MARKET ANCILLARY SERVICE SPECIFICATION REVIEW

FINAL REPORT AND DETERMINATION

Published: **30 June 2017**

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

EXECUTIVE SUMMARY

The publication of this Final Report and Determination (Final Report) concludes the Rules consultation process conducted by AEMO to amend the *market ancillary service specification* (MASS) under clauses 3.11.2(c) and (d) of the National Electricity Rules (*Rules*).

This review was prompted by:

- The need to update the MASS to reflect the National Electricity Amendment (Demand Response Mechanism and Ancillary Services Unbundling) Rule 2016 No 10 (Ancillary Services Unbundling rule change), due to take effect on 1 July 2017; and
- Technological developments which are increasing the range of *market participants* that can provide *market ancillary services* in the *National Electricity Market* (NEM).

AEMO published an Issues Paper in January 2017 to elicit comments from Consulted Persons on any barriers to entry from new technologies in response to the Ancillary Services Unbundling rule change, and to ensure the document met the needs of the changing environment.

Based on nine submissions to the Issues Paper, AEMO published a Draft Report and Determination (Draft Report) in April 2017, which included a draft of the MASS.

Five submissions were received in response to the Draft Report. The submissions raised the following key topics:

- No major technical barriers to new entrants identified.
- The need for regulation service to ensure frequency recovers quickly.
- Allocation of Frequency Setting to each constituent part of an Aggregated Ancillary Service Facility.
- Impacts of ancillary service provision on causer pays contribution factors.
- Measurement of response.

AEMO has prepared this Final Report to detail the key issues raised by the five submissions to the Draft Report, and to communicate AEMO's final determination.

The key points in the final determination are:

- There are no major technical barriers to entry for new entrants.
- AEMO will allocate a range of Frequency Settings for each aggregated ancillary service unit, and the Market Participant will manage the allocation to relevant plant within the aggregated ancillary service unit.
- The impacts of response to ancillary service signals on the causer pays contribution factor are beyond the scope of this review, and no changes have been made to the MASS.
- It is critical that the response of all units enabled for ancillary services can be recorded and stored accurately. The MASS has been amended to include data transducers in the specification.
- Some minor drafting issues have been addressed

AEMO anticipates that further reviews to the MASS will follow consultation through the Ancillary Services Technical Advisory Group.

AEMO's final determination is to amend the *market ancillary service specification* in the form published with this Final Report.

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1. STAKEHOLDER CONSULTATION PROCESS

As allowed by clauses 3.11.2(c) and (d) of the *Rules*, AEMO has consulted on *market ancillary service specification* (MASS) in accordance with the *Rules consultation procedures* in rule 8.9. The consultation was conducted in the following stages:

Process Stage	Date
Notice of First Stage Consultation and Issues Paper	25 January 2017
Submissions in response to Notice and Issues Paper received	10 March 2017
Draft Report and Draft Determination	26 April 2017
Submissions in response to the Draft Report received	19 May 2017
Final Report and Final Determination	30 June 2017

The Final Report is published in accordance of clause 8.9(k) of the *Rules*.

All submissions received during the second stage of the consultation are summarised in Section 3 and discussed in Section 4.

All submissions received during this consultation have been published on *AEMO's* website at:

http://www.aemo.com.au/Stakeholder-Consultation/Consultations/Amendment-Of-The-Market-Ancillary-Service-Specification.

2. BACKGROUND

2.1 Rules requirements

This Final Report concerns the application of clauses 3.11.2(c) and (g) of the *Rules*, which allow *AEMO* to amend the specification and standards for the provision of *market ancillary services*.

Clause 3.11.2(b) of the Rules provides:

(b) *AEMO* must make and publish a *market ancillary service specification* containing:

(1) a detailed description of each kind of *market ancillary service*; and

(2) the performance parameters and requirements which must be satisfied in order for a service to qualify as the relevant *market ancillary service* and also when a *Market Participant* provides the relevant kind of *market ancillary service*.

The previous version of the MASS was published on 20 March 2012. *AEMO* may amend the MASS from time to time under clause 3.11.2(c) of the *Rules*.

Clause 3.11.2(f) of the *Rules* provides that a *Market Participant* which has classified a *generating unit* as an *ancillary service generating unit* or a *market load* as an *ancillary service load* must install and maintain in accordance with the standards referred to in clause 3.11.2(g), monitoring equipment to monitor and record the response of the *ancillary service generating unit* or *ancillary service load* to changes in the *frequency* of the *power system*. Clause 3.11.2(g) provides for *AEMO* to develop and amend standards that must be met in installing and maintaining the required equipment.

