Hydro Tasmania

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AMENDMENT OF THE MARKET ANCILLARY SERVICE SPECIFICATION (MASS)

Hydro Tasmania appreciates the opportunity to make a submission in response to AEMO'S Proposed Amendment of the Market Ancillary Service Specification (MASS). The consultation related to Distributed Energy Resource's requirements to participate in the Contingency Frequency Control Ancillary Services (FCAS) markets and also relevant issues in a 'General MASS Review".

Hydro Tasmania has reviewed both aspects and provides a detailed response to AEMO's questions in Appendix 1 (DER) and Appendix 2 (General).

If you have any queries on this submission or require further information please contact John Cooper (john.cooper@hydro.com.au)

Yours sincerely

John Cooper
Regulatory Manager

Appendix 1: DER MASS

1. ***Which option for the ongoing measurement requirements for DER described in Section 2.3 do you want AEMO to implement and why? Should any other options be considered?***

   The initiative of including the DER (VPP) technical specification in the MASS is supported by Hydro Tasmania. We believe this is a critical step for DER to be recognised as a part of the NEM as well as be harmonized with other generation technologies at a technical level.

   Hydro Tasmania has the following observations about the specific options:

   Option 1
   Option 1 is not supported as the metering requirements applied on utility scale generators are not suitable for application at a domestic and/or commercial level due to their high cost.

   Option 2
   Option 2 provided useful experience for the VPP trial program and could be used as a benchmark to understand if other more cost-effective alternatives are available e.g., option 3.

   Hydro Tasmania would like to point out that the additional requirement stated in S2.3.2 point 3 'For every 5 megawatts (MW) of aggregated ancillary service capacity per region, a high-speed meter is needed', doesn't appear in line with the original consideration of the VPP trail program, that only one high speed data meter is needed per region for the purpose of system frequency checking in islanding. Hydro Tasmania noticed that in the recent consultation response AEMO provided a high-level explanation, Hydro would suggest AEMO share more technical details of this requirement.

   Option 3
   Hydro Tasmania would like to acknowledge the suggestion from other participants in the consultation meeting, particularly the proposal to consider using the invertor logger as one of the acceptable sources for VPP FCAS contingency response evaluation.

   It is recommended that AEMO explore the technical feasibility of using 100ms as an alternative for the fast contingency FCAS evaluation and facilitate VPP technical standards forming and overall cost saving in long term.

   We have observed that certain battery/solar manufacturers are already able to or very close to reach 100ms/per sample data resolution with only a marginal incremental cost above existing invertors. Hydro Tasmania would encourage AEMO to consult widely with these manufactures to understand how this technology is expected to develop.

2. ***Which option do you think is more consistent with the NEO, and why?***

   Given that only two options have been proposed and discussed, a judgement of which one is more consistent with the NEO may be premature.

   Hydro Tasmamia is aware of the time frame of the existing VPP trail program and understands the intention of AEMO to establish certain technical requirements in the MASS and better guide the growth of VPP. Given the complexity of this, Hydro Tasmania recommends AEMO:

1) seek an interim technical specification with a few options (including IBR) co-existing in the MASS; then
2) focus on the technical consultation and seek more comprehensive proposals for long-term ongoing measurement, optimisation and settlement.

3. ***Should AEMO consider any principles other than those described in Section 2.4 to guide its assessment?***

Hydro Tasmania supports the principles listed in the Section 2.4 though would suggest keeping the Technology Neutral principle on the list.

4. ***What is the difference in implementation costs, such as updating the communication links or installing additional equipment, for capturing data at a resolution of either 50 ms or 1 second for every NMI for different VPP facility types? Do you consider the cost difference to be prohibitive for participating in the Contingency FCAS markets? Please provide examples or analysis if possible.***

There is a material difference in terms of the implementation costs for data at a resolution of 50ms vs. 1s.

As 1 second data has been widely adopted by the battery manufacturers there is only a marginal increase for batteries to participate in the VPP FCAS markets. In contrast, the initial cost of a 50ms high speed data logger installed per region is over $10k.

To find a lower cost solution, we contacted a number of 3rd party meter manufacturers in Asia and were informed that 50ms isn't a standard resolution in many countries. Developing one for Australia would require development work and a minimum procurement volume, limiting the ability to lower the high cost.

Hydro Tasmania believes it would be more practical and cost effective in the long term to simply use the invertor's internal data logger as the primary source for contingency FCAS evaluation, particularly as 100ms is already feasible.

