MARKET ANCILLARY SERVICE SPECIFICATION REVIEW

DRAFT REPORT AND DETERMINATION

Published: **March 2017**

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

NOTICE OF SECOND STAGE CONSULTATION – MARKET ANCILLARY SERVICE SPECIFICATION REVIEW

National Electricity Rules – Rule 8.9

Date of Notice: 26 April 2017

This notice informs all *Registered Participants* and *interested parties* (*Consulted Persons*) that *AEMO* is commencing the second stage of its consultation on the *market ancillary service specification* (MASS) review.

This consultation is being conducted under clauses 3.11.2(c) and (d) of the *National Electricity Rules* (*NER*), in accordance with the Rules consultation requirements detailed in rule 8.9 of the NER.

Invitation to make Submissions

AEMO invites written submissions on the matter under consultation.

Please identify any parts of your submission that you wish to remain confidential, and provide the reasons why you wish that information to be treated as confidential. *AEMO* may still publish that information if it does not consider it to be confidential, but will consult with you before doing so.

Consulted Persons should note that material identified as confidential may be given less weight in the decision-making process than material that is published.

Closing Date and Time

Submissions in response to this Notice of Second Stage of Rules Consultation should be sent by email to rob.jackson@aemo.com.au, to reach *AEMO* by 5.00pm (Melbourne time) on 19 May 2017.

All submissions must be forwarded in electronic format. Please send any queries about this consultation to the same email address.

Submissions received after the closing date and time will not be valid, and *AEMO* is not obliged to consider them. Any late submissions should explain the reason for lateness and the detriment to you if *AEMO* does not consider your submission.

Publication

All submissions will be published on *AEMO's* website, other than confidential content.

EXECUTIVE SUMMARY

The publication of this Draft Report and Determination (Draft Report) commences the second stage of the *Rules* consultation process conducted by *AEMO* to consider proposed amendments to the *market ancillary service specification* (MASS) under the *National Electricity Rules* (NER).

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 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.

The submissions highlighted that a number of the issues identified both in the Issues Paper and by *Consulted Persons* are complex and potentially contentious and will require further consultation. *AEMO* considers there is value with revising the MASS to address those less contentious issues quickly.

AEMO has reviewed the submissions in detail and has reached the following conclusions:

- Barriers for new entrants – General issues
  - The submissions identified little in the way of barriers to entry for new entrants. Two issues beyond the scope of this review where identified and AEMO will be consider these in other forums. A number of submissions did caution AEMO on making amendments that would impact on the operation or costs of existing participants and AEMO has considered this risk when proposing amendments to the MASS.
- Provision of *regulation services*
  - Most submissions supported clarifying the MASS to confirm the ability for aggregated Ancillary Service Facilities to provide *regulation services*. *AEMO* has proposed amendments to the MASS to detail the process required for aggregated Ancillary Service Facilities to provide *regulation services*.
- Aggregation of *loads* across *regions*
  - Only one submission commented on the current requirement for all the constituent units of an aggregated Ancillary Service Facility to be in a single *region* and it supported maintaining the status quo. *AEMO* agrees and does not propose any amendments to this requirement.
- Variable generation
  - There was general support for continued use of a linear trajectory in the verification process for of Contingency Services from *scheduled* or *semi-scheduled* units; though one submission suggested further consultation on alternatives. *AEMO* proposes maintaining the current process at this time, but will consult further on the matter.
- Measurement of response across aggregated sites
  - The submissions generally supported the requirement for each site to be individually metered, although some suggested a degree of flexibility. The MASS will require *market participants* to be able to show the performance of individual units, but will allow for *market participants* to propose options for doing this which *AEMO*, at its discretion, could accept.
- High Speed Metering

  - Most submissions supported the need for high speed metering, although some suggested it could be relaxed. One suggested that maintaining the high speed metering requirement future-proofed the system should a faster *ancillary service* be introduced. *AEMO* suggests there is some flexibility in the current arrangements, and proposes to retain the current requirements.
- Definition of services – Principles
  - While there was general support for the principle that *market ancillary services* main role is managing *frequency*, a number of submissions highlighted that individual *market participants* should not be held responsible for a failure to control *frequency*. *AEMO* agrees that individual *market participants* whose Ancillary Service Facilities respond as required by the MASS should not be held accountable for a failure to maintain System Frequency.
- Definition of the *regulation services*
  - Most submissions agreed that the current definition of *regulation services* is lacking in detail. Some submissions urged caution in making amendments to the definition that could require existing *market participants* to modify their plant. *AEMO* proposes a more detailed description of the *regulation services* to clarify the current situation. *AEMO* expects this will improve overall performance without requiring existing *market participants* to make fundamental changes to their *control systems*.
- Definition of Contingency Services
  - In the Issues Paper, *AEMO* proposed that definitions of Contingency Services should be amended to provide more details on handover from one service to the next. Submissions highlighted that this could have implications for providers. *AEMO* does not propose to make this amendment at this time, but will consult further on the issue through the Ancillary Services Technical Advisory Group before recommending any changes to current arrangements.
- Interaction of *regulation services* and Contingency Services
  - Some submissions highlighted concerns with *non-scheduled generating units* and *loads* returning to pre-event levels as described. *AEMO* has considered the responses received and will amend the MASS to refer only to the behaviour of *scheduled and semi-scheduled generating units* when *frequency* returns to the *normal operating frequency band* following a *contingency event*.
- Performance parameters and verification requirements
  - Only one submission responded to this issue and highlighted that the requirements should apply equally to all service providers regardless of the technology used. AEMO supports the technology neutral approach and does not propose amending the MASS based on specific technologies. AEMO does, however, believe there are market benefits in allowing *market participants* some flexibility in verifying the performance of their facilities and will amend the MASS accordingly.
- Performance parameters and verification requirements for *regulation services*
  - *AEMO* proposed introducing a performance index for *regulation services*. Several submissions raised potential concerns with implementing such a mechanism at this time. *AEMO* proposes amending the MASS to include generic performance requirements, but believes further consultation is required through the Ancillary Services Technical Advisory Group before any detailed performance requirements are applied.
- Performance parameters and verification requirements for Contingency Services
  - Most submissions supported continued use of the Frequency Control Ancillary Services Verification Tool (FCASVT), but agreed that the current wording was overly complicated. *AEMO* proposes removing the detailed description of the FCASVT from the MASS and allowing *market participants* to propose use of alternate methods.

- Allocation of Switching Controller settings
  - There was general support for increased flexibility in allocating Switching Controller *frequencies*.
  - AEMO proposes amending the MASS to provide a more flexible approach to the calculations while maintaining the current restrictions that limit *AEMO*'s ability to ask *market participants* to further modify their Frequency Settings.
- Changes to existing systems
  - A number of *Consulted Persons* cautioned *AEMO* on implementing amendments that would impact on the operation of or costs for existing *market participants*. *AEMO* has considered the comments and does not intend that existing *market participants* should need to make fundamental changes to their systems as a result of the proposed amendments to the MASS.
- Frequency Control Ancillary Services (FCAS) trials for emerging technologies
  - One submission recommended trialling how new technologies will perform in practice. *AEMO* believes there are benefits to this and will amend the MASS to support short period trials.

To fully investigate the preferred solutions for the complex and potentially contentious issues not addressed above, *AEMO* intends to further consult interested parties through the Ancillary Services Technical Advisory Group on a range of issues including:

- Detailed design of *regulation services*, including the potential for having Ancillary Service Facilities respond to local frequency rather than through *AEMO's automatic generation control (AGC)* system.
- Detailed design of Contingency Services, including details of the requirements for transition between the services and the potential for under- or- over-delivery and the actual speed of *market participant* response.
- Details of performance parameters and verification requirements for the *regulation services*, including consideration of mechanisms such as a performance index as used in other jurisdictions.
- Details of performance parameters and verification requirements for Contingency Services, including the most appropriate definition of the "clock start" for the event and use of "baseline" techniques.
- The most appropriate trajectory to assume when adjusting contingency response to account for energy *dispatch target* or *dispatch level*.
- Potential for using local voltage control to provide *market ancillary services*
- Amendments/updates required to the FCASVT to better verify the performance of a range of technologies.
- Potential for finer control of Switching Controller Frequency Settings.
- Possible changes to AEMO's *frequency control systems* to better manage system *frequency* and the impact on MASS requirements.
- Potential for additional services and the need for further amendments to the MASS.

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

AEMO's draft determination is to amend the MASS in the form published with this Draft Report.

CONTENTS

1. STAKEHOLDER CONSULTATION PROCESS

As required by clause 3.11.2(d) of the NER, AEMO is consulting on *market ancillary service specification* (MASS) in accordance with the *Rules consultation process* in rule 8.9.