2.2 Context for this consultation

This review was prompted by:

- The need to update the MASS to reflect the Ancillary Services Unbundling rule change due to take effect on 1 July 2017.
- Technological developments which are increasing the range of *Market Participants* that can provide *market ancillary services* in the *National Electricity Market* (NEM).

As a consequence, this document is focused on applying the MASS within the existing *Rules* framework and does not consider potential future amendments to the *Rules*. The scope of this review is discussed further in Section 4.2.

AEMO is currently undertaking several related pieces of work on ancillary services and has establishing an Ancillary Services Technical Advisory Group to provide contributions to *AEMO* on matters relating to ancillary services, both current and those potentially needed in the future. *AEMO* anticipates that further reviews to the MASS will follow consultation through the Ancillary Services Technical Advisory Group.

2.3 First stage consultation

AEMO issued a Notice of First Stage Consultation on 25 January 2017.

AEMO prepared the Issues Paper to facilitate informed debate and seek stakeholder feedback on amendments to the MASS to:

- Articulate the principles underlying the *market ancillary service specification*.
- Identify and where possible address any barriers to entry for new *Market Ancillary Service Providers.*
- Better define the services required in terms of what is needed for *power system security*.
- Better describe the principles for verifying *plant* performance.
- Provide more flexibility in allocating Switching Controller settings, particularly for aggregated units.

AEMO received nine written submissions in the first stage of consultation. These respondents were:

- AGL.
- Australian Energy Council.
- Clean Energy Council.
- Delta Electricity.
- ENGIE.
- EnerNOC.
- ERM Power.
- Hydro Tasmania.
- United Energy.

Copies of all written submissions have been published on *AEMO's* website at: http://www.aemo.com.au/Stakeholder-Consultation/Consultations/Amendment-Of-The-Market-Ancillary-Service-Specification.

2.4 Second stage consultation

On 26 April 2017, *AEMO* issued a Notice of Second Stage Consultation along with the Draft Report and the draft *market ancillary service specification*, both of which are available on *AEMO's* website.[1]

AEMO received five written submissions in the second stage of consultation. These respondents were:

- Delta Electricity.
- EnerNOC.
- Snowy Hydro Limited.
- Tilt Renewables.
- Yokogawa Australia.

Copies of all written submissions have been published on *AEMO's* website at: http://www.aemo.com.au/Stakeholder-Consultation/Consultations/Amendment-Of-The-Market-Ancillary-Service-Specification. Responses to these submissions are included in this Final Report.

[1] http://www.aemo.com.au/Stakeholder-Consultation/Consultations/Amendment-Of-The-Market-Ancillary-Service-Specification.

3. SUMMARY OF MATERIAL ISSUES

The key material issues arising from the proposal and raised by Consulted Persons are summarised in the following table:

No.	Issue	Raised by
1.	Barriers to new entrants	Delta Australia
2.	The need for *regulation service* to ensure *frequency* recovers quickly	Yokogawa Australia
3.	Allocation of Frequency Setting to each constituent part of an Aggregated Ancillary Service Facility	EnerNOC
4.	Impacts of ancillary service provision on causer pays	Snowy Hydro Limited
5.	Measurement of response	Delta Electricity , EnerNOC, Snowy Hydro Limited

A detailed summary of issues raised by Consulted Persons in submissions, together with *AEMO's* responses, is contained in **Appendix B**.

4. DISCUSSION OF MATERIAL ISSUES

4.1 Barriers to new entrants

4.1.1 Issue summary and submissions

In the Issues Paper, *AEMO* sought feedback on any barriers to new entrants participating in the *ancillary services* markets and identified a number of issues for stakeholders to consider. In the Draft Determination, AEMO addressed an issue relating to the ability for *aggregated units* to provide *regulation services*.

In its response to the Draft Determination, Delta Electricity agreed with *AEMO* that no major technical barriers appear to exist in the MASS, and supported *AEMO's* determination that no major amendments are required to remove such barriers.

4.1.2 AEMO's assessment

Submissions have not identified any major technical barriers for the entry of new entrants offering new or emerging technologies into the *ancillary services* markets.

4.1.3 AEMO's conclusion

AEMO determines that no major amendments are required to the MASS to remove barriers to entry.

4.2 The need for *regulation service* to ensure *frequency* recovers quickly

4.2.1 Issue summary and submissions

Yokogawa Australia identified that the draft MASS required that generating units enabled for regulation services should respond to AGC instructions as soon as frequency returns to the range of 49.9 Hz to 50.1 Hz.

