Market Ancillary Service Specification Consultation - May 2022

Submission to Issues paper template

This template has been developed to assist Consulted Persons in providing submissions on the questions posed in the Issues Paper. AEMO encourages Consulted Persons to use this template to assist AEMO when considering the views expressed on each issue.

Consulted Persons should feel free to address only those questions that are of particular interest/concern to them and delete those they are not responding to.

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1 Background	
1.4 Industry advice	
Question 1:	Are there any further issues for investigation by the Consultative Forum that are relevant to the specification of Very Fast FCAS?
Response:	
3 Capability of different technologies to deliver Very Fast FCAS	
Question 2:	Do you agree with the capabilities expressed in Table 3? If not, please advise which of these you do not agree with and provide evidence to support alternative capabilities.

Response:

Mostly agree, with the below observations:

For wind farms, capability depends on wind turbine type. Type 3 WTG would mostly have an inertial response but have a slower rotational speed. Type 4 WTGs are fully inverter connected and therefore would have similar characteristics than other grid following inverter technology, depending on the wind resource.

Solar farm would have similar characteristics than other grid following inverter technology, depending on the solar resource.

For synchronous generation, the capability will vary depending on the technology:

- Synchronous generation response can't necessarily be sustained for a prolonged period of time, depending on the technology.

– Ignoring the inertial response, most synchronous generators will be limited by their mechanical ramp rates

Question 3:	Are there any technologies not mentioned in Table 3 that could potentially provide Very Fast FCAS? If so, what characteristics (including response time) could be expected of them? Please provide evidence to support their capabilities.

Response:

AEMO refers to “Aggregators” in its last bullet point, but this is not included in the table.

It depends on the nature of the aggregation, but same characteristics would apply to aggregated loads and aggregated battery storage (subject to any additional communication/control schemes)

Question 4:	How could wind farm and solar farm operators be incentivised to participate in the Very Fast FCAS markets? What are the technical barriers impeding participation? For example, this may be a conflict of voltage disturbance controls with frequency response controls.

Response:

Technically we cannot see issues for new technologies. Participation will be based on regulatory and commercial issues.

Question 5:	Are there any other issues relevant to the capability to provide Very Fast FCAS by different technologies that AEMO should consider?

Response:

To be able to provide raise services, headroom is required which directly translates into a production loss and needs to be justified by market economics and/or allowed by any commercial arrangements (I.e. PPA). The cost of including an autobidding system to revise the bids every 5 minutes is also seen as a barrier. Furthermore, the capability depends on wind and solar resource and conditions.

For lower services, the plant can self-constrain.

However, in both scenarios, the capability of those plants relies on the wind and solar resource. If the resource disappears, so does the FCAS availability.

This also creates a reliability and compliance issue, which can partially be addressed by modifying the energy output to maintain FCAS compliance, therefore trading off FCAS compliance with Energy compliance.

4 Proposed design of Very Fast FCAS markets

4.2 Guidance from other FFR Markets

Question 6:	Are there any specific useful lessons to be learned from other FFR markets around the world?

Response:

4.3 Proposed design of Very Fast FCAS markets

4.3.2 AEMO’s proposed high level market design

Question 7:	Are there any issues with the concept of shifting Fast FCAS to accommodate a similar, but faster, Very Fast FCAS? Is there a better alternative that is compatible with the Amending Rule?

Response:

This approach seems reasonable.

Question 8:	Are there any other issues relevant to market design that AEMO should consider?

Response:

As commented during the initial Industry Consultation, while the amount of Very Fast FCAS would change based on system conditions, the Very Fast FCAS market should be designed independent of the inertia level. That is, the physical response of a plant should remain unchanged for the same frequency disturbance..

Figure 8 shows a different MW output at 1s depending on the inertia level. For the avoidance of doubt, if this due to different volumes procured, this is fine, but this cannot work at a plant level, i.e. the response for Very Fast FCAS will not change (in comparison to other FCAS) based on inertia conditions.

4.3.3 Impact of inertia

Question 9:	Are there any other issues relevant to the impact of inertia that AEMO should consider?