AEMO's indicative timeline for this consultation is outlined below. Future dates may be adjusted depending on the number and complexity of issues raised in submissions.

Deliverable	Indicative date
Submissions due on Draft Report	19 May 2017
Final Report and Determination published	30 June 2017

The publication of this Draft Report marks commencement of the second stage of consultation.

Note that there is a glossary of terms used in this Draft Report at **Appendix A**

2. BACKGROUND

2.1 NER requirements

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 current 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.

Clauses 3.11.2(f) 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. 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 focussed 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 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.

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.

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 for new entrants – General issues	Clean Energy Council, Delta Electricity, EnerNOC, ERM Power, United Energy
2.	Provision of *regulation services*	AGL, ERM Power
3.	Aggregation of loads across *regions*	ERM Power
4.	Variable *generation*	Clean Energy Council, Delta Electricity, ENGIE, United Energy
5.	Measurement of response across aggregated sites	AGL, Clean Energy Council, EnerNOC, ENGIE
6.	High Speed Metering	ERM Power, EnerNOC, ENGIE, United Energy
7.	Definition of services - Principles	AGL, Delta Electricity, ENGIE, ERM Power
8.	Definition of the *regulation services*	Delta Electricity, EnerNOC, ENGIE, ERM Power
9.	Definition of Contingency Services	Delta Electricity, EnerNOC, ENGIE, ERM Power
10.	Interaction of *Regulation* and Contingency Services	Delta Electricity, EnerNOC, ERM Power, Hydro Tasmania
11.	Performance parameters and verification requirements	ERM Power
12.	Performance parameters and verification requirements for *regulation services*	Delta Electricity, EnerNOC, ERM Power
13.	Performance parameters and verification requirements for Contingency Services	AGL, EnerNOC, ERM Power, United Energy
14.	Allocation of Switching Controller settings	AGL, Delta Electricity, ERM Power, United Energy
15.	Changes to existing systems	Delta Electricity, ENGIE
16.	FCAS trials for emerging technologies	AGL

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

This section addresses each of the material issues raised in submissions.

4.1 Barriers for new entrants – General issues

4.1.1 Issue summary and submissions

AEMO has been approached by a number of proponents of potential new supplies of market ancillary services using technologies such as wind, photovoltaic (PV), batteries and loads currently not registered to provide these services.

AEMO wants to ensure that the MASS does not contain barriers to these proponents' participation in *market ancillary services* markets, and ensure that any potential issues may be able to be overcome without compromising *power system* integrity.

While most submissions supported the need for the review, a number did not identify major technical barriers:

Clean Energy Council – "We have previously noted that the Market Ancillary Service Specification (MASS) needs to be revised".

ERM Power – "…supports changes to the MASS to remove any artificial barriers to entry for new participants whilst ensuring that the services paid for are actually delivered as required to the Market".

Delta Electricity – "…as a present registered supplier of FCAS services, does not consider the existing specification represents a barrier to entry".

EnerNOC – "For a provider of aggregated IL (interruptible loads), today's MASS presents no technical barriers to entry".

United Energy – "….able to dynamically control active power load on the shared network (and therefore influence frequency) to a certain extent within the timeframes contemplated by the MASS through the application of small changes in voltage..."

Two submissions raised other barriers to entry of new *market participants*.

EnerNOC – "….the biggest potential barriers to entry for new-entrant FCAS providers lie not in the MASS itself, but rather in the various registration procedures that AEMO may implement to accommodate the Ancillary Services Unbundling rule change".

United Energy – "…some barriers associated with DNSPs being able to participate in the MASS in relation to demand side participation using shared network assets".

4.1.2 *AEMO's* assessment

There is general support for *AEMO* making whatever amendments are required to the MASS to remove any artificial barriers to entry for new *market participants* whilst ensuring that the services paid for are actually delivered as required to the market.

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

The issues relating to the registration procedures are outside the scope for this review, however AEMO has considered a comment received as part of the process of developing the registration process for *Market Ancillary Service Providers*.

The potential for regulated entities such as *Network Service Providers* (NSPs) wanting to register to supply FCAS, is beyond the scope of the MASS.

4.1.3 *AEMO's* draft conclusion

No major amendments are required to the MASS to remove barriers to entry

4.2 Provision of regulation services

4.2.1 Issue summary and submissions

On a real time basis, *AEMO* uses the *Automatic Generation Control (AGC)* system to instruct plant enabled to provide *regulating raise and regulating lower services* at the time to adjust their *dispatch levels*. Clause 1.3 of the current MASS can be interpreted as placing a barrier on aggregated units providing *regulation services*, and the Australian Energy Market Commission (AEMC) in its final determination on the Ancillary Services Unbundling rule change suggested that *AEMO* review this clause.

Some submissions supported *AEMO's* approach:

ERM Power – "We also agree that it is appropriate for AEMO's systems to provide a dispatch instruction for the provision of Regulating FCAS services to one central control location and it is the responsibility of the MASP to ensure components within the aggregated service complies with this dispatch instruction".

Others suggested alternate approaches:

AGL – "A more viable means of enabling a fleet of small-scale batteries to participate would be to permit provision/response via local sensing devices installed in the meter or inverter".

4.2.2 *AEMO's* assessment

There was general support for clarifying the MASS to confirm that aggregated units are able to provide *regulation services*.

AEMO considers there will be additional benefits to consumers from the increased competition from the participation of aggregated units.

One submission suggested having the units respond to Local Frequency rather than the central *AGC* system. Such an option is beyond the scope of this review but will be considered in the Ancillary Services Technical Advisory Group meetings.

4.2.3 *AEMO's* draft conclusion

AEMO intends to amend the MASS to specifically document the requirements for aggregated units providing *regulation services*. *AEMO* does not intend to amend the MASS to allow the provision of *regulation* services independent of the *AGC* system.

4.3 Aggregation of loads across regions

4.3.1 Issue summary and submissions

The current *NER* requires that aggregated *ancillary services loads* must be connected within a single *region*. *AEMO* sought feedback on this rule. Only one submission was received on this topic and it supported the current arrangements.

ERM Power **–** **"**We agree with AEMO that the National Electricity Rules (NER) allow for aggregation of service providers within a region.**"**

4.3.2 *AEMO's* assessment

No issues were raised with this requirement and *AEMO* does not see any market benefits with further review of current requirements.

4.3.3 *AEMO's* draft conclusion

AEMO does not propose any amendments to the regional requirement.

4.4 Variable generation

4.4.1 Issue summary and submissions

If the Ancillary Service Facility is *scheduled* or *semi-scheduled*, for verifying Contingency Services the current MASS requires the determination of a reference trajectory to be defined as the successive straight line interpolations of the initial metered loading at the beginning of a dispatch interval to the expected *dispatch target* or *dispatch level* at the end of the *dispatch interval*. This is used to adjust the recorded response to account for *generation* or *load* responding to their *dispatch target* or *dispatch level.* Given that generation such as wind and PV is subject to variations due to variable fuel input, *AEMO* sought to confirm the methodology to determine a trajectory for *semi-scheduled generation*.

Most submissions support using the current linear trajectory for adjusting the response of variable *schedule*d or *semi-scheduled generation,* to account for them responding to their *dispatch* target or *dispatch level*.

ENGIE – "….believes that the straight line interpolation method should continue to be used for variable generation, taking into account the estimated power in those cases that the generator chooses to supply this figure".

Delta Electricity – "A common dispatch trajectory process should apply to variable generation".

United Energy – "….we agree with the linear interpolation method".

Clean Energy Council – "…given the existing FCAS regulation regime, it is not clear that options exist outside of straight line interpolation between generation at the start of the interval and the dispatch level (or estimated power).

One submission raised the potential value of *generating units* or *loads* that could ramp faster than the assumed linear trajectory.

Clean Energy Council – "AEMO should also be sure to specify the MASS in a way that does not restrict faster responses if they are called upon by the market settings."

4.4.2 *AEMO's* assessment

There was general support for maintaining the methodology in the current MASS, and *AEMO* has not identified any costs from maintaining the current methodology.

AEMO recognises potential benefits from plant ramping faster than the linear trajectory assumed for response to a change to the *dispatch target* or *dispatch level* of a *scheduled* or *semi-scheduled generator,* and proposes to discuss this issue in the Ancillary Services Technical Advisory Group.

4.4.3 *AEMO's* draft conclusion

AEMO does not intend to amend the current provisions.

4.5 Measurement of response across aggregated sites

4.5.1 Issue summary and submissions

The Ancillary Services Unbundling rule change is expected to lead to *Market Ancillary Service Providers* aggregating *market ancillary service* capability across numerous physical sites and offering them into the market as aggregated units. *AEMO* sought options for accurately determining the total change in power flow from the aggregated unit, with time intervals appropriate to the service.

