to MASS stakeholders (11th November) placed a number of requirements on data that would have clearly excluded the source data supplied to the UoM report. No rationale is provided for this asymmetry in stakeholder management.

AEMO has mentioned in the third-round consultation and relevant Summary of Discussion that Project MATCH may provide a channel for stakeholders to submit relevant data. The existence of Project MATCH – in addition to AEMO’s extraordinary data request on 8-day notice - suggests AEMO is aware of the need for better data to inform more robust conclusion to these ends, and has strategically resourced accordingly to close a gap in knowledge relevant to the current MASS review. To request data that has been available for some time (potentially at low to zero cost) through a specific, future, out-of-scope project channel is a curious use of process - particularly so relative to current MASS review objectives.

AEMO has placed a significant emphasis in this review process on transitional arrangements for VPP Demonstrations trials customers. The VPP Demonstrations were a government-funded initiative to (among a number of intended outcomes) demonstrate an easier way of delivering contingency FCAS from DERs by way of decreased access barriers. It is difficult to understand why - nearly three years and thousands of trial NMIs later - the outputs of the trial's design do not have among them the very data necessary to unequivocally prove that which the trial seeks to achieve. Original requirements of the VPP Demonstrations (being managed by AEMO) stipulated clear requirements for high-speed, MASS-compliant metering. AEMO’s current technical conclusions are not based on trial data. It is noted that, on a per-NMI basis, Tesla is significantly represented among participating trial DERs.

Concerns around impact of oscillatory response assessment

AEMO’s approach to oscillations in potential DER response is incomplete with respect to the requirements such oscillations pose on relevant metrology, in particular sampling frequency. The UoM report correctly identifies the relevance of Nyquist-Shannon sampling theorem, suggesting that in excess of twice the oscillation rate is required as a sampling rate to accurately capture an oscillating signal – a common conclusion. The report promulgates an assessment methodology with a number of sample and application dependencies to correctly identify an oscillating signal; once identified as oscillating, the method does not provide a means to reconstruct such a signal within the accuracy requirements of the MASS.

The UoM report confirms samples provided by AEMO for relevant evaluation feature oscillations in the range 1-3 seconds, the lower bound of which would be adequately met by a 200ms sampling rate. AEMO acknowledged data within a submission predating the commissioning of the UoM including data identifying a DER approved for sale in Australia (and thus falling within the scope of the MASS) having a ~6Hz oscillation in response data. Per sampling theory described in the UoM report this response signal would not be adequately captured within the accuracy requirements of the MASS if sampling at 200ms.

AEMO response (verbatim in third consultation forum) – “we haven’t observed an oscillatory behaviour from a fleet of DER inverters” – neither addresses the evident nature of the submission provided (falling well within the scope of possibility the MASS covers) and is further inconsistent with AEMO’s prior evidence base and rationale for determining sampling rate (i.e., using a single laboratory sample with synthetic error rather than “behaviour from a fleet of DER inverters”). It is further stressed that DERs covered by the MASS are not limited to inverting DERs, and that oscillation in DER response may arise from a number of possibilities not limited to inverter response (in lieu of regulation for standards conformance to these ends). No rationale is given as to why metrology requirements of the MASS should cover some classes and behaviours of DERs and not others.

Concerns around vendor capabilities

AEMO disclosed during the third-round consultation that some DER vendors were unable to meet a sampling rate requirement of less than 200ms in the context of changes to the MASS. AEMO omitted this detail from their stakeholder forum summary document. AEMO has not detailed how this information affected decisions around draft MASS sampling rate specifications.

Conclusions

The present situation shadows a significant body of directionally-correct work intended to extend Australia's leading position as an enabler of active DER through advanced market design. It's important that processes to evolve our rules remain fair: there is certainly scope to create and develop fair, equitable, competitive market rules for grid services enabling the participation of world-leading volumes of active DERs across current and future types - inverting and otherwise - from a growing number of vendors providing value-adding solutions to customers living the world's highest-penetration DER market.

With an impending new MASS review just around the corner in 2022 - one inclusive of considerations towards Fast Frequency Response (FFR, which may redefine ancillary service markets and according value distributions) - it may be prudent to pause further modification to the MASS within this review pending a more robust approach to analysis, source data and related process driven by learnings from current experience. DER participation is a complex issue, particularly in our wide, deep and storied market. Evolution in market design is certainly important to maximise net consumer value against evolving opportunity. Similarly, it is paramount to seek excellence in what precedents are set in processes supporting change such that expectations and outcomes from change initiatives are reflective of all interests towards best, competitive ends - to do otherwise undermines our best collective intent.

There are many practical ways to lower access barriers to DER participation in FCAS. We therefore suggest that AEMO reconsider modifications to the current MASS for DER implications in the next MASS review, wherein various learnings may be considered in a more complete manner.

We look forward to working with AEMO.

Kind regards

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Appendix A: Open matters

We would note that the following email requests to Mass.Consultation@aemo.com.au remain unanswered:

- An email sent on the 4th of November ahead of the third MASS Consultation forum seeking to understand who would be presenting limited an ability to form questions on notice,
- An email sent on the 11th of November in response to AEMO's extraordinary request for frequency response data, raising concerns around (summarised):
 - The terms of the data request and what processes would be used to qualify, parse and select data for evaluation,
 - The limitations placed around sources (that do not apply to source data AEMO has used in existing studies),
 - The lack of information around any processes used to compare any results arising from use of supplied data,
 - Whether or not the method employed by the University of Melbourne (UoM) were open to challenge, and
 - Whether or not AEMO considered the 8-day deadline afforded to this request to be fair given both the extensive period afforded to the procurement and use of a single laboratory sample in AEMO's current assessments and the request for NMI-related data necessitating some time in the management of any consumer data rights and related, adjacent issues,
- An email sent on the 16th of November in response to AEMO's Summary of Discussion of the third stakeholder review offering to amend some key inaccuracies and omissions in AEMO's record of events as communicated to the MASS stakeholder base. Critically, the following matters are omitted from AEMO's Summary of Discussion:
 - Concerns raised around AEMO's lack of process in adequately seeking DER frequency response data from known and available sources to better inform review of sampling rates,
 - Concerns raised from a stakeholder with diverse DER fleet experience that known asset behaviours are not reflected in the methodology chosen for assessment, and
 - AEMO's admission of understanding that some DER vendors are known to be unable to meet a MASS metrology requirement under 200ms.

No rationale or explanation is given for the lack of response or the cited omissions from record. The latter are considered a serious matter given AEMO's Summary of Discussion forms both a matter of record within AEMO's consultation processes and a reference upon which stakeholders may use through the submission process.