However, variable controllers, such as governors on thermal generators are not providing much service as frequency approaches these limits again. Without Automated Governor Control (AGC), this is likely to inhibit recovery.

Yokogawa Australia proposed that a solution could be for units to respond to AGC raise or lower commands once any "FCAS" raise services are not also raising load or lower services are not also lowering load.

4.2.2 AEMO's assessment

AEMO has reviewed the relevant clause of the Draft MASS (clause 6.9, Response to AGC instructions during and after a contingency event) and believes that it is important to avoid over delivery of services and potential further frequency events by providing clear requirements for plant providing both contingency and regulation services.

AEMO supports the view from Yokogawa Australia that at frequencies close to the dead-band generating units with variable controllers, such as governors on thermal or hydro generators, are not providing much service. Regulation services are needed to ensure that frequency recovers close to 50 Hz and should respond to AGC instructions once the frequency enters the *normal operating frequency band.*

4.2.3 AEMO's conclusion

AEMO determines that generating units or loads enabled to provide both regulation and contingency services should respond to raise or lower instructions received from AEMO's AGC system raise or lower commands once frequency has recovered to the *normal operating frequency band*.

AEMO has amended the MASS to reflect this conclusion.

4.3 Allocation of Frequency Setting to each constituent part of an Aggregated Ancillary Service Facility

4.3.1 Issue summary and submissions

EnerNOC questioned how AEMO will assign the range of Frequency Settings to each relevant plant of an Aggregated Ancillary Service Facility.

The draft MASS was not clear on how these Frequency Setting would be allocated. Options for this could be for AEMO to allocate individual Frequency Setting to each relevant plant of the Aggregated Ancillary Service Facility at the time of registering each incremental constituent part, or for AEMO to allocate the Aggregated Ancillary Service Facility a range of Frequency Settings, with the expectation that the participant will manage the allocation of Frequency Settings across the relevant plant of the Aggregated Ancillary Service Facility. Both options would aim to achieve some sort of even balance across the range.

4.3.2 AEMO's assessment

In allocating a range of Frequency Settings for the relevant plant of an Aggregated Ancillary Service Facility, AEMO is aiming to achieve a combined response similar to that of variable controller, and in doing so, minimise the potential for over delivery of services.

There is an expectation that Market Participants will, from time to time, amend the list of relevant plant making up an Aggregated Ancillary Service Facility. In doing this, the Market Participant would be required to allocate Frequency Settings to provide the required aggregate response from the Aggregated Ancillary Service Facility.

Having Market Participant undertake the detailed allocation of Frequency Settings, both initially and following any amendments to the Aggregated Ancillary Service Facility, will reduce the administration costs of registration and allow the Market Participant the maximum flexibility in achieving the desired outcome.

AEMO recognises that there may be issues in relation to the frequencies that can be allocated to some of the relevant plant in an Aggregated Ancillary Service Facility, and recognises the need for some negotiation on how the settings are allocated.

4.3.3 AEMO's conclusion

AEMO determines that, where possible, it will negotiate with the Market Participant to allocate a range of Frequency Settings and allow the Market Participant to allocate these across the relevant plant of the Aggregated Ancillary Service Facility to simulate the behaviour of Variable Controllers.

AEMO has amended the MASS to reflect this conclusion.

4.4 Impacts of ancillary service provision on causer pays

4.4.1 Issue summary and submissions

Snowy Hydro Limited raised a number of questions on the clarity on the computation of causer pays contribution factors.

Snowy Hydro Limited suggested that it is possible for the Service Provider to detect a local frequency excursion that triggers a contingency service response while the frequency measured remotely by AEMO may not indicate a contingency event. As a consequence, the Service Provider will be away from its energy target, which negatively impact on the causer pays contribution factor calculated for the period.

Snowy Hydro Limited commented that it is possible for a Service Provider that was enabled to provide Regulation FCAS services, and receiving combined energy and regulation service dispatch targets, to continue to receive abnormally high/low targets for a significant amount of time after the Service Provider is no longer enabled for provision of Regulation service. This could also negatively impact on the causer pays contribution factor calculated for the period.

4.4.2 AEMO's assessment

The MASS is required to provide a detailed description of each kind of market ancillary service, and the performance parameters and requirements which must be satisfied in order for a service to qualify as the relevant market ancillary service, and also when a Market Participant provides the relevant kind of market ancillary service.