A number of submissions called for *AEMO* to have flexibility in approving arrangements for measuring response across aggregated sites to suit the facilities being used, but agreed that determining the overall response was important.

AGL – "…AEMO's processes and registration requirements will need to have a degree of flexibility embedded within them to allow alternative means of verifying and assuring service delivery to be proposed as technologies evolve".

AGL – "Many (if not most) of the 'non-conventional' sources that could be aggregated to participate in the FCAS markets would have their own measurement capability at a resolution which would be useful for the calculation of service provision".

Clean Energy Council – "….the performance should be based on whether all of the procured services have an aggregate effect on the intended outcome (the control of frequency)."

Clean Energy Council – "For aggregators, it will remain important to measure responses at each unit."

ENGIE – "….adopt a two tiered approach. The first tier should be to allow aggregators to propose a variation method to AEMO on a case by case basis…The second tier to the approach would be for AEMO to utilise real time power flow measurements at the relevant local connection point to build up an historical analysis of the baseline power flow for each dispatch interval."

EnerNOC – "….for an aggregated IL (Interruptible Load) using a simple switching controller and supplying contingency FCAS, the current measurement and verification on today's MASS is straightforward and appropriate…".

4.5.2 *AEMO's* assessment

In determination of this issue, *AEMO* considered the following points:

- General support from submissions
  - The submissions generally supported the requirement for each site to be individually metered.
- Cost versus benefit
  - Submissions generally supported the need for verification, and did not identify the issue as a high cost to participate. Some submissions supported a degree of flexibility in the measurement.

4.5.3 *AEMO's* draft conclusion

The draft MASS requires *market participants* to be able to show the performance of individual units within an aggregated Ancillary Service Facility, and allows *market participants* to propose options for doing this which *AEMO*, at its discretion, may accept.

4.6 High Speed Metering

4.6.1 Issue summary and submissions

The current MASS requires high speed metering of at least 50 millisecond resolution to verify the response of *fast raise* and *fast lower* services. *AEMO* sought feedback on other, potentially cheaper

performance measurement methods. Most submissions supported the need for high speed recordings, but some questioned the need for this to be as fast as currently required.

One submission highlighted that maintaining the 50 millisecond requirement may be of benefit should other faster frequency services being considered by the AEMC be added in the future.

ERM Power – "….verification data provided by the operation of some form of switched controllers, this should be of sufficient granularity to verify that a response has actually been achieved".

ENGIE – "….(if) the need to adjust for inertia does not arise….then it would seem that non-synchronous technology need not be required to meet the onerous 50 millisecond measurement requirement".

Clean Energy Council – "Recording equipment is now available that can be located on site and report data to the registered aggregator as requested."

United Energy – "….allow some flexibility for a range of solutions in the MASS".

EnerNOC – "High speed recorders are an essential component of verifying performance of the plant or aggregated unit….100 ms resolution data would not increase measurement errors significantly".

EnerNOC – "If AEMO intended only to procure the services currently specified in the MASS, then a 50 ms resolution could be considered an over-specification. However, such high-resolution data does provide a degree of future-proofing, as it could be used to verify the delivery of much faster services."

4.6.2 *AEMO's* assessment

The current MASS requires that metering the measurements of power flow and Local Frequency for *fast raise* and *fast lower services* must be made at intervals of 50 millisecond or less. However where a Switching Controller is used, it does allow *AEMO* to agree to the measurement of power flow to be made at intervals of up to 4 seconds. As long as another measurement of power flow provided at an interval of 50 milliseconds or less is sufficient to determine the timing of the *market ancillary service* provision relative to Local Frequency.

AEMO has considered the submissions and does not consider that the current requirements are a barrier to new entrants. The current requirements do allow a degree of flexibility. *AEMO* also agrees that retaining the current requirement provides some future proofing should a faster *frequency ancillary service* be introduced in the future.

4.6.3 *AEMO's* draft conclusion

AEMO has not amended the requirements for high speed recorders for the verification of *fast raise* and *fast lower services*.

4.7 Definition of services - Principles

4.7.1 Issue summary and submissions

In the Issues Paper, *AEMO* proposed to more explicitly define responses required to manage system *frequency* through use of the eight *market ancillary services,* and to define the interaction between the various services.

The Issues Paper highlighted that *AEMO* believes that a key principle underlying the MASS is that it should be related to the control of System Frequency, and not just the delivery of an amount of energy.

While there was general support for the role of m*arket ancillary services* in managing *frequency*, a number of submissions highlighted that individual *market participants* should not be held responsible for a failure to control *frequency*.

Delta Electricity – "….cautions against less defined services that permit wider interpretations of the requirements which could lead to less resultant services than are currently delivered".

ENGIE – "….the purpose of the MASS is to define the frequency control products, and the requirements that service providers will need to meet to be eligible to participate in the frequency control markets".

AGL – "….believes it is important that participants not be penalised if, despite them delivering the stabilising service that they have committed, frequency continues to deviate due to other external factors.

ERM Power – "….agree that the key principle in the construction of the revised MASS should relate to the control of power system frequency. Notwithstanding this, the MASS should not require a service provider to deliver an ancillary service in excess of its enablement amount or for a service provider who has supplied the required enablement or activated amount to be held responsible for the failure of ancillary services to control frequency."

4.7.2 *AEMO's* assessment

While the submissions received agreed that the principle underlying the MASS should be related to the control of System Frequency, and not just the delivery of an amount of energy, a number of submissions cautioned its application in practice, highlighting that individual units that respond as offered should not be held responsible for a failure to manage *frequency*. Such a risk may lead to current *market participants* withdrawing from the *ancillary services markets*.

AEMO has considered the submissions received. *AEMO* believes that it is the long term interests of consumers that the underlying principle behind the MASS should be to manage System Frequency.

The suggested amendments to the MASS are drafted around the principles. This will include amendments to clauses on the allocation of Switching Controllers and transition from providing Contingency Services once *frequency* has returned to the *normal operating frequency band*. *AEMO* has drafted the revised definitions for the *market ancillary services* to better ensure that the services are delivered as expected without placing any additional responsibilities on individual *market participants* in managing overall *frequency* recovery.

This approach will guide the development of the MASS and help manage *power system security* without adding additional risks on *market participants*.

4.7.3 *AEMO's* draft conclusion

AEMO proposes to add a clause to the MASS on the principles behind the *market ancillary services*.

4.8 Definition of the regulation services

4.8.1 Issue summary and submissions

The current definitions for *regulation services* are quite vague and do not provide guidance on the timing and accuracy of the expected response. The amount of service for dispatch purposes is defined around progressive delivery over a five minute period, and the verification clauses are drafted around verifying this amount of service delivered compared to the amount of service in the enabled bands.

This does not provide any definition of the expected timing and accuracy response to the actual four second (eight second in Tasmania) *AGC* signals. Some submissions urged caution that too detailed a definition could be a barrier to entry and one, while agreeing the definition could be improved, thought that a definition built around the five minute periods was appropriate.

Most submissions agreed that the current definition of *regulation services* is lacking in detail.

Delta Electricity – "The current definitions of contingency services are considered adequate. The current definitions of the regulation services less so".

Delta Electricity – "…recommend that AEMO consider in more detail their regulation dispatch system design".

ERM Power – "….the two Regulating FCAS services are poorly defined with regard to actual service requirements."

ERM Power – "… disagree with AEMO's view that the current MASS fails to provide a timeframe over which the regulation service must be supplied"

ERM Power – "…. submit that the Regulation FCAS should be based on the enablement amount being the maximum deviation away from the theoretical dispatch trajectory at any given point in time within the 5-minute dispatch interval subject to the bid Energy ramp rate limitations of the provider."

EnerNOC – "….supportive of AEMO's initiative to improve the MASS by putting more rigour around how the regulation services are verified".

However one submission disagreed.

ENGIE – "….believes that introducing a new definition for regulation services might have the opposite effect to that being sought by AEMO – in other words, it might inadvertently introduce a new barrier to entry".

4.8.2 *AEMO's* assessment

Most submissions that addressed this question supported the need for an improved definition of the *regulation services*, although one submission cautioned *AEMO* of the possibility of new requirements acting as a barrier to new entry.

AEMO considered the submissions received and the implications for *power system security* and believes that more consultation is required to better define the *regulation service* requirements before major amendments to the definition for *regulating services* are introduced. To get further stakeholder input into this issue, the definition of *regulating services* will be considered in the Ancillary Services Technical Advisory Group.

AEMO considers that while this progresses, some improvements to the description should be included to better define the system requirements. This description will be technology neutral and would apply to all participants in these markets. It is not intended that these amendments to the current MASS should require existing *market participants* to make fundamental changes to their *control systems*.