5. ***Do you think that either of the options presented will result in more or less competition in the Contingency FCAS markets?***

Hydro Tasmania believes that both options, in so far as they drive wider adoption of VPP, will facilitate greater competition in the contingency FCAS markets. The objective of the proposed VPP FCAS measurement approach should be independent from the market competition.

6. ***Are there any technical risks that you envisage if the Option 2 measurement requirements are allowed? How material do you consider those risks and how could they be efficiently mitigated?***

As mentioned above, Option 2 provides a good benchmark for exploring the other options, but AEMO should not be limited by this option.

Hydro Tasmania believes that as VPP is still a nascent in the FCAS markets, with limited global references, its initial measurement requirements need to be reasonably conservative and avoid over committing participants to specific, high-cost solutions.

7. ***Does the sampling rate of one second rather than 50ms for Fast Contingency FCAS under Option 2 and the determination of the FCAS delivery at the inverter/controllable device level create market distortion or negatively impact the FCAS markets?***

This question involves in two aspects:

1) Measurement resolution:

   Based on the proposal in Option 2, the 1s sampling rate is used for the FCAS response integrity check but isn't directly used in the FCAS delivery evaluation. Instead, the actual FCAS delivery is calculation based e.g., the battery deadband and droop settings as well as the default battery performance based on the FAT injection test.

   Given the chemical battery response effectiveness, this approach appears ok in general, however its suitableness may lessen if/once the VPP reaches other technologies outside of chemical battery e.g., if VPP involves in rotational sources and the initial response needs to be distinguished. To address this issue, the 100ms data appears to be a good long-term alternative as mentioned already.

   As the existing 50ms data resolution requirement was specified nearly two decades ago, it would be reasonable to conduct a technical review to understand the necessity of this requirement.

   Hydro Tasmania is happy to facilitate this analysis given Tasmania's unique power system condition e.g., small system and relatively large system frequency deviation, which provides a perfect window to understand if e.g. 100ms resolution data is sufficient for the system inertial response evaluation.

2) Measurement locations:

   Hydro fully understands the challenge of specifying the measurement locations for different purpose.

   - In the Wide Test, for the purpose of understanding and demonstrating the battery performance, the measurement specified at the invertor / controllable device level appears practical and reasonable.

   - Whereas for the purpose of FCAS delivery evaluation, either a calculated or measured net grid response should be considered.

Given that, Hydro suggests that subject to the purpose, it may be helpful to keep the measurement location specifications separated in the MASS.

8. ***If Option 2 was adopted, should the changes to the measurement requirements of the MASS be limited to small-scale DER (under 1 MW per NMI), or should a different threshold apply, such as 5 MW? For example, what do you see as the risks and benefits of expanding these measurement requirements to other FCAS providers and in what circumstances might that be appropriate?***

   If 100ms can be adopted as a global standard there will be no difference in terms of the measurement requirements between utility scale generators and VPP.

   If 50ms is retained, the MASS shouldn't be limited to DER under 1MW. Hydro Tasmania has a mix of customers above and below the 1MW threshold, including some that will transition across that threshold over time.

   If 50ms is retained, the existing metering requirements should remain at a State level, rather than a meter per 5MW as the cost to install will be prohibitive for existing use cases and markets. AEMO should also articulate what technical concern needs to be managed by tightening the measurement requirements further and the cost benefit analysis that supports that.

Appendix 2: General MASS

9. Does the proposed reformat of the MASS make for improved readability and understanding? What other improvements in the form and drafting of the MASS could be beneficial? If you consider the reformatted MASS may have materially changed the substantive meaning of the MASS v6.0, please also bring this to our attention.

As the primary reference of the NEM FCAS technical specification, Hydro Tasmania believes that the proposed MASS review and modification is important to continuously improve the readability and usability of the MASS, and ensure this document is up to date e.g. accommodating the changes of implementing the mandatory PFR.

Hydro Tasmania is supportive for this initiative. However is still of the view that inertia needs further consideration due to its emerging importance in the NEM.

10. Clarification of FOS references – please provide any feedback on the proposal to clarify that FOS terms relate to Table A.1 of the FOS, and any other terms that have ambiguous values.

The information provided in the FOS Table A.1 contains the Frequency Operating Standards in different stages responses including Containment, Stabilisation and Recovery in different system conditions and over different time frames.

On the other hand, MASS as the document to implement the FOS with different market mechanisms, should reflect the connection between the 8 FCAS services and the corresponding frequency control objectives.