As such, the MASS is focused on the technical design and performance of plant offered into the ancillary services markets. AEMO acknowledges that there are interactions between the operation of the market ancillary services and the calculation of the causer pays contribution factors used for the recovery of the costs of providing regulation services. However, AEMO does not believe it is appropriate or efficient to address these issues in the MASS. They are more appropriately covered in the Causer Pays Procedure.

4.4.3 AEMO's conclusion

AEMO determines that the issues concerning the calculation of causer pays contribution factors are beyond the scope of the MASS.

4.5 Measurement of response

4.5.1 Issue summary and submissions

A number of submissions raised questions relating to the measurement of the response of services to contingency events.

Snowy Hydro Limited suggested that the MASS was unclear on whether a Market Participant was required to record and store data for contingency events at times when they are not enabled to provide the services.

EnerNOC asked whether there was a requirement for a Market Participant to record and store data for a contingency event if the local frequency does not reach the Frequency Setting for the enabled service and the Facility is not expected to respond.

Delta Electricity also suggests that more detail is required in the MASS to ensure that the source instrumentation has the same specifications as the data recorder specification.

4.5.2 AEMO's assessment

The preamble to clause 3.6(a) of the MASS talks about "the equipment required to monitor and record the raise response in respect of a fast raise service or the lower response in respect of a fast lower service".

A Facility that is not enabled to provide a service is not expected to respond to a contingency event, and AEMO does not require the Facility to record and store data in this situation.

In the case of a Facility with a Switching Controller enabled to provide a service, if the local frequency does not reach the Frequency Setting, there is no expected response from the Facility, but the data should be recorded and stored to demonstrate this.

It is critical to the integrity of the data that all elements of the data collection and storage have a resolution that ensures that the final data does represent the performance of the plant at or better than the minimum requirements set out in the MASS.

4.5.3 AEMO's conclusion

AEMO determines that the MASS does indicate that a Facility must record and store response of a Facility enabled to provide a service at times of a contingency event. AEMO will amend the MASS to confirm that the data resolution requirements are for the transducers collecting the data as well as the recorders and data storage.

5. OTHER MATTERS

There was broad support in the submissions received for the changes proposed, and for AEMO to continue the work on reviewing Ancillary Services to improve the management of power system frequency.

Some submissions raised a number of small drafting and definitional changes that have been addressed in the final determination:

- A number of items have been added to the glossary.
- For ease of reading, the requirements for the performance of Facilities providing contingency services following the recovery of system frequency has been moved into the Control Facilities sections of each associated service.
- A number of phrases have been added to the text to increase clarity.
- For consistency with other AEMO documents, the terms “constituent unit” and “constituent plant” have been replaced with “relevant plant”.

6. FINAL DETERMINATION

Having considered the matters raised in submissions, AEMO's final determination is to amend the *market ancillary service specification* in the form of **Attachment 1**, in accordance with clause 3.11.2(c) of the *Rules*.

For clarity, a marked up copy of the MASS is included in **Attachment 2** highlighting the changes from the Draft MASS.

APPENDIX A - GLOSSARY

Terms defined in the National Electricity Law or the *Rules* have the same meanings in the final determination unless otherwise specified in this clause. Those terms/Defined terms are intended to be identified in the final determination by italicising them, but failure to italicise a defined term does not affect its meaning.

Term or acronym	Meaning
AEMC	means the Australian Energy Market Commission
AGC	means Automated Governor Control
Aggregated Ancillary Service Facility	means the relevant plant which ancillary service generating units and/or ancillary service loads have aggregated to provide the relevant market ancillary service
Ancillary Service Facilities	means the *ancillary service generating unit* and/or *ancillary service load* used to provide the relevant *market ancillary service*
Ancillary Services Technical Advisory Group	means the select group of industry experts that will be called upon to provide contributions to *AEMO* on matters relating to *ancillary services*
Ancillary Services Unbundling rule change	means the National Electricity Amendment (Demand Response Mechanism and Ancillary Services Unbundling) Rule 2016 No. 10 made by the AEMC on 24 November, 2016 allowing the unbundling of the provision of *ancillary services* from the provision of energy
Causer pays	means the arrangements set out in clauses 3.15.6A(h)-(nb) of the NER which determines the recovery of costs associated with regulation services.
Contingency Services	means the (1) *fast raise service*; (2) *fast lower service*; (3) *slow raise service*; (4) *slow lower service*; (5) *delayed raise service*; and (6) *delayed lower service*
Draft Report	means AEMO's Draft Report and Determination published 26 April 2017
FCAS	means frequency control ancillary services – *Regulation services* and Contingency Services, acquired as *market ancillary services*
FCASVT	means the frequency control ancillary service verification tool, an Excel spreadsheet designed to verify the performance of Contingency Services
Final Report	means this report
Frequency Setting	means a level of *frequency* determined by *AEMO* in accordance with the procedure set out in the *MASS* and notified in writing to the m*arket participant* for use by a Switching Controller or a combined Switching Controller for a particular Ancillary Service Facility when providing a particular m*arket ancillary service*
Issues Paper	means AEMO's Issues Paper for Amendment Of The *market ancillary service specification* published 25 January 2017
Local Frequency	means the *frequency* of the electricity delivered by an *ancillary service generating unit* or consumed by an *ancillary service load*, measured in Hz
Switching Controller	means a control system that delivers a specific amount of service when one or more specified conditions are met
System Frequency	means a frequency measured by or for AEMO that represents the frequency of the power system to which the ancillary service generating unit or ancillary service load is connected