4.8.3 *AEMO's* draft conclusion

AEMO proposes to amend the definition of *regulation services* to require those enabled to provide the services to respond in a timely and accurate manner to the signals provided from *AEMO's AGC* system, with due consideration to delays in SCADA systems. The definition does not detail what constitutes a timely and accurate manner.

4.9 Definition of Contingency Services

4.9.1 Issue summary and submissions

The current MASS requires providers to "provide an orderly transition" to the next service, but does not define what is meant by this phrase. It is implied in the verification clauses that the transition is a linear raise and linear reduction in service response, but this is not actually spelt out. *AEMO* sought feedback on the proposed description of the expected transition response.

Some submissions raised concerns with the potential for the new definition requiring expensive changes to their systems, or placing barriers to new entrants.

ENGIE – "….supports the objective behind this proposal, however is somewhat concerned that applying a new description to existing service providers might impose a new obligation or requirement that was not required in the past.

Delta Electricity – "The existing principles and verification requirements for the contingency services could be considered, although complex, to be appropriate for the purpose. A change to the specification for transition may be expensive to participants if it requires them to change the installed design".

ERM Power – "Rather than AEMO attempting to specify a theoretical description, perhaps it would be better that all contingency services providers provide a description of the manner in which their plant transitions from one service to the other".

EnerNOC – "….concerned that if implemented too prescriptively, the proposed "description of the expected transition response… would preclude most IL (interruptible load)."

EnerNOC – "Mandating a linear response would be a mistake, as not only would it preclude participation by most loads, but it would also remove the incentive for enabled Fast Raise suppliers to respond as quickly as possible".

4.9.2 *AEMO's* assessment

There was general consensus that the definitions of the Contingency Services are adequate, and a number of submissions raised concerns with an approach of trying to fully define the transition from one Contingency Service to the next. Many highlighted the potential perverse outcomes of forcing *market participant*s to follow a particular transition between Contingency Services.

AEMO has considered the responses and accepts that there could be unintended consequences from codifying the details of expected handover at this time. *AEMO* considers that transition between Contingency Services could be an issue that may need to be considered should the mix of technologies supplying the services change over time. *AEMO* will monitor the performance of System Frequency and the response of Contingency Service providers and, if required, bring the issue to the Ancillary Services Technical Advisory Group for further consultation.

AEMO does not intend that the amendments to the current MASS should require *market participants* to make fundamental changes to existing *control systems*.

4.9.3 *AEMO's* draft conclusion

Other than amendments highlighted in section 4.10, *AEMO* is not proposing major amendments to the definitions of the Contingency Services contained in the current MASS. The revised MASS will not include further details on the expected handover from one Contingency Service to the next.

4.10 Interaction of regulation and Contingency Services

4.10.1 Issue summary and submissions

AEMO is concerned with the potential for over delivery of services following a *contingency event* and proposed amending the MASS to require that, during a *frequency* excursion that triggers a contingency response, a *market ancillary service control system* is to give preference to the Contingency Service over responding to *AGC* instructions. However once the *frequency* has returned to the *normal operating frequency band*, the *market ancillary services control systems* would be required to ramp back the *ancillary services unit* to its energy or *AGC* target, for a *scheduled generating unit*, *semi-scheduled generating unit* or *scheduled load*, or to its pre-contingency state for a *non-scheduled generating unit* or *non-scheduled load*.

Some submissions raised concerns with this approach.

Hydro Tasmania – "….believes that requiring a non-scheduled generating unit or a non-scheduled load to ramp back to its pre-contingency state is unreasonable".

ERM Power – "….agree with AEMO concerns with regards to oversupply of Contingency FCAS….agree with AEMO's view regarding the interaction of Regulating and Contingency… concerned that these

changes will result in additional costs being incurred to yet again modify control systems to meet changed AEMO requirements".

Delta Electricity – "There are no limitations on the Vales Point plant that prevent a resumption of standard operations assuming the system recovery…."

EnerNOC – "The interruption of a load is achieved via automated signal...the restoration of a load must typically be carried out manually.… This may mean that it takes longer than one, four, or five minutes".

4.10.2 *AEMO's* assessment

AEMO has considered the submissions and the implications of the proposals made in the Issues Paper.

Submissions provided varied support for the proposal and indicated different costs and complications that might arise from implementing the proposal as outlined in the Issues Paper. *AEMO* recognises the limitations for *non-scheduled generating units* and *non-scheduled loads* that have provided Contingency Services returning to pre-event levels once the local *frequency* has recovered.

AEMO agrees there would be little benefit and potentially high costs or barriers to entry for application of this principle to *non-scheduled generating units* and *non-scheduled loads*.

AEMO is concerned with the potential for unexpected interaction between *scheduled* and *semi-scheduled generating units* or *loads* responding to both the *AGC* signals and local contingency systems. *AEMO* believes this could lead to *power system security* concerns and has the potential to extend the duration and severity of *frequency* events. Therefore *AEMO* proposes that, if the Ancillary Service Facility is *scheduled* or *semi-scheduled* and is enabled to provide both Contingency Service(s) and *regulation service* and the Contingency Service(s) are triggered the Ancillary Service Facility should give priority to providing the Contingency Services. The facilities should not follow the *AGC* targets until such time as the *frequency* has returned to the *normal operating frequency band*. Once *frequency* has recovered to the *normal operating frequency band,* the facility should resume responding to *AGC* targets.

4.10.3 *AEMO's* draft conclusion

AEMO proposes placing a requirement on *scheduled* and *semi-scheduled loads* and *generating units* to transition back to *AGC* control once frequency returns to the *normal operating frequency band* following a *contingency event*.

4.11 Performance parameters and verification requirements

4.11.1 Issue summary and submissions

In the Issues Paper, *AEMO* stated that it is important that the market has confidence that the *market ancillary services* enabled will actually deliver their response both accurately and in a timely manner. Only one submission commented on this statement and they supported the proposal, but cautioned against special requirements for specific technologies.

ERM Power – "We support AEMO's view that the ability to verify the performance of units enabled to provide market ancillary services is a key element of the MASS. We also believe that performance parameters and uniform standard of verification requirements should apply equally to all service providers regardless of the technology used to supply the service".

4.11.2 *AEMO's* assessment

AEMO has assessed there are long term benefits in having competition in the market, and that having a general description of the verification requirements that applies equally to all technologies is most likely to achieve this.

4.11.3 *AEMO's* draft conclusion

AEMO intends that, while the verification requirements should include some flexibility in how a *market participant* verifies the performance of their facilities, the MASS will remain technology neutral.

4.12 Performance parameters and verification requirements for regulation services

4.12.1 Issue summary and submissions

The Issues Paper highlighted concerns with the lack of detail of the expected performance parameters and verification requirements for *regulations services*, and sought comments on how to verify acceptable performance.

Delta Electricity – "The specification requires more definitive expectations for the regulation services but mandated redesigns of existing system should take place only if participants are proceeding to alter relevant equipment associated with these services in projects the participant initiates".

ERM Power – "….AEMO needs to consult on and provide a proven methodology to compensate for the variable latency of SCADA data".

ERM Power – "When assessing performance for Regulation FCAS, we believe this should be based on activated and not the enabled amount".

EnerNOC – "…there should be ongoing monitoring of the accuracy with which enabled units meet their AGC targets. Further, a time limit for meeting the AGC target should be defined and enforced".

4.12.2 *AEMO's* assessment

AEMO still believes there is a need to develop a better definition of the required performance in response to an *AGC* signal sent to a *market participant* for *regulation services*. However, following the comments received in the submissions, *AEMO* believes it needs to consult further on developing performance methodology for *regulation services*. This topic will be considered further in the Ancillary Services Technical Advisory Group.

AEMO believes there are benefits from a more general requirement for enabled units to respond to the *AGC* signals sent.

4.12.3 AEMO's draft conclusion

AEMO proposes to monitor the performance of *generating units* and *loads* enabled to provide *regulation services* to determine the level of performance is being provided.

AEMO intends work with the Ancillary Services Technical Advisory Group to ascertain an appropriate methodology for determining the performance of Ancillary Service Facilities providing *regulation services*.

4.13 Performance parameters and verification requirements for Contingency Services

4.13.1 Issue summary and submissions

The Issues Paper sought feedback on the principles of Contingency Service verification and any barriers to the use of the FCASVT for emerging technologies.

AGL – "The FCASVT could be improved to clearly distinguish between grid event data and the need for the machine inertia, over injected data which does not need inertia".

Delta Electricity – "…the current verification methods of contingency services are considered costly but adequate".