Hydro Tasmania would suggest creating one more column in the MASS summary Table 3 'Description of each FCAS Service', to highlight the correspondence between each type of FCAS services and the FOS, and ensure MASS specifications and FOS requirements are well aligned.

Creating one more column here for FOS

Table 3 Description of each FCAS

Type	NER Term	Commonly Referred to as...	Group	Description	Purpose	Usually Facilitated by...	FOS
Contingency FCAS	*Fast raise service*	6-Second Raise FCAS	Fast FCAS	A rapid increase in *generation* or a decrease in *load* in response to decreases in Local Frequency.	To arrest a change in System Frequency following a *contingency event* that takes it outside the NOFB within the first 6 s of a Frequency Disturbance and then provide an orderly transition to a Slow FCAS.	• Governor or governor-like *control systems* • Frequency relay detecting System. Frequency below NOFB and starting a fast *generating unit* or *disconnecting load*. • Rapid change in charging or discharging from batteries.	
	Fast lower service	6-Second Lower FCAS		A rapid decrease in *generation* or an increase in *load* in response to increases in Local Frequency.		• Governor or governor-like *control systems*. • *Frequency* relay detecting System Frequency above NOFB and reducing a *generating unit's* output or reducing *load*.	
	Slow raise service	60-Second Raise FCAS	Slow FCAS	An increase in *generation* or a decrease in *load* in response to decreases in Local Frequency.	To stabilise System Frequency following a *contingency event* within the first 60 s of a Frequency Disturbance, and then provide an orderly transition to a Delayed FCAS.	• Governor or governor-like control systems • *Frequency* relay detecting a frequency deviation and reducing *load*.	
	Slow lower service	60-Second Lower FCAS		A decrease in *generation* or an increase *load* in response to increases in Local Frequency.		Governor systems on *generating units*.	
	Delayed raise service	5-Minute Raise FCAS	Delayed FCAS	An increase in *generation* or a decrease in *load* in response to decreases in Local Frequency.	To return System Frequency to 50 Hz within the first 5 min of a Frequency Disturbance, and to sustain that response until *central dispatch* can re-schedule *generation* and *load* to balance the *power system*.	*Frequency* relay detecting a *frequency* deviation starting up *generating units* or reducing *load*.	
	Delayed lower service	5-Minute Lower FCAS		A decrease in *generation* or an increase in *load* in response to increases in Local Frequency.		*Frequency* relay detecting a *frequency* deviation and reducing *generating unit* output or increasing *loads*.	
Regulation FCAS	*Regulating raise service*	Raise Regulation FCAS	Regulation FCAS	Increasing *generation* or decreasing *load* in response to Raise Signals to increase System Frequency.	To support the control of System Frequency within the NOFB and time error in response to variations of demand and *generation* within a *dispatch interval*.	Setpoint controllers on *generating units*.	
	Regulating lower service	Lower Regulation FCAS		Decreasing *generation* or increasing *load* in response to Lower Signals to reduce System Frequency.			

11. Frequency responsiveness of FCAS:
What would be involved in ensuring that non-frequency responsive facilities:
a. Respond only when enabled in the relevant FCAS market(s)?
b. Do not deliver significantly more than market enablement (for example, >50%)?
Do any alternative options exist to manage over-delivery?

Hydro Tasmania understands the system frequency control challenges in a market environment and agree to the issue of the potential over correcting issue due to the uncertainty from the non-dispatched and non-frequency responsive facilities (including those with a switching FCAS response load response).

In regards the proposed solutions.

> Option A: Hydro suggests make the first option to be conditional and avoid sending counterproductive signals to the generators that the market enablement status overrides technical consideration. More details are provided in the alternative. An example of the counterproductive signals was the previously seen issues with the introduction of deadbands to remove perceived conflicts of NER and AEMO requirements.
>
> Option B: The proposal of 'the response should no more than 50%' appears somewhat arbitrary and needs to be thought through in aggregate across the power system.

Hydro Tasmania would suggest an alternative as below:

Given concern is non-frequency responsive facilities over correcting, it would be worthwhile to break down this question to different scenarios and considering a logical approach to manage this issue.

1) Based on the system studies, AEMO proposes a frequency threshold or thresholds.