APPENDIX B - SUMMARY OF SECOND ROUND SUBMISSIONS AND AEMO RESPONSES

No.	Consulted person	Issue	MASS Clause	AEMO response
1.	Tilt Renewables	Tilt Renewables strongly encourages AEMO to continue its work on frequency control, including the Ancillary Services Technical Advisory Group, in parallel with the completion of this consultation, and encourages AEMO to schedule a further consultation on amendments to the MASS to progress the complex issues raised.	N/A	AEMO notes comment.
2.	Tilt Renewables	Tilt Renewables encourages AEMO, in conjunction with the Ancillary Services Technical Advisory Group, to develop a comprehensive performance measure, such as a performance index, that measures the performance of regulation service delivery in a way that balances the system need for some level of certainty in delivery against the cost of achieving this.	6.5	AEMO notes comment, and will take the issue to the Ancillary Services Technical Advisory Group, to be considered as part of a broad review of frequency issues including both the physical and the financial (including causer pays).
3.	Tilt Renewables	As a participant with technology not traditionally used for FCAS, we consider that the Contingency services could be better specified in the MASS by a thorough illustration of the desired response.	3, 4 & 5	AEMO notes comment, and will take the issue to the Ancillary Services Technical Advisory Group, to be considered as part of a broad review of frequency issues.
4.	Tilt Renewables	Tilt Renewables agrees that further work is needed on the definition of the “orderly transition” to the next Contingency service, as the desired response, while it may be implicitly assumed to be a linear ramp, is not specified in the MASS.	3, 4 & 5	AEMO notes comment – to be discussed in the Ancillary Services Technical Advisory Group.
5.	Tilt Renewables	Tilt Renewables does not agree that avoiding system changes and costs on existing providers should itself be a consideration, but that both the costs and benefits of any system changes should be evaluated, in accordance with achieving the National Electricity Objective.	N/A	AEMO notes comment – in proposing any amendments, AEMO will consider the National Electricity Objective, considering the long-term costs and benefits, including the potential impacts of requiring retrospective changes.
6.	Yokogawa Australia	Generating units enabled for regulation services should respond to AGC instructions as soon as frequency returns to the range of 49.9 Hz to 50.1 Hz. Variable controllers are not providing much service as frequency approaches 49.90 again. Without AGC this is likely to inhibit recovery. A solution can be for units to respond to AGC raise commands once any “FCAS” raise services are not also raising load.	6.9	MASS amended to reflect this suggestion, with units enabled for regulation services being required to respond to AGC instructions as soon as frequency returns to the range of 49.85 Hz to 50.15 Hz.
7.	Yokogawa Australia	A further minor observation is that the diagram for the mainland in Appendix A could be misleading due to it not being drawn to scale.	Appendix A	MASS amended to reflect this comment.

