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: No comment	
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: The time to full response by loads will vary by more than 0.25 - 0.5 seconds. In the Irish electricity market VIOTAS operates loads which can fully respond in less than 150 ms (including communication and control latency). VIOTAS currently sees fast responding sites reaching full response between 150ms to 2s, including all control and communication system latency.	
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: No comment	

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: No comment	
Question 5:	Are there any other issues relevant to the capability to provide Very Fast FCAS by different technologies that AEMO should consider?
Response: No comment	

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: See response to question 40.	

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: See response to question 35. Can AEMO please provide details of the re-registration process it is considering for Ancillary Service Loads that wish to participate in Very Fast FCAS and those not wishing to participate in Very Fast FCAS.? For aggregation based FCAS Providers such as VIOTAS this will potentially have a material resource and cost impact if further testing, registration application work and AEMO fees are required.	
Question 8:	Are there any other issues relevant to market design that AEMO should consider?
Response: See response to question 16.	

4.3.3 Impact of inertia

Question 9:	Are there any other issues relevant to the impact of inertia that AEMO should consider?
Response: Can AEMO provide an indication to the number annual hours Very Fast FCAS will be required and the demand volume?	

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:

No comment

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:

As highlighted in question 18 a 1s response time for a switching controller load with a ramp rate of 1Hz/s, FDT equalling 49.85 Hz and a standard frequency setting of 49.80 Hz, equates to 950 ms of usable response time and a proposed initiation time of 450ms.

It's unlikely many load participants that currently prefer to parse tripping control signals via onsite communications systems (eg SCADA) will be able to meet the proposed specification for go-live.

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

Response:

See responses to questions 16, 18 and 39.

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:

See response to question 16 and 18.

Question 14:	Are there benefits to setting the response time for Very Fast FCAS faster than 1 second that AEMO should consider?

Response:

No comment

Question 15:	Are there any other issues relevant to the proposed response time and timeframe that AEMO should consider?

Response:

See response to question 39.

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:

Section 5.6.4 dot point 2 proposes a revision to the measurement process for registration and assessment stating:

"A new requirement that the relevant Contingency FCAS must be initiated no later than half-way through the relevant ramp-up period. For example, this would be by 3 seconds after FDT for Fast FCAS"

However, this requirement is not specified in section 5.2.2. Can AEMO clarify if this new requirement will in fact be included in the upcoming MASS and why this is required given the multiplier effect already incentives resources to respond as quickly as possible?

For switched controller FCAS Providers, Very Fast FCAS would translate to a maximum 'initiation' window (delta between FDT and the latest time a load could commence a measurable response) of 450ms (FDT +50ms to FDT+500ms), assuming a ramp rate of 1Hz/s and a frequency setting of 49.80 Hz. This window will decrease for loads with a frequency setting below 49.80 Hz by 50ms per 0.05 Hz.

Assuming FCAS Provider's control and monitoring hardware has a latency of ~100ms, this reduces a load's portion of the activation lead time to 350ms. It is unlikely many loads' communication, control systems (eg SCADA) and physical load response will be able to commence responding in 350ms. To meet this requirement loads would typically need to be controlled directly by protection equipment, such as circuit breakers, which have a response time of ~50ms for medium voltage applications, which is not the industry norm in Australia.

This may limit the pool of load participants looking to participate in Very Fast FCAS, particularly during the first months of operation when the value of the market is uncertain. VIOTAS suspects most FCAS Providers will require several months to develop, deploy, and test the service once AEMO has released the final specification. Aggregators who also need to sell the service will potentially 'wait and see' to assess the value of participating.

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:

No comment

5.2.4 Frequency Ramp Rate

Question 18:	Are there any other issues relevant to RoCoF that AEMO should consider?

Response:

With regards to loads using switching controllers, a characteristic of the MASS that isn't discussed in this review is the commencement of the assessment window. For contingency raise services this is equal to FDT (currently the edge of the NOFB, ie 49.85 Hz), however frequency settings are assigned by AEMO at or below 49.80 Hz. This creates a =>0.05 Hz delay between the frequency leaving the NOFB (49.85 Hz) and start time for resources using switching controllers, which in effect acts as a penalty as it reduces the measurement window. This effect is exacerbated when RoCoF is slow, or the frequency hovers between 49.85 Hz and the controller's frequency setting, further delaying the controller's start time. VIOTAS understand AEMO use engineering discretion during post event performance verification, however during registration this delay is governed by the Standard Frequency Ramp of 0.125 Hz/s for Fast, Slow and Delayed FCAS. A 0.5 Hz delta at a ramp rate of 0.125 Hz/s results in a 400 ms delay, or a fifteenth of the ramp period. See VIOTAS response to question 16 for the impact to Very Fast FCAS.