ERM Power – "….agree that in the future it may be possible to use an aggregated group of inverters to provide FCAS, however, the verification process should ensure that sufficient historical data can be supplied to ensure that the inverter was not already responding in the desired operational mode immediately prior to the FCAS requirement".

United Energy – "The FCASVT needs to also cover voltage control providing frequency ancillary services where a change in voltage at customer supply points results in a change in active power consumption."

EnerNOC – "A re-wording into plainer English would certainly be valuable."

EnerNOC – "The FCASVT is a useful tool for participants".

EnerNOC – "….recommendation is that the MASS instruct participants to time-align each meter's logged recordings to the time the frequency excursion was detected and then sum the MW figures prior to loading them into the FCASVT".

EnerNOC – "….the simplest change AEMO could make would be to make the 'clock start' when the frequency reaches each provider's allocated frequency deviation setting, rather than when the frequency leaves the NOFB (*Normal Operating Frequency Band*)".

4.13.2 *AEMO's* assessment

AEMO proposes removing the details of the current Contingency Service verification methodology and replacing them with a clearer description of what is required to verify the performance of the *market participant's* facilities. These principles will include requirements on how *AEMO* will continue to support the FCASVT, but details of its operation will be shifted to the FCASVT Guidelines document. A number of submissions suggested changes to the FCASVT to better suit their proposed technologies. *AEMO* recognises that there may be limitations to the use of the FCASVT. *AEMO* is not planning to amend the FCASVT to the needs of specific technologies. *Market participants* will be able to verify the performance of their facilities using the FCASVT or by other agreed methods that meet the required principles.

At this stage *AEMO* is not convinced that a change to the MASS to make the 'clock start' when the *frequency* reaches each provider's allocated frequency deviation setting, rather than when the *frequency* leaves the *normal operating frequency band,* is justified, but this will be considered further in the Ancillary Services Technical Advisory Group.

4.13.3 *AEMO's* draft conclusion

AEMO proposes to remove the details of the current Contingency Service verification methodology and replace them with a clearer description of what is required to verify the performance of a *market participant's* facilities. *AEMO* will continue to support the FCASVT, but proposes to allow participants to suggest an alternate method of verifying performance that *AEMO* may, at its discretion, accept.

The draft MASS also includes a description on how to time-align each meter's logged recordings to the time the *frequency* excursion was detected.

4.14 Allocation of Switching Controller settings

4.14.1 Issue summary and submissions

AGL – "Requiring larger-scale 'traditional' generation with switching controllers to be configured to provide a staggered response would add complexity…. in the case of a market ancillary service provider comprised of an aggregation of smaller sources (such as batteries), achieving variable switching is very straightforward".

Clean Energy Council – "….there does not appear to be any specific barriers to generator aggregators designing the response of switching controllers to specific settings across many small units".

Delta Electricity – "….switching controller…is adjustable and the frequency settings are not restricted but are also not expected to exceed the 47-52 Hz system standard".

Delta Electricity – "The proposed principles of meeting frequency operating standards with flexibility fairness and certainty are supported by Delta Electricity where inexpensive solutions to achieve them are possible".

ERM Power – "This consultation should determine what MASS requirements are required going forward and if deemed necessary provide sufficient time for existing service providers to modify or replace control systems if required. Alternatively, existing service providers could be designated to supply services at their existing setting with new service providers required to provide services in accordance with any new expanded range of settings".

United Energy – "…would need to modify our control systems (hardware, software and configurations) to be able to provide ancillary services. If this is done we don't envisage any limits."

4.14.2 *AEMO's* assessment

No submissions raised any concerns with the concept of allowing *AEMO* some flexibility in allocating Switching Controller *frequency* settings. *AEMO* notes that some submissions raised concerns with the potential costs to current providers of being asked to amend their current Frequency Settings. The current MASS includes limitations on *AEMO's* ability to ask a *market participant* to change the existing Frequency Settings at a facility. *AEMO* believes it is appropriate for these provisions to remain in the revised MASS.

4.14.3 *AEMO's* draft conclusion

AEMO proposes to amend the MASS to allow more flexibility in AEMO's process for allocating Frequency Settings to Switching Controllers, while maintaining the current limitations on *AEMO's* ability to ask M*arket Participants* to make subsequent changes to these settings.

4.15 Changes to existing systems

4.15.1 Issue summary and submissions

The issue of potentially large costs from requiring currently registered *market participants* to modify their systems to meet new or amended requirements in the MASS was raised in a number of submissions.

Delta Electricity – "It is imperative that any amendment to the MASS does not require fundamental changes to the systems deployed by existing conventional plant".

ENGIE – "….provided that any changes do not impose additional costs on existing ancillary service providers".

4.15.2 *AEMO's* assessment

AEMO considered the costs of potential changes to current systems and does not anticipate that any amendment proposed would require fundamental changes to the systems deployed by existing conventional plant beyond that allowed in the current MASS.

As an example, the current MASS allows *AEMO* to request *market participants* to change the Frequency Settings on Switching Controllers under certain circumstances.

4.15.3 *AEMO's* draft conclusion

AEMO has reviewed the proposed amendments to the MASS and does not believe that they would require fundamental changes to existing systems.

4.16 FCAS trials for emerging technologies

4.16.1 Issue summary and submissions

One submission raised the potential value from AEMO allowing trials or pilots of new forms of technologies as a means of understanding the operating performance characteristics of these technologies.

AGL – "…recently tested a small number of residential scale batteries in an aggregated formation to an artificial AGC signal. The batteries individually and in aggregate followed the signal and responded with a latency of 4 seconds to both raise and lower signals. These kinds of trials and pilots will be a useful means of understanding the operating performance characteristics of new forms of technologies".

Where such new technologies have not previously provided the services, there is no practical knowledge of how they will perform in real life situations.

Initial deployments may have some difficulty meeting the full requirements of the MASS.

4.16.2 *AEMO's* assessment

AEMO has considered this suggestion and agrees there is value in allowing limited services to be provided for a limited duration to trial the technology and *control systems*. Such systems would be required to use best endeavours to meet the requirements of the MASS, but may not meet all requirements completely. *AEMO* would limit the quantity to be offered to ensure that *power system security* was not compromised, and limit the length of the trial to minimise impacts on the markets.

4.16.3 *AEMO's* draft conclusion

The draft MASS includes a clause on the potential for short term trials to determine the ability of new technologies to meet the full requirements of the MASS.

5. OTHER MATTERS

5.1 Other minor issues identified

5.1.1 Issue summary and submissions

The Issues Paper highlighted minor corrections needed to the current MASS and a number of submissions included other minor improvements.

Delta Electricity – "If the specification also provided clear contact details to relevant AEMO personnel, participants may be encouraged to ask questions about new and existing services"

5.1.2 *AEMO's* assessment

There is benefit in efficient communication between *market participants* and *AEMO*. While there may be short term benefits to including the contact details of individual AEMO personnel in the MASS, this can cause problems if the individual is not available. *AEMO* believes it is more efficient for all enquiries to come through the Information and Support Hub.

5.1.3 *AEMO's* draft conclusion

AEMO proposes amending the MASS to update incorrect *Rules* clause references, remove unused terms from the Glossary and simplify some sections of the document.

AEMO believes that the most efficient means of contacting the relevant *AEMO* personnel is through *AEMO's* Information and Support Hub, and will include contact details.

5.2 Ancillary Services Technical Advisory Group

The Ancillary Services Technical Advisory Group[1] is a select group of industry experts that will be called upon to contribute to *AEMO* on matters relating to *ancillary services* (both the currently defined services and any new services potentially needed in the future).

Contributions from the Ancillary Services Technical Advisory Group will be taken into consideration when formulating further amendments to the MASS. *AEMO* intends to provide industry with an opportunity to respond to these contributions as part of the formal clause 8.9 *Rules* mandated consultation process required to amend the MASS.

This consultation has identified unresolved issues that will be referred to the Ancillary Services Technical Advisory Group for further consultation prior to developing further amendments to the MASS. These issues include:

- Detailed design of *regulation services*, including the potential for having unit respond to Local Frequency rather than the central *AGC* system.
- Detailed design of Contingency Services including details of the requirements for transition between the services and the potential for under- or- over-delivery and the actual speed of response of the Ancillary Service Facilities.
- Details of performance parameters and verification requirements for the *regulation services*, including consideration of mechanisms such as a performance index as used in other jurisdictions.
- Details of performance parameters and verification requirements for Contingency Services, including most appropriate definition of the "clock start" for the event and the use of "baseline" techniques.