No.	Consulted person	Issue	MASS Clause	AEMO response
8.	Snowy Hydro Limited	Snowy Hydro proposes that further clarity could be given to Service Providers if the MASS had a dedicated section identifying how FCAS capability is to be determined for each service.	3.4, 4.4 & 5.4	AEMO notes comment – each service has a section.
9.	Snowy Hydro Limited	Snowy Hydro proposes that further clarity could be given to Service Providers if the explanation currently contained within section 2.1.1 (Contingency Services) is separately identified within the Control Facilities sections of each associated FCAS service.	2.1.1, 4.2 & 5.2	MASS amended to reflect this suggestion.
10.	Snowy Hydro Limited	Snowy Hydro observes that the Draft MASS 2017 does not provide any guidance on how provision of FCAS should be abandoned if frequency has returned to the normal frequency band prior to the end of the FCAS provision period (i.e. step vs ramp vs ramp rate).	3.2, 4.2 & 5.2	AEMO notes comment, and will take the issue to the Ancillary Services Technical Advisory Group, to be considered as part of a broad review of frequency issues.
11.	Snowy Hydro Limited	The draft MASS makes no distinction between when an FCAS service is enabled or not with regards to data recording facilities. The unanswered question being, if you are not enabled for provision of any FCAS service, are you required to record data even if frequency or df/dt falls outside relevant parameters?	4.6, 4.6 & 5.6	AEMO notes comment – the requirements are to record response, if not enabled there is no response to be recorded.
12.	Snowy Hydro Limited	The draft MASS provides no clarity on the computation of causer pays.	N/A	AEMO notes comment, but causer pays is beyond the scope of this review. By design, MASS should not provide clarity on causer pays.
13.	Snowy Hydro Limited	When a Service Provider detects and triggers a contingent FCAS response from its own frequency source, the frequency excursion detected may not be correspondingly observed as an FCAS event by AEMO (i.e. AEMO concludes the occurrence of contingent events via their own frequency source). The consequence results in the Service Provider being inadvertently penalised by causer pays.	N/A	AEMO notes comment and considers the risk of this to be very low, but will take the issue to the Ancillary Services Technical Advisory Group, to be considered as part of a broad review of frequency issues.
14.	Snowy Hydro Limited	When a Service Provider is enabled to provide Regulation FCAS services, the 4 second target provided by AEMO (made up of both energy and regulation FCAS) is held up for a number of seconds across the dispatch interval. The issue being that if the Service Provider is no longer enabled for provision of Regulation FCAS over the second interval, AEMO's 4 second target is held abnormally high/low for a significant amount of time until correction is applied and a step change to the target is provided. The consequence results in the Service Provider being inadvertently penalised by causer pays.	N/A	AEMO notes comment, and will take the issue to the Ancillary Services Technical Advisory Group, to be considered as part of a broad review of frequency issues including both the physical and the financial (including causer pays).
15.	Snowy Hydro Limited	SHL would like to see a clear mark-up of amendments to the MASS.	N/A	AEMO is providing a mark-up of amendments made to the draft MASS.

No.	Consulted person	Issue	MASS Clause	AEMO response
16.	EnerNOC	How AEMO will assess the compliance of an Aggregated Ancillary Service Facility in the event that a frequency disturbance only reaches partway through the Facility's allocated range of Frequency Settings.	7.2 with 3.7, 4,7 & 5.7	AEMO notes comment. and believes that the MASS would require a response based on the amount of controllers that the frequency deviation activates.
17.	EnerNOC	it is unclear to us whether AEMO will assign a unique Frequency Setting to each constituent part of an Aggregated Ancillary Service Facility at the time of registering each incremental constituent part, or whether AEMO will assign the Aggregated Ancillary Service Facility a range of Settings, with the expectation that the participant will manage the allocation of Settings across the constituent parts of the Facility, with the aim to achieve some sort of even balance across the range.	7.2	MASS amended to address this comment.
18.	EnerNOC	How AEMO will combine high-speed data from multiple constituent parts within an aggregated facility with different frequency settings in order to arrive at a single delivered quantity.	2.4	AEMO notes comment – only triggered constituents will be used for verification
19.	EnerNOC	How AEMO intends fast-responding participants to calculate offers.	3.3, 3.4, 3.7, 4.3, 4.4, 4.7, 5.3, 5.4 & 5.7	AEMO notes comment – in defining the amount of service offered and the verification of performance in a generic manner without reference to speed of response.
20.	EnerNOC	Definition of Ancillary Service Facility. Throughout the Draft MASS, the terms Ancillary Service Facility and Aggregated Ancillary Service Facility are variously employed, but only the former term is defined in the Definition of Terms.	1.2.1	MASS amended to address this comment.
21.	EnerNOC	Definition of Frequency Deviation Setting – indicates that the setting is applied to the Ancillary Service Facility and implies that the setting is singular. Further sections imply that a facility might be assigned multiple settings. In addition – it is unclear to us how this defined term is different to Frequency Setting.	1.2.1	MASS amended to address this comment. Frequency deviation setting could include both frequency setting and frequency rate of change setting.
22.	EnerNOC	"the MASS is designed to… treat ancillary service facilities with the same performance equally". It seems possible to us that the Draft MASS itself violates this principle, via employment of a standard frequency ramp and the "clock start" point of when the frequency leaves the normal operating band.	2.1	AEMO notes comment, but does not believe there is any inconsistency in the clauses.