Response:

Agree that Very Fast FCAS and inertia (mechanical or synthetic) should be treated separately and exclusive.

We note it may be challenging ex post to separate (synthetic) inertia and FFR responses when provided at small timescales and with an actual frequency trace (i.e. not a clean theoretical trace).

4.3.4 Primary Frequency Response

Question 10:	Are there any other issues relevant to the interaction between Very Fast FCAS and PFR that AEMO should consider?

Response:

Agree with the approach outlined, and in particular the fact that all ‘genuine’ frequency response should count towards Contingency FCAS, regardless of whether it is delivered by a PFR mechanism, or whether it is inside or outside of the NOFB.

4.4 Existing capability to deliver Very Fast FCAS

Question 11:	Does a 1-second response time specification automatically exclude certain technologies from being able to participate in the Very Fast FCAS markets? Which ones and why?

Response:

1-second response time specification will most likely exclude existing older synchronous generators. Given that this market is designed for the future grid to prepare for the retirement of older synchronous generators, this may be an appropriate trade off given a 1s service provides a more valuable response.

Question 12:	Is there anything else AEMO should consider in maximising the pool of potential Very Fast FCAS?

Response:

AEMO should ensure that the required volume of Very Fast FCAS response that AEMO will need can be delivered. It is important that the specified parameters for the service are not a barrier to entry in providing the service and are set to ensure there is sufficient market competition to deliver an efficiently priced service.

5 Specification of Very Fast FCAS and associated changes to the MASS	
5.2 Proposed key parameters for Very Fast FCAS	
5.2.1 Response time, timeframe and initiation delay	
Question 13:	Will some technology types be locked out of the Very Fast FCAS markets if the maximum response time is specified as 0.5 seconds rather than 1 second?
Response: Site-controller based response (e.g. Lake Bonney Battery or hybrid plants) have longer response time than those whose response is directly initiated at the inverter level (without intermediary power converter), because of the communication delays introduced. In the example of Lake Bonney Battery, this decision was made because of the need to manage a common transmission asset. Given the trend towards developing hybrid plants, and the likelihood of various technologies collocating with future or existing assets, it would be preferrable not to exclude those. As such, we believe a sub 1s response requirement could end up preventing wind and solar farms to participate. Either new ones or older ones that couldn't be retrofitted to participate. Given that an increased procurement of 1s service tends to improve the frequency nadir and trends toward a 0.5s service (with a lower procurement level), it seems appropriate to allow a bigger pool of participants by designing the system at 1s and adjust the procurement level.	
Question 14:	Are there benefits to setting the response time for Very Fast FCAS faster than 1 second that AEMO should consider?
Response: While we don't know how much FFR capacity the NEM needs, it seems that there is value in making the threshold higher to enable a higher number of responses/participants. Technology will do what they are capable of doing. i.e. batteries will respond quicker than 1 second and won't slow down their response time. In other words, the "overall" response of providers as a whole will be faster than 1s. If this market works in the same way other markets currently do (multiplier effect), the faster the response, the higher the registration will be, hence creating a financial incentive for plants to provide faster responses. Iberdrola supports a 1s Very Fast service, with a multiplier effect. We believe this will provide the right incentive to provide faster response, without limiting the pool of participants.	
Question 15:	Are there any other issues relevant to the proposed response time and timeframe that AEMO should consider?
Response: N/A	
5.2.2 Market ancillary service offer requirements	
Question 16:	Are there any other issues relevant to the proposed market ancillary service offer requirements that AEMO should consider?
Response: The FCAS multiplier effect currently provides an incentive to source faster responses. Once a very fast service is introduced, it seems fair to reward faster responses through this faster service.	