[1] http://www.aemo.com.au/Stakeholder-Consultation/Industry-forums-and-working-groups/Other-meetings/Ancillary-Services-Technical-Advisory-Group

- The most appropriate trajectory to assume when adjusting contingency response to account for energy *dispatch* target or *dispatch level*.
- The potential for providing *regulation services* based on Local Frequency independent of *AEMO's AGC* system.
- The potential for using local voltage control to provide *market ancillary services*
- Amendments/updates required to the FCASVT to better verify the performance of a range of technologies.
- The potential for finer control of Switching Controller Frequency Settings.
- Possible changes to *AEMO's frequency control systems* to better manage system *frequency* and the impact on the requirements of the MASS.
- The potential for additional services and the need for further amendments to the MASS.

6. DRAFT DETERMINATION

Having considered the matters raised in submissions, *AEMO's* draft determination is to amend the Market Ancillary Service Specification in the form of **Attachment 1**, in accordance with clause 3.11.2(b) of the NER.

APPENDIX A - GLOSSARY

Terms defined in the National Electricity Law or the NER have the same meanings in the draft determination unless otherwise specified in this clause. Those terms/Defined terms are intended to be identified in the draft 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
Ancillary Services Unbundling rule change	means the National Electricity Amendment (Demand Response Mechanism and Ancillary Services Unbundling) Rule 2016 No 10
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
ASEFS	means the Australian solar energy forecasting system
AWEFS	means the Australian wind energy forecasting system
Contingency Services	means the (1) the *fast raise service*; (2) the *fast lower service*; (3) the *slow raise service*; (4) the *slow lower service*; (5) the *delayed raise service*; and (6) the *delayed lower service*
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
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*
Information and Support Hub	means the first point of contact for people wishing to contact AEMO
Issues Paper	means AEMO's Issues Paper for Amendment Of The Market Ancillary Service Specification (MASS) 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
PV	means photovoltaic
SCADA	means the supervisory control and data acquisition system
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 SUBMISSIONS AND AEMO RESPONSES

No.	Consulted person	Issue	AEMO response
1.	Australian Energy Council	We support AEMO's view that the ability to verify the performance of units enabled to provide market ancillary services is a key element of the MASS.	AEMO notes this comment
2.	Australian Energy Council	We support AEMO in identifying the best means to verify ancillary service unit performance when considering how best to incorporate new technologies into the ancillary services market	AEMO notes this comment
3.	AGL	For aggregation of smaller-scale sources (such as batteries), it would be economically infeasible to deploy AGC/SCADA control to each connection point. If this were managed via a 3G or 4G network then it is questionable whether the signal would be received within the 4 second timeframe required. To install a fixed line, would result in expenses equivalent to AGC-enablement. A more viable means of enabling a fleet of small-scale batteries to participate would be to permit provision/response via local sensing devices installed in the meter or inverter.	Such a change is beyond the scope of this review and will be considered by the Ancillary Services Technical Advisory Group
4.	AGL	Many (if not most) of the 'non-conventional' sources that could be aggregated to participate in the FCAS markets would have their own measurement capability at a resolution which would be useful for the calculation of service provision. To the extent that these are not in the form of an accredited meter source, then AEMO should facilitate a process for the testing and verification of these measurement devices to ensure they are sufficiently accurate and reliable to assure service delivery. Accreditation could be against particular devices (make/model) or proceed as accreditation of the aggregate performance of the fleet seeking registration.	*AEMO* will consider this through the Market Ancillary Service Participant registration process.
5.	AGL	AGL has recently tested a small number of residential scale batteries in an aggregated formation to an artificial AGC signal. The batteries individually and in aggregate followed the signal and responded with a latency of 4 seconds to both raise and lower signals. These kinds of trials and pilots will be a useful means of understanding the operating performance characteristics of new forms of technologies.	Addressed in Clause 4.16
6.	AGL	AGL agrees that the purpose of FCAS services is to control power system frequency, rather than simply the delivery of a defined amount of energy,	Covered in clause 4.5
7.	AGL	However, it is important that participants not be penalised if, despite them delivering the stabilising service that they have committed, frequency continues to deviate due to other external factors.	Covered in clause 4.5
8.	AGL	In AGL's view, relying on a more diverse range of FCAS sources and service providers will promote a smooth transition between services.	Covered in clause 4.9

No.	Consulted person	Issue	AEMO response
9.	AGL	AGL agrees with AEMO that on recovery of the frequency from a contingency, the source should return to follow the AGC signal. However, if/where the AGC signal is not in use and the local frequency is used as the reference then there is no need to change reference on recovery.	Covered in clause 4.10
10.	AGL	The FCASVT could be improved to clearly distinguish between grid event data and the need for the machine inertia, over injected data which does not need inertia.	Covered in clause 4.13
11.	AGL	Requiring larger-scale 'traditional' generation with switching controllers to be configured to provide a staggered response would add complexity.	Covered in clause 4.14
12.	AGL	However, in the case of a market ancillary service provider comprised of an aggregation of smaller sources (such as batteries), achieving variable switching is very straightforward	Covered in clause 4.14
13.	Clean Energy Council	A concern is that the FCAS regime is predicated on the delivery of energy, not the control of frequency.	Covered in clause 4.5
14.	Clean Energy Council	While we appreciate the restricted scope of this review, we expect that the review should at least provide a view on significant issues that are beyond its scope. This can allow future work to consider these issues.	*AEMO* is forming the Ancillary Services Technical Advisory Group to consider some of the other issues raised
15.	Clean Energy Council	AEMO's language used around the 'dispatch targets' modelled by AWEFS and ASEFS and provided by NEMDE for semi-scheduled or 'variable' generation is inconsistent with the National Electricity Rules. AEMO should be clear that AWEFS and ASEFS do not produce 'dispatch targets', and that the NER refers to this as a 'dispatch level'	*AEMO* agrees. Covered in clause 4.4
16.	Clean Energy Council	it is not clear that options exist outside of straight line interpolation between generation at the start of the interval and the dispatch level (or estimated power)	Covered in clause 4.4
17.	Clean Energy Council	AEMO should also be sure to specify the MASS in a way that does not restrict faster responses if they are called upon by the market settings.	To be considered by the Ancillary Services Advisory Group. Covered in clause 4.4
18.	Clean Energy Council	For aggregators, it will remain important to measure responses at each unit.	Covered in clause 4.5
19.	Clean Energy Council	occurs, the registered aggregator should be required to provide data for each unit to demonstrate individual performance	Covered in clause 4.5
20.	Clean Energy Council	SCADA, 3G or 4G based systems will create barriers to entry for aggregators and must be avoided. Recording equipment is now available that can be located on site and report data to the registered aggregator as requested.	Covered in clause 4.6
21.	Clean Energy Council	There does not appear to be any specific barriers to generator aggregators designing the response of switching controllers to specific settings across many small units. AEMO should attempt to allocate bands of response across each aggregator.	Covered in clause 4.14

No.	Consulted person	Issue	AEMO response
22.	Delta Electricity	Delta believes the current MASS has been effective in supporting the provision of adequate levels of system security services and a major redesign of the specification is not required	
23.	Delta Electricity	It is imperative that any amendment to the MASS does not require fundamental changes to the systems deployed by existing conventional plant. Costly redesigns will likely result in higher electricity costs to consumers which is contrary to the objective of the review	*AEMO* does not intend that the existing *market participants* should need to make fundamental changes to their systems as a result of the proposed amendments to the MASS
24.	Delta Electricity	A more effective MASS that encourages new entrants can be achieved through simplification of the design requirements and objectives, a reduction in the complexity of the verification process, encouraging self-verification of services by participants and the creation of consultative communication pathways between participants and AEMO.	This review intends to simplify the definitions and requirements of the MASS to encourage new entrants without compromising *power system security*.
25.	Delta Electricity	Delta cautions against less defined services that permit wider interpretation of the requirements which could lead to less resultant services than are currently delivered.	*AEMO* notes this comment and believes the revisions proposed are a good balance between simplifying the definitions and maintaining the integrity of the services
26.	Delta Electricity	Delta agrees that the current specifications for the contingency services are unnecessarily complex.	Covered in clause 4.9
27.	Delta Electricity	Principle-based specifications which can be inconsistently interpreted by participants may inhibit efforts to maintain or improve current performance.	*AEMO* will provide sufficient detail in the definitions to avoid inconsistent interpretation
28.	Delta Electricity	Whilst the service verification for contingency services is described by complex formulas, it should be able to be applied consistently by participants Delta Electricity…. does not consider the existing specification represents a barrier to entry.	Covered in clause 4.13
29.	Delta Electricity	Simplification of the design requirements and verification process may encourage more participants apply to provide the services.	Covered in clauses 4.9 and 4.13
30.	Delta Electricity	If the specification also provided clear contact details to relevant AEMO personnel, participants may be encouraged to ask questions about new and existing services	Covered in clause 5
31.	Delta Electricity	Delta Electricity considers….a common dispatch trajectory process should apply for variable generation as currently applies for synchronous generation. If another method id is to be utilised, all technologies should be given the option to provide the services that carries the least cost outcome.	Covered in clause 4.4
32.	Delta Electricity	Delta Electricity is comfortable with the reliance upon high speed recorders for providing data as presently specified in the MASS	Covered in clause 4.6
33.	Delta Electricity	The current definitions of the contingency services are considered adequate. The definitions of the regulation services b contrast are less so.	Covered in clauses 4.8 and 4.9