No.	Consulted person	Issue	MASS Clause	AEMO response
23.	EnerNOC	The terms “constituent unit” and “constituent plant” are employed variously throughout the Draft MASS. We suggest that AEMO will receive offers from an increased number of aggregated facilities in the future, and thus references to the constituent components of a facility will become more commonplace (particularly if constituent components of a facility are assigned unique frequency settings). As such, it may be worthwhile for AEMO to decide on preferred nomenclature for a “constituent” piece of a facility and to memorialise it in the Definition of Terms.	1.2.1, 2.4 & 7.2	MASS amended to address this comment.
24.	EnerNOC	In our view, it is important that participants are consulted on and made aware of any changes to the FCASVT, as many will leverage the tool to both create offers and verify the performance of their facilities.	N/A	AEMO notes comment.
25.	EnerNOC	Draft MASS section 3.6 (a) (ix) effectively requires a Fast Raise measurement facility to record and store high-speed recordings every time the frequency reaches 49.8 Hz. Many facilities will have a frequency setting below 49.8 Hz, and so are required to capture high speed recordings in situations even where their setting is never reached and no service delivery is required/desired.	3.6	AEMO notes the comment – following an event, AEMO would seek details of response from all ancillary service generating units and loads enabled at the time.
26.	EnerNOC	To us it seems that Draft MASS section 3.7.1 (a)(i) might be improved by appending “or, in the event that Frequency Recovery does not occur within 60 seconds of the Frequency Disturbance Time, 60 seconds”.	3.7.1, 4.7.1 & 5.7.1	MASS amended to address this comment.
27.	EnerNOC	The term “basic response” is an essential term that is employed frequently throughout the Draft MASS, but that its definition is arrived at indirectly. As such we consider there may be value in defining the term in the Definition of Terms.	1.2.1	AEMO notes the comment, but “basic response” is purely an intermediate step in the verification calculation and has no intrinsic value requiring definition.
28.	EnerNOC	Draft MASS Section 3.7.1(a)(viii) has a strikethrough, and it is unclear to us whether AEMO intends for this paragraph to remain in the MASS, or not.	3.7.1	MASS amended to address this comment.
29.	EnerNOC	In Draft MASS Section 4.3 (a) we suggest that this paragraph might be improved/clarified by replacing the word “provided” with “enabled”, to better reflect the composition of value “FD” in the current MASS.	4.3	AEMO notes comment, but believes “provided” is correct.
30.	EnerNOC	In Draft MASS Section 7.2.(d)(i) we suspect the reference to “(a)” is meant to read “(b)”.	7.2	MASS amended to address this comment.
31.	Delta Electricity	Delta Electricity agrees that no technical barriers to entry appear to in the MASS version 4.	N/A	AEMO notes comment.
32.	Delta Electricity	Delta Electricity agrees with the intent and wording of the inclusions made to document the requirements for aggregated units providing regulation services.	2.1.2	AEMO notes comment.

No.	Consulted person	Issue	MASS Clause	AEMO response
33.	Delta Electricity	Delta Electricity observes that the document could be restructured to ensure that the specifications for control and measurement facilities appear in similar locations in the document.	3.5, 4.5, 5.5 & 6.5	AEMO notes comment. All contingency setting information is in the same place in each chapter, and the regulation is in a different section due to added sub clause.
34.	Delta Electricity	Delta Electricity agrees with AEMO's determination concerning aggregation of loads across regions.	N/A	AEMO notes comment.
35.	Delta Electricity	Delta Electricity agrees with AEMO's determination concerning the calculation of the performance of units with variable generation.	3.7, 4.7 & 5.7	AEMO notes comment.
36.	Delta Electricity	Delta Electricity agrees with AEMO's determination concerning the measurement of performance across aggregated sites.	2.4	AEMO notes comment.
37.	Delta Electricity	Delta Electricity agrees with AEMO's determination concerning high speed metering.	3.6	AEMO notes comment.
38.	Delta Electricity	Delta Electricity also suggests that more detail is required in the MASS about the required instrumentation and/or recording systems. It is possible to interpret clauses 3.6(a), 4.6(a), 5.6(a) and the first paragraph of 6.7 as defining what the data recorder specifications should be without applying the same requirements on any source instrumentation that may be providing source data to a recorder.	3.6, 4.6, 5.6 & 6.7	MASS amended to address this comment.
39.	Delta Electricity	Delta Electricity agrees with AEMO's determination on the Definition of services – Principles.	3.2, 4.2, 5.2 & 6.2	AEMO notes comment.
40.	Delta Electricity	To ensure consistency with the contingency services, Delta Electricity suggests adding a sentence to clause 2.1.2 to read: "In contrast to the occasional use of Contingency Services, enabled regulations services are normally utilised by AEMO in each dispatch interval."	2.1.2	MASS amended to address this comment.
41.	Delta Electricity	In the Definition of regulating services, Delta Electricity recognises that the wording "timely and accurate" is subjective, but supports its adaption.	6.2	AEMO notes comment.
42.	Delta Electricity	Delta Electricity notes that the draft MASS appears to have removed the wording "generation setpoint controllers" from the statement about traditional provision being from generating units.	6.2	MASS amended to address this comment.
43.	Delta Electricity	Delta Electricity agrees with AEMO's determination on the definition of Contingency Services.	3.2, 4.2 & 5.2	AEMO notes comment.