The UoM's latest analysis highlights this issue and adopts a rolling assessment window as a work around in order to conduct the analysis, otherwise the assessment window would be too long, although this doesn't reflect the MASS.
"switched loads […] generally exhibit response delays associated with a combination of actual response initiation delay and the time difference between when the frequency exits the normal operating frequency band (NOFB) and when it reaches the trigger setting of the load (which may be different from the NOFB).

Can AEMO justify why loads are penalised in this way, that is, why FDT is equal to the edge of the NOFB and not a switching controller's frequency setting? We note that this penalty is not equally imposed on generators to account for PFR, as illustrated in Figure 25 of the MASS Issues Paper.

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:

No comment

Question 20:	Are there any other issues relevant to the proposed control system requirements for a combined FCAS controller that AEMO should consider?

Response:

No comment

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

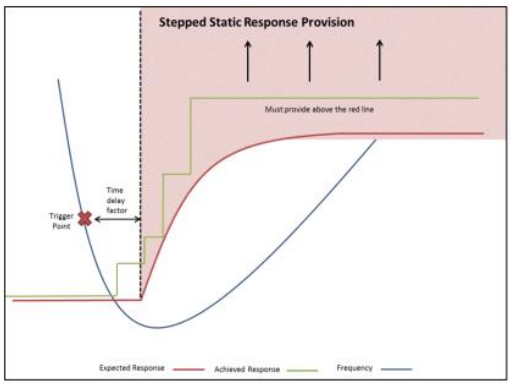
Response:

VIOTAS understands that AEMO's proposed combination controller solution is to encourage fast responding droop based resources, primarily BESS technologies, to partially register as proportional controllers in place of entirely registering as switching controllers. This would enable BESS resources to register their full capacity and provide the smoother response of proportional control. VIOTAS noted during the MASS workshop that at least one BESS vendor said registering a BESS as switching controller was purely a commercial decision and VIOTAS has heard similar comments from other BESS vendors. Assuming this is true, it is clear then that the combination controller solution must have greater commercial benefit than registering as a switching controller to incentivise BESS FCAS Providers.

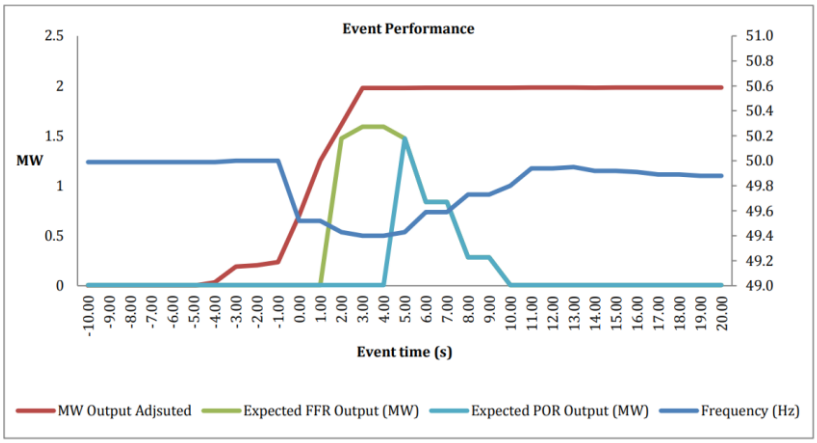
VIOTAS' experience supports AEMO's comments that "variable controllers are preferred [over switching controllers] from a power system security perspective where feasible, as this control design is more versatile".

VIOTAS currently operates a hybrid switching controller technology in the Irish FFR market (150ms ramp window) which mimics dynamic like behaviour to provide the grid operator greater flexibility of switched controller response. This technology is called Stepped Static and is illustrated in the figures below. Providers are assigned a maximum and minimum trigger response point and required to give a proportional response over this range.

We understand AEMO currently distribute frequency settings of switching controllers on a participant portfolio basis with the intention of approximating an overall dynamic response, but we question the effectiveness of this approach in comparison to Stepped Static. We encourage AEMO to consider how a similar hybrid controller design to Stepped Static could be included in the MASS to better utilise switching controllers.