2) By comparing the facility response trigger setting against the specified frequency threshold, the switching response facilities will be classified into two categories:

   a. If the switching response is within the proposed threshold, e.g. if the setting is too close to the NOFB, it would be putting in the 'likely over correcting' category. In other words, this facility is likely to trigger and once is triggered, its response is likely to cause over correcting, thus certain action is needed.

   b. If the facility setting is outside of the proposed threshold, e.g. distant from the NOFB, it would be considered in the 'unlikely' category. In other words, this facility is unlikely to trigger, if is triggered, the response is unlikely cause over correcting but just discount the proportional response. For these facilities there will be no action required.

By doing that, we can avoid unnecessary physical modification of the switching response if the facility is in the unlikely category. More importantly, it sets up a good engineering practice, as the voluntary FCAS switching response is valuable during extreme system contingencies, e.g. at the edge of emergency Under Frequency Load Shedding Scheme (UFLSS). So as long as it is outside of the potential over correcting zone, having some voluntary FCAS switching response is not always a bad thing. Again, consideration should be given to the aggregate response across the power system, not focusing just on facilities in isolation.

b. Please provide feedback on the proposed revised trigger ranges for switching controllers set out in Table 1 and Table 2 of section 3.3.

Table 1 Frequency settings for regions other than Tasmania

Level	Raise service Frequency Deviation Setting (Hz)	Lower service Frequency Deviation Setting (Hz)	Frequency Rate of Change Multiplier (seconds)
Frequency Deviation Setting range	~~49.80 Hz to 49.60 Hz~~ 49.85 Hz to 49.70 Hz	~~50.20 Hz to 50.4 Hz~~ 50.15 Hz to 50.3 Hz	0.4
Default Frequency Deviation Setting	~~49.65 Hz~~ 49.80 Hz	~~50.35 Hz~~ 50.20 Hz	0.4

Table 2 Frequency settings for the Tasmania region

Level	Raise service Frequency Deviation Setting (Hz)	Lower service Frequency Deviation Setting (Hz)	Frequency Rate of Change Multiplier (seconds)
Frequency Deviation Setting range	~~49.50 Hz to 48.75 Hz~~ 49.60 Hz to 49.00 Hz	~~50.50 Hz to 51.25 Hz~~ 50.40 Hz to 51.00 Hz	0.875
Default Frequency Deviation Setting	~~49.125 Hz~~ 49.30 Hz	~~50.825 Hz~~ 50.70 Hz	0.875

Hydro Tasmania would suggest maintaining the trigger range in Tasmania region, in order to accommodate the frequency deviation caused by the Basslink power flow reversal.

c. Please provide feedback on the proposal in section 3.3 to require proportional controllers to set deadbands no wider than ¬±0.1 Hz.

The FOS states that AEMO should restore frequency to be within the NOFB, not its edge. AEMO has noted many frequency events where frequency struggles to recover to be within the NOFB, as Contingency FCAS response may be very weak or withdrawn entirely as frequency approaches the edge of the NOFB.

Hydro Tasmania understands the consideration of revising the maximum allowable proportional controller dead band to ±0.1 Hz, so that the FOS requirement and the MASS technical specification aligns.

However, given the recent efforts on implementation of mandatory PFR which we believe supports this desired outcome, a conscious decision needs to be made about the completion of this change and the remaining shortfall. Thus Hydro Tasmania proposes AEMO defers the ±0.1Hz change in the MASS until the mandatory PFR implementation is fully completed and assessed.

This is critical for the participants to ensure that there is a sufficient and stable frequency margin between the normal frequency operating band NOFB) and contingency bands, thus permanent dead band reduction e.g. from ±0.15Hz to ±0.1Hz could possibly be made once assessed post mandatory PFR is implemented..
Note: The ±0.1 Hz deadband requirement will not be applied for the PFR variation and exemption units.

12. Co-ordination of different FCAS and PFR:

Hydro Tasmania believes it is important to establish technical co-ordination between different FCAS services and other characteristics that support management of system frequency.

Given the complexity of the issue, Hydro Tasmania would encourage AEMO to consider an independent document to state the coordination specifications details, but only leave high level principal description in the MASS. This would be helpful to ensure that each section in the MASS is reasonable balanced and no significant modification of MASS is required when update or further coordination specification is needed.

In regards the coordination specification contents, Hydro would suggest AEMO considering a logical and sequential approach, including:

- PFR and SFR roles and objectives.
- PFR and SFR response characteristics and the coordination design principle.
- PFR and SFR coordination guideline. E.g. physical coordination and control settings.
- FCAS delivery evaluation coordination specification.
- …

AEMO has proposed a coordination diagram in Figure 8. Hydro thinks this is good starting concept, on top of that more details would be helpful to reflect the two key factors of coordination - 1) responding timing and 2) allocated Δp size after coordination.

a. Referencing the list of co-ordination matters in section 3.4, are there other co-ordination matters AEMO should seek to address in the MASS?