Should AEMO proceed with the capping of registered FCAS based on the actual response, this would have to occur at the same time as the introduction of the Very Fast FCAS. Otherwise, we see the following problems: • Unfair discrepancy in treatment of Fast FCAS services between the participants having opted to register for Very Fast FCAS compared to the one not having opted to provide very Fast FCAS • A reduction in Fast FCAS capacity if not enforced for all participants will slow down the participants in registering for very fast FCAS and taking a wait a see approach. It will take time for participants to weigh the economic benefits of making the registration change. As previously mentioned, faster responses should be seen as a positive contribution and should be incentivised. After the introduction of Very Fast services, Iberdrola Australia supports the capping of the Fast, Slow and Delayed services, but recommends a multiplier effect incentive for the Very Fast service.		
5.2.3 Reference frequency levels		
Question 17:	Are there any other issues or concerns relevant to AEMO's proposal to apply the current definitions of 'Raise Reference Frequency' and 'Lower Reference Frequency' to Very Fast FCAS?	
Response: Iberdrola Australia supports a consistent Reference Frequency across all contingency FCAS services. Specific to batteries, the current droop and reference frequency means that a battery can only provide ~50% of its capacity in cFCAS. Given batteries are currently the best assets (most commonly deployed compared to supercapacitor or flywheels) to provide this service, and given the potential lack of resource for fast responses, it would be beneficial to allow batteries to operate with a lower droop coefficient (i.e. 0.7%) so that they can provide a full response at ±0.5Hz. AEMO previously indicated security concerns with "faster" droop coefficient. A "faster" droop surely would not create more concerns than switched responses (or a combined FCAS controller) and we believe it would also help correct potential over-delivery of switched responses. In our view, and in consideration of AEMO's observations, the best combination would be to keep the ±0.5Hz reference frequency but allow a full response at that reference frequency.		
5.2.4 Frequency Ramp Rate		
Question 18:	Are there any other issues relevant to RoCoF that AEMO should consider?	
Response: No		
5.3 Control system requirements		
Question 19:	Is AEMO's proposal to permit the use of a 'combination' controller, namely, a hybrid of proportional and switched controls for Very Fast FCAS appropriate? Please provide reasons for your response.	
Response: For switched responses, we also query how AEMO will control the frequency threshold at which load trips depending on inertia conditions? Enabling FCAS providers with switched capabilities could lead to over-procurement of frequency responses when these generators are not dispatched to provide contingency services during a given interval but still have the relevant control scheme activated.		
Question 20:	Are there any other issues relevant to the proposed control system requirements for a combined FCAS controller that AEMO should consider?	

Response:

Question 21: Are there other FCAS delivery methods that AEMO should consider allowing for Very Fast FCAS?

Response:

See response to question 17. Iberdrola supports a lower droop coefficient of 0.7%.

Iberdrola supports incentives to start responding within the NOFB as opposed to from the NOFB.

5.4 Verification and measurement requirements

5.4.3 Frequency measurements

Question 22: What is the error margin and resolution for frequency measurements by high-speed metering installed by Fast FCAS Providers that could be retrofitted to existing Ancillary Service Facilities for participation in Very Fast FCAS markets?

Response:

Currently, Mass Requirement accuracy is 0.01Hz or 0.02% of 50Hz and resolution of 0.0025Hz or 2.5mHz

Lake Bonney BESS uses an Acuvim meter (Acuvim IIR-D-5A) for control. Accuracy 0.02% frequency, resolution of 1mHz. Lake monitors with an Elspec 4430 with 10mHz resolution and an accuracy of +/-10mHz.

Iberdrola Australia now specifies Elspec G5 meters at the point of connection for all projects. This model has a 1mHz resolution and an accuracy of +/-1mHz.

Question 23: What is the error margin and resolution for frequency measurements by high-speed metering that is not currently in use in the NEM, but is available for use in the Very Fast FCAS markets?

Response:

See above.

Question 24: What is the cost of high-speed metering that captures frequency measurements with a margin of error lower than <0.1 Hz?

Response:

See above. For a utility scale battery, solar farm or wind farm, this is not significant.

Question 25: Can metering providers submit the specifications of their high-speed metering currently available, or in use by Fast FCAS providers?

Response:

See above.

Question 26: Are measurement rates of <100ms feasible for your technology? What is the nature and extent of changes that would need to be made to support rates of <100ms?