No.	Consulted person	Issue	MASS Clause	AEMO response
44.	Delta Electricity	Delta Electricity commented on the interaction of Regulation and Contingency Services. For remote control units scheduled under AEMO AGC control, unless plant conditions or safety concerns warrant a Unit dropping out of remote control, the contingency event will be responded to by the unit simultaneously with the continuation of receipt and dispatch of the energy target. The action required by the contingency event is blended with the unit's energy target setpoint and then applied to the unit.	6.9	MASS amended to address this comment.
45.	Delta Electricity	Delta Electricity agrees with AEMO's determination concerning performance and verification requirements for contingency services.	3.7, 4.7 & 5.7	AEMO notes comment.
46.	Delta Electricity	Delta Electricity agrees with AEMO's determination concerning performance and verification requirements for regulation services.	6.8	AEMO notes comment.
47.	Delta Electricity	Delta Electricity notes that at many coal-fired power stations, the Unit setpoint controller is the system that receives the AEMO dispatch target for regulation coupled with energy. In some cases safety design with boilers etc. can delay the response, sometimes in the order of minutes. If AEMO requires a more precise and timely regulation response, AEMO may need to separate the regulation dispatch from the energy target dispatch	6.8	AEMO notes comment – to be discussed in the Ancillary Services Technical Advisory Group.
48.	Delta Electricity	Delta Electricity noted that if AEMO's centrally controlled regulation is not in the same direction as that required to correct frequency the overall regulation of the system will potentially be less effective. Other systems of regulation exist which respond almost instantaneously to locally detected deviations in frequency and are unspecified in the regulation services described in the MASS.,	N/A	AEMO notes comment – to be discussed in the Ancillary Services Technical Advisory Group.
49.	Delta Electricity	Delta Electricity agrees with the removal and relocation of the mathematical details from the MASS to AEMO's FCAS Verification Tool guide.	3.7, 4.7 & 5.7	AEMO notes comment.
50.	Delta Electricity	Proposed methodology other than use of the tool should be proven to produce results consistent with the results produced by the tool prior to being accepted by AEMO.	3.7, 4.7 & 5.7	AEMO notes comment.
51.	Delta Electricity	The wording "operating point….just prior to" used in clauses 3.7.1(a)(v), 4.7.1(a)(iv) and 5.7.1(a)(iv) needs to be specified in value and time as is done in the existing MASS (clauses 2.6(a)(v), 3.6(a0(v) and 5.6(a)(v))	3.7.1, 4.7.1 & 5.7.1	AEMO notes comment; but is not proposing any change. This is covered in the FCASVT.
52.	Delta Electricity	The measurement of power specified in Clauses 3.6(a)(i), 4.6(a)(i), 5.6(a)(i) and 6.7(a) to be "at or close to the relevant connection point" implies sent out power that for many stations may not be directly comparable with dispatch targets. AEMO should confirm that sent out power is preferred rather than generated data.	3.6, 4.6, 5.6 & 6.7	AEMO notes comment, but believes some flexibility is needed and is not proposing any change.

No.	Consulted person	Issue	MASS Clause	AEMO response
53.	Delta Electricity	Delta Electricity agrees with AEMO's determination concerning the allocation of switching controller settings.	7.2	AEMO notes comment.
54.	Delta Electricity	Delta Electricity agrees with AEMO's determination concerning changes to existing systems.	N/A	AEMO notes comment.
55.	Delta Electricity	Delta Electricity agrees with AEMO's determination concerning FCAS trials for emerging technologies.	7.3	AEMO notes comment.

ATTACHMENT 1 – MARKET ANCILLARY SERVICE SPECIFICATION

ATTACHMENT 2 – MARKED-UP COPY OF MARKET ANCILLARY SERVICE SPECIFICATION

Showing changes from the Draft *market ancillary service specification*.