Please refer to the general response above.

b. Does the list of clarifications on co-ordination of Contingency FCAS/PFR controls with AGC controls in Section 3.4 provide a reasonable balance between guidance and flexibility for plant control design?

Please refer to the general response above.

13. Regulation FCAS requirements:

In the current proposal, the regulation FCAS requirements seems only relate to AGC - the secondary frequency response, however given the reality that now governor response are also involved in the frequency regulation, Hydro would firstly suggest AEMO clearing the Regulation FCAS definition and scope in 3.5, then regulation FCAS requirement.

a. Are the requirements and proposed settings listed in section 3.5 adequate and achievable? In particular, can PFR (separate to other plant targets) be determined readily and communicated to AEMO?

Adequacy:

Hydro believes the proposed measurements have reasonably captured the need for regulation FCAS performance evaluation.

Achievability:

While most of proposed measurements are already available or provided to AEMO, Hydro would like to point out that it can be challenging to extract the PFR response other than the existing approach established in the contingency FCAS space e.g. using machine terminal power minus the inertial response.

Hydro suggests considering PFR determination as a stand alone topic.

b. Would a 1-year phase-in period for existing Regulation FCAS providers be satisfactory?

Hydro would suggest the Regulation FCAS implementation is scheduled after the mandatory PFR project.

As for the time frame, it would be helpful if the implementation can be carried out in multiple stages based on the size of the machine (similar to the PFR). This will allow the participant like Hydro Tasmania (fleet includes 50 units or 29 production lines) have sufficient time to plan and implement.

c. Do Consulted Persons believe that a 2-year Regulation FCAS testing cycle strike the right balance of stringency and reasonableness?

From Hydro perspective, the real challenges is to accommodate all 50 units within the 2 years testing cycle (e.g. averagely 2 units per months) and then repeat this pattern in monthly basis.

Alternatively, Hydro would suggest if the proposed tests can be integrated in normal operation, for example, using inbuilt data logging facilities where available in response to market signals and adding small ramp up and down test signals in the AEMO regulation target and introduce the power bias via the global AGC channel.

By doing that, Hydro believes that:

- The entire AGC channel can be tested and better identify the regulation response performance in different sections.
- Testing downtime and cost can be significant reduced.

While at this stage it is believed that AMEO still needs time to work out the testing details, Hydro would like to express an interest to facilitate the potential trails.

d. Clarification of requirements for Delayed FCAS – please consider the implications from your perspective of clarifying that Delayed FCAS controls may be of a switched type only (rather than also proportional), and, whether other factors in addition to those outlined in section 3.6 need to be considered.

Hydro would agree that synchronous machine droop responses end up with steady state error, thus an additional response outside of droop compensation is needed to bring the system frequency back to 50Hz. To achieve a suitable 'switched' response, a bias in the base assumptions is essentially needed..

14. Regarding issues associated with the pending FFR rule change canvassed in section 3.7 and any other rule changes of concern, AEMO wishes to hear from Consulted Persons on the following issues, which would be used to help scope future changes to the MASS:

a. What MASS issues they consider should be addressed in subsequent reviews, including if possible, provide reasoning as to why these issues are important.

Better connection with the market.

While the current MASS well covers the frequency ancillary services definition, measurement requirements, control specifications, evaluated calculation details, etc. There is very limited information available in regards how FCAS demand is specified/calculated and how each individual stage of FCAS procurement is coordinated to achieve overall system frequency control.

Hydro believes that MASS is the right document to include a high level FCAS demand and procurement specification principle, but then should be underpinned by a dedicated document (or in the Appendix) with detailed technical explanations, so that more transparent and objective guidance can be established and allow improvements for both AEMO and market participants.

b. How any other desirable changes to the MASS could be managed in the context of ongoing rule changes.

Accommodate and coordinate with the new potential changes from inertia, FFR and the ongoing PFR are the major questions that need to be addressed in the MASS or at least considered.

So in this iteration, apart from the content changes as specified, it would be worthwhile to have a review in regards the ancillary services technical specification documentation structure, e.g. to what level, the contents should be reflected in the MASS, what are the interrelated/dedicated documents with what details are needed.