No.	Consulted person	Issue	AEMO response
34.	Delta Electricity	Delta Electricity supports regulation services definitions aligned to the points below: • The definition can be consistently interpreted and the services required provided at a low cost • The definitions result in services that can be consistently verified at low cost • The definitions should not require expensive plant modifications for existing plant to comply with or otherwise come with caveats permitting existing generation to utilize the previous MASS for which they were constructed • The definitions should promote a level playing field for all suppliers of the services • The definitions should promote and require performance from all technologies that is consistently evaluated and regularly re-evaluated,	Covered in clause 4.8 *AEMO* does not intend that the existing *market participants* should need to make fundamental changes to their systems as a result of the proposed amendments to the MASS. *AEMO* intends that the MASS should be technology neutral
35.	Delta Electricity	Delta Electricity's view is that…it is AEMO's obligation to track and determine whether frequency is being adequately controlled across the entire NEM. Therefore, other than a review of the MASS, AEMO should also consider the breadth and reliability of its instrumentation and the resultant breadth of the frequency data it monitors.	To be considered by the Ancillary Services Technology Advisory Group
36.	Delta Electricity	As contingency services are provided in events corresponding to larger frequency deviations, and appear to be functioning adequately, the existing principles and verification requirements for the contingency services could be considered, although complex, to be appropriate for the purpose,.	*AEMO* believes the principles and verification requirements for the Contingency Services can be simplified without compromising the integrity of the services.
37.	Delta Electricity	The present regulation services are delivered at four second intervals by AEMO's AGC. Therefore performance cannot be measure at less than 4-8 seconds.	*AEMO* notes this. Details of any performance index, including time frames, will be considered by the Ancillary Services Technology Advisory Group
38.	Delta Electricity	It is recommended that AEMO consider In more detail their regulation dispatch design, its delivery relevant to it reading of frequency and the operation of existing closed loop automatic regulation systems that cannot be influenced by AEMO's energy dispatch signal except by way of response to the resultant frequency changes that occur.	To be considered by the Ancillary Services Technology Advisory Group
39.	Delta Electricity	AEMO should consider the consequences of any revised MASS on existing services currently designed for the existing MASS before producing any retrospective requirements on the existing services.	*AEMO* does not intend that the existing *market participants* should need to make fundamental changes to their systems as a result of the proposed amendments to the MASS.
40.	Delta Electricity	A change in the specification for transition may be expensive to participants if it requires them to change the installed design and therefore whilst any revised specification can be mandated for new entrants, changes to the specification ought not mandate a redesign of existing systems	Addressed in clause 4.9 *AEMO* does not intend that the *existing market participants* should need to make fundamental changes to their systems as a result of the proposed amendments to the MASS.

No.	Consulted person	Issue	AEMO response
41.	Delta Electricity	There are no limitations on the Vales Point plant that prevent a resumption of standard operations assuming the system recovery is in accordance with the AEMC/Reliability Panel's determined frequency operating standards and no further event occurs before the Unit has time to fully recover from any previous event.	*AEMO* notes the comment. Covered in clause 4.14
42.	Delta Electricity	One limitation inherently in the current overall process is the present volatility of experienced frequency.	To be considered by the Ancillary Services Technology Advisory Group
43.	Delta Electricity	Delta Electricity also supports any increased monitoring by the Operator.	To be considered by the Ancillary Services Technology Advisory Group
44.	Delta Electricity	The specification requires more definitive expectations of the regulation services, but mandated redesigning of existing system should only take place if participants are proceeding to alter relevant equipment associated with these services in projects the participant initiates.	*AEMO* does not intend that the existing *market participants* should need to make fundamental changes to their systems as a result of the proposed amendments to the MASS.
45.	Delta Electricity	As part of improvements, AEMO could develop a communications pathway for participants to share responses and report difficulties seeking AEMO advice on how improvements could be achieved by coordinated action between AEMO AGC control responses and a participant's control systems.	*AEMO* believes that the Ancillary Services Technology Advisory Group will assist in this process. *Market participants* with issues with the AGC should contact *AEMO* through the Information and Support Hub
46.	Delta Electricity	Finer steps on the selection of frequency activation (for switching controllers) should be possible but AEMO should keep in mind that switching controllers may not be detecting frequency as fast as the high speed recorders. AEMO may need to consider and define what resolution of detection for these services is required.	To be considered by the Ancillary Services Technology Advisory Group
47.	EnerNOC	For a provider of aggregated interruptible load (IL), today's MASS presents no technical barriers to entry.	*AEMO* notes the comment
48.	EnerNOC	the MASS is difficult to read and understand	*AEMO* notes the comment
49.	EnerNOC	The biggest potential barriers to entry for new-entrant FCAS providers lie not in the MASS itself, but rather in the various registration procedures that AEMO may implement to accommodate the Ancillary Services Unbundling rule change.	To be considered as part of the design of the *Market Ancillary Service Provider* registration process
50.	EnerNOC	for an aggregated IL unit using a simple switching controller and supplying contingency FCAS, the current measurement and verification (M&V) in today's MASS is straightforward and appropriate	*AEMO* notes the comment, but believes there are benefits to simplifying the definition and verification clauses. Considered in clauses 4.9 and 4.13
51.	EnerNOC	50ms resolution is probably higher than is actually required to verify the delivery of the services currently specified in the MASS. It seems likely that working from, say, 100 ms resolution data would not increase measurement errors significantly.	Considered in clause 4.6
52.	EnerNOC	EnerNOC is supportive of AEMO's initiative to improve the MASS by putting more rigour around how the regulation services are verified, including verifying real-time response to AEMO's AGC signals.	Covered in clause 4.12

No.	Consulted person	Issue	AEMO response
53.	EnerNOC	EnerNOC is concerned that if implemented too prescriptively, the proposed "description of the expected transition response" in section 3.2.4 of the Issues Paper would preclude most IL from participating in the FCAS markets.	Covered in clause 4.9
54.	EnerNOC	A switching controller connected to a load can respond and deliver its FCAS quantity very quickly. The response time depends on the load, but many can achieve less than 1 second. Since the purpose of the Fast Raise service is to arrest the falling frequency, faster responses are more valuable and should be encouraged.	Covered in clause 4.9
55.	EnerNOC	Mandating a linear response would be a mistake, as not only would it preclude participation by most loads, but it would also remove the incentive for enabled Fast Raise suppliers to respond as quickly as possible. It would thus hinder AEMO's ability to arrest falling frequency.	Covered in clause 4.9
56.	EnerNOC	The interruption of a load is achieved via automated signal to a PLC, or in some cases, a circuit breaker. However, the restoration of a load must typically be carried out manually, often with the involvement of on-site staff, due to safety considerations6.	Covered in clause 4.9
57.	EnerNOC	In ensuring the MASS efficiently maintains the power system security, arresting frequency fall should be the primary objective, whereas ensuring a precise restoration to pre-contingent levels should be a secondary consideration. Mandating an unnecessarily prescriptive restoration profile would exclude aggregated IL from participating in the FCAS markets, and sacrifice the former objective for the sake of the latter.	Covered in clause 4.9
58.	EnerNOC	The most cost-effective approach is to minimise the requirements, so that the service is required to be just good enough to solve to problem (arresting, stabilising, restoring frequency). This will provide a better outcome for consumers than specifying an awe-inducingly superb service that can only be provided by a handful of providers at great cost. The (New Zealand) report concluded that "over-frequency due to IL over-provision is not currently an issue nor is it likely to become an issue in the foreseeable future", and so the restrictions were not imposed and over-prescription costs were avoided	*AEMO* notes the comment. Covered in clause 4.9 This issue will also be considered by the Ancillary Services Technical Advisory Group
59.	EnerNOC	During further consultation, it would be useful if AEMO would elaborate for participants on the value of having "orderly" transitions. As noted, many (newer) contingency FCAS technologies can respond very quickly, in a binary fashion, to contribute to frequency arrest… such technologies are unlikely to restore themselves to pre-contingent levels in a sudden, binary fashion	To be considered by the Ancillary Services Technical Advisory Group