Response:

See above.

Question 27:	Are there any other issues relevant to the proposed verification and measurement requirements that AEMO should consider?
Response: n/a/	

5.5 Overload capacity

Question 28:	How long can overload capacity be sustained?
Response: Question for OEMs as responses will vary. Our understanding is that this work on an I^2t relationship (current overload, not power overload). If because of voltage disturbance the system switches to Q priority, there would be no guarantee of the inverter being able to provide active power.	
Question 29:	What percentage of a generating unit's nameplate rating is equivalent to the overload capacity?
Response: Question for OEMs as responses will vary. Our understanding is that for inverter units this usually is limited to maximum ~20%. Synchronous generators are limited by the protection system.	
Question 30:	How often can overload capacity be triggered in a 5-minute trading interval?
Response: Question for OEMs as responses will vary. Our understanding is that it would depend on how big the overload is (thermal recovery issue).	
Question 31:	Can overload capacity be delivered proportionally to the frequency deviation, or can it only be delivered by a step change in active power?
Response: Question for OEMs. Our understanding is that it should be proportional.	
Question 32:	Is there an energy payback after overload capacity is delivered?
Response: Question for OEMs as responses will vary. Our understanding is there isn't subject to state of charge. For synchronous generation, there is the effect of the inertial response.	
Question 33:	What technologies other than BESS have overload capacity that be sustained for at least 6 seconds?
Response:	

Question 34:	Are there any other issues relevant to the potential use of overload capacity for Very Fast FCAS that AEMO should consider?

Response:

In our view this can only work if very fast FCAS is allowed to have a higher cap than the other cFCAS services (assuming voltage stays at or greater than 1p.u)

Utilising the overload capability to provide active power may result in GPS non-compliance in relation to reactive power capability and voltage control.

How will AEMO manage the registered FCAS trapeziums for overload capabilities to prevent stranding of the assets (outside the FCAS trapeziums)? Will the Enablement Max reflect the overload capability of the system or the registered maximum capacity?

5.6 Changes to other FCAS

5.6.1 Interaction between Very Fast FCAS and Fast FCAS

Question 35:	Can Consulted Persons identify any case where a decrease in Fast FCAS capability could be observed?

Response:

no

Question 36:	Are there any other issues relevant to the interaction between Very Fast FCAS and Fast FCAS that AEMO should consider?

Response:

no

5.6.2 Interaction between Very Fast FCAS and Slow FCAS and Delayed FCAS

Question 37:	Are there any issues relevant to the interaction between Very Fast FCAS and Slow FCAS and Delayed FCAS that AEMO should consider?

Response:

no

5.6.3 Interaction between Very Fast FCAS and Regulation FCAS

Question 38:	Are there any issues relevant to the interaction between Regulation FCAS and Very Fast FCAS that AEMO should consider?

Response:

no

5.6.4 Revision to FCAS measurement

Question 39:	Are there alternatives to capping the registered Very Fast FCAS capacity to the actual peak active power change to minimise the discrepancy between the amount of FCAS enabled and the actual contingency size?

Response:

Iberdrola supports an incentive for providers to deliver a faster response.

We note that a cap, if any, should also consider the impact of the proportional / switched hybrid model that would provide an additional response once frequency exceeds the switched response threshold.	
Question 40:	Are there any other issues relevant to the proposed market ancillary service offer requirements that AEMO should consider?
Response: See responses to questions 16/17.	
5.7 Proposed handling of Contingency Event Time	
Question 41:	Are there any other issues relevant to the proposed removal of Contingency Event Time that AEMO should consider?
Response: no	
Question 42:	In there a better alternative to the baseline compensation approach than the one proposed by AEMO? Please provide reasons for your response.
Response: Not that we have considered at this time	
6 Issues not under consideration	
6.4 Geographic diversity	
Question 43:	Are there any other issues relevant to geographic diversity that AEMO should consider?
Response: Diversity of response type, i.e. would it pose a significant issue if in some geographical areas the very fast response was only of a single type, e.g. loads?	