Ideal Stepped Static Response in DS3 System Services in Ireland



Actual Stepped Static Response in DS3 System Services in Ireland

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: See the attached specification sheet. This equipment is currently in operation.	
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 the attached specification sheet. This equipment is currently in operation and exceeds the proposed metering requirements.	
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 the attached specification sheet.	
Question 25:	Can metering providers submit the specifications of their high-speed metering currently available, or in use by Fast FCAS providers?
Response: See the attached specification sheet. This equipment is currently in operation.	
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: Yes. 20ms power and frequency samples are currently possible. Only software changes are required to unlock this sampling rate.	
Question 27:	Are there any other issues relevant to the proposed verification and measurement requirements that AEMO should consider?
Response: No comment	
5.5 Overload capacity	
Question 28:	How long can overload capacity be sustained?
Response: No comment	
Question 29:	What percentage of a generating unit's nameplate rating is equivalent to the overload capacity?
Response: No comment	
Question 30:	How often can overload capacity be triggered in a 5-minute trading interval?
Response: No comment	
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: No comment	
Question 32:	Is there an energy payback after overload capacity is delivered?
Response: No comment	
Question 33:	What technologies other than BESS have overload capacity that be sustained for at least 6 seconds?

Response: No comment	
Question 34:	Are there any other issues relevant to the potential use of overload capacity for Very Fast FCAS that AEMO should consider?
Response: No comment	

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:

AEMO has assumed FCAS Providers would not change their control configuration if the Fast FCAS timeframes were changed. VIOTAS questions this assumption in the scenario where loads are too slow to participate in Very Fast FCAS. VIOTAS would likely change relay control settings to reflect any changes in Fast FCAS timeframes to mitigate the risk of tripping loads when not required to respond – ie Frequency Recovery is achieved between 0-1s, as per s3.7.1(a)(i) of the MASS. This would reduce the ramp period to 5s, thus potentially reducing Fast FCAS capacity. VIOTAS suggests AEMO validate this assumption through FCAS Provider feedback.

Can AEMO explain how frequency is arrested between 0-1s when Very Fast FCAS has not been procured, due to sufficient system inertia and interconnectedness?

Question 36:	Are there any other issues relevant to the interaction between Very Fast FCAS and Fast FCAS that AEMO should consider?
Response: See answer to question 18.	

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 comment	

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 comment	

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:

VIOTAS believes the proposed approach is sufficient, subject to an appropriate financial incentive (to reward faster responding resources) and omitting the new requirement in s5.6.4 of the Issues Paper, which requires response to initiate no later than half way through the ramp period – see response to question 16.

AEMO has not justified the need for introducing the initiation requirement. The market multiplier already incentivises FCAS Providers to respond as quickly as possible.

Question 40:	Are there any other issues relevant to the proposed market ancillary service offer requirements that AEMO should consider?

Response:

VIOTAS understands that the multiplier effect leads to AEMO procuring FCAS volumes that do not reflect the underlying active power requirement to maintain power system security. VIOTAS stresses the importance of the speed of response during a frequency disturbance and specifically, faster responding resources are technically better at arresting RoCoF than slower responding resources, which is exacerbated as inertia decreases.

VIOTAS speculates that the resources benefiting most from the market multiplier are those which can respond fastest, likely in less than 1s, which will naturally participate in Very Fast FCAS, likely reducing the multiplier effect across the NEM portfolio. Resources currently registered in Fast FCAS but unable to participate in Very Fast FCAS likely have a linear ramp rate or at best can respond in 2-3s, thus experiencing a relatively minor multiplier effect.

Deploying both the active power cap (removing an incentive to respond quickly) and introducing Very Fast FCAS simultaneously without experience of either appears to be a hasty decision that may materially impact the combined response of Fast FCAS resources.

It is important to note the success of performance based pricing in other markets. For example, in Ireland where "scalars" are applied to DS3 ancillary services payments to appropriately reward response speed. The Irish market rewards FFR response within 150 ms threefold versus that within the 2 second minimum requirement.

With lower levels of inertia, the loss of the same Largest Credible Risk will result in faster system frequency nadirs. Response times fast enough to meet the minimum frequency nadir time allow safe operation across all inertia levels. Fast response contingency services act to address the frequency nadir quickly and also reduce the RoCoF experienced by other devices on the grid. Within the same service, not all response is equal and that which can respond faster provides greater benefit, which should be appropriately rewarded and encouraged.

VIOTAS believes it is important for ancillary services minimum requirements to be as broad as possible (enabling the widest possible range of providers) but for these to be complemented by strong price signals to incentivise the characteristics of highest value to the system. One method to achieve this is scalars / differential pricing.

Currently the MASS implicitly includes a form of differential pricing, despite pricing being out of scope, as it uses response speed to determine the maximum volume a resource can provide. The intention of the multiplier is correct – reward faster resources – however perhaps price multipliers would be more appropriate than volume multipliers.

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 comment

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: No comment	

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: No comment	