No.	Consulted person	Issue	AEMO response
60.	EnerNOC	After testing and commissioning, there should be ongoing monitoring of the accuracy with which enabled units meet their AGC targets… Regulation payers are assessed payments based on their causer-pays factors, calculated every 4 seconds. It seems reasonable that regulation providers should be assessed via a similar methodology, to ensure the market is receiving the quantities of regulation it is paying for. The method employed by PJM appears reasonable for use in the NEM.	To be considered by the Ancillary Services Technology Advisory Group
61.	EnerNOC	An Aggregated IL unit may not be able to restore to pre-contingent levels in a smooth ramp, nor on a precise timeline	*AEMO* notes the comment. Covered in clause 4.9
62.	EnerNOC	Service requirements should be as loose as can be made to work. Imposing limits on over-delivery would preclude participation by some types of load.	Covered in clause 4.9
63.	EnerNOC	In the unique situation where an aggregated IL unit is enabled for Fast Raise and Delayed Raise but NOT Slow Raise, it would be impossible for the unit to avoid delivering a Slow Raise quantity.	*AEMO* agrees.
64.	EnerNOC	The utilisation of a 'reference frequency trace' is necessary for suppliers to be able to determine whether their delivered quantities were compliant with their enabled quantities. However, this is only so because of the way today's MASS determines the start time of an excursion… In terms of simplifying contingency FCAS verification in the MASS, the simplest change AEMO could make would be to make the 'clock start' when the frequency reaches each provider's allocated frequency deviation setting, rather than when the frequency leaves the NOFB.	To be considered by the Ancillary Services Technical Advisory Group
65.	EnerNOC	The FCASVT is a useful tool for participants and we are glad that AEMO intends to continue to maintain it.	*AEMO* notes the comment
66.	EnerNOC	at present, the MASS is silent on how providers of aggregated services should time-align and combine the data from their multiple high-speed recorders, prior to loading them into the FCASVT… recommendation is that the MASS instruct participants to time-align each meter's logged recordings to the time the frequency excursion was detected	*AEMO* notes the comment. Covered in clause 4.13
67.	EnerNOC	These types of sources (large number of small scale installations, such as batteries) should be able to be verified using the principles specified in 3.3.2 of the Issues Paper, provided the same requirement for high-speed data recordings is applied to small scale installations	Covered in clause 4.13
68.	EnerNOC	In principle, AEMO's proposed approach of staggering frequency deviation settings within a single aggregated dispatchable unit and using settings beyond today's 0.05 Hz step changes is philosophically reasonable and technologically feasible.	Covered in clause 4.14
69.	ENGIE	ENGIE is generally supportive of AEMO's efforts to improve the descriptions in the MASS and to reduce barriers to entry, provided that any changes do not impose additional costs on existing ancillary service providers.	*AEMO* does not intend that the existing *market participants* should need to make fundamental changes to their systems as a result of the proposed amendments to the MASS

No.	Consulted person	Issue	AEMO response
70.	ENGIE	ENGIE believes that the straight line interpolation method should continue to be used for variable generation, taking into account the estimated power in those cases that the generator chooses to supply this figure.	Covered in clause 4.4
71.	ENGIE	ENGIE is supportive of the general desire to minimise barriers to entry for these emerging distributed and aggregated resources, but is also very mindful of the importance of ensuring that power system frequency management is robust and efficiently priced	*AEMO* notes the comment
72.	ENGIE	As aggregated resources become more prolific, ENGIE expects that new technology options will develop which may help to provide solutions to the verification problem. In the meantime, ENGIE suggests that AEMO adopt a two tiered approach. The first tier should be to allow aggregators to propose a variation method to AEMO on a case by case basis, which would allow for innovative and low cost solutions. These proposals would need to be approved by AEMO, and then published so that all stakeholders are clear on what method is being applied. The second tier to the approach would be for AEMO to utilise real time power flow measurements at the relevant local connection point to build up an historical analysis of the baseline power flow for each dispatch interval. AEMO could then apply this pseudo baseline as a reasonability check to confirm the local verification method that is being used by the aggregators at that location.	Covered in clause 4.13 To be further considered by the Ancillary Services Technical Advisory Group
73.	ENGIE	When considering the potential provision of fast services from non-synchronous technology, ENGIE would suggest that the need to adjust for inertia does not arise. If this is true, then it would seem that non-synchronous technology need not be required to meet the onerous 50 millisecond measurement requirement.	Covered in clause 4.6
74.	ENGIE	ENGIE supports ensuring that different technology types are given the opportunity to provide regulation services. Assuming that all regulation services are still going to be controlled by the AGC system, ENGIE believes that introducing a new definition for regulation services might have the opposite effect to that being sought by AEMO – in other words, it might inadvertently introduce a new barrier to entry.	Covered in clause 4.2

No.	Consulted person	Issue	AEMO response
75.	ENGIE	AEMO have proposed to include a description of the expected transition between the fast, slow and delayed services to ensure that these transitions are managed to avoid under or over delivery of services. ENGIE supports the objective behind this proposal, however is somewhat concerned that applying a new description to existing service providers might impose a new obligation or requirement that was not required in the past. Rather than AEMO specifying a description, perhaps it would be better that all contingency services providers are required to describe to AEMO, the manner in which their plant transitions from one service to the other. AEMO would then be able to account for the sum total of these transitions, based on the contingency service providers enabled at any point in time.	AEMO does not intend that the existing *market participants* should need to make fundamental changes to their systems as a result of the proposed amendments to the MASS Covered in clause 4.9
76.	ENGIE	ENGIE agrees that the ultimate objective of the frequency control arrangements is to ensure secure management of power system frequency, but it is not quite so clear that this should be the principle underlying the MASS. In ENGIE's view, the purpose of the MASS is to define the frequency control products, and the requirements that service providers will need to meet to be eligible to participate in the frequency control markets. From the perspective of an individual service provider, the obligations that it should be expected to fulfil are to ensure that when the frequency deviation occurs, it responds with an appropriate MW change.	*AEMO* notes the comment. It is not intended that the principles would require an individual *market participant* to provide more than they have offered Covered in clause 4.7
77.	ENGIE	ENGIE is concerned that if the principle of the MASS is somehow changed to make the frequency control the central principle, it might lead to an outcome whereby a service provider does what is expected in terms of MW response, but due to circumstances outside of its control, the power system frequency might remain outside of the desirable range, and the service provider might then be unfairly penalised.	*AEMO* notes the comment. It is not intended that the principles would require an individual *market participant* to provide more than they have offered Covered in clause 4.7
78.	ERM Power	ERM Power supports changes to the MASS to remove any artificial barriers to entry for new participants whilst ensuring that the services paid for are actually delivered as required to the Market. In this regard we support AEMO in identifying the best means to verify ancillary service unit performance when considering how best to incorporate new technologies into the ancillary services market.	AEMO notes the comment
79.	ERM Power	We believe the process for review of the MASS would benefit from the setting up of an industry working group to work through the change process with AEMO.	*AEMO* is forming the Ancillary Services Technical Advisory Group to consider some of the other issues raised
80.	ERM Power	It would be of great concern to the industry if changes implemented resulted in the withdrawal of some existing service provision or the non-participation of some potential service providers.	*AEMO* notes the comment.

No.	Consulted person	Issue	AEMO response
81.	ERM Power	We agree with AEMO that the National Electricity Rules (NER) allow for aggregation of service providers within a region. We also agree that it is appropriate for AEMO's systems to provide a dispatch instruction for the provision of Regulating FCAS services to one central control location and it is the responsibility of the MASP to ensure components within the aggregated service complies with this dispatch instruction.	Covered in clause 4.2
82.	ERM Power	With regard to verification data provided by the operation of some form of switched controllers, this should be of sufficient granularity to verify that a response has actually been achieved. Where the source of the service is distributed load, generation or storage, verification data needs to support the actual provision of a service not just that a control or switching action has been activated.	Covered in clause 4.5
83.	ERM Power	Whilst the six Contingency FCAS services are reasonably defined the two Regulating FCAS services are poorly defined with regard to actual service requirements. We support AEMO's view that this area of the MASS requires improvement.	Covered in clause 4.8
84.	ERM Power	We agree that the key principle in the construction of the revised MASS should relate to the control of power system frequency. Notwithstanding this, the MASS should not require a service provider to deliver an ancillary service in excess of its enablement amount or for a service provider who has supplied the required enablement or activated amount to be held responsible for the failure of ancillary services to control frequency.	*AEMO* notes the comment. It is not intended that the principles would require an individual *market participant* to provide more than they have offered Covered in clause 4.7
85.	ERM Power	We disagree with AEMO's view that the current MASS fails to provide a timeframe over which the regulation service must be supplied. The current MASS indicates in Sections 5.2 and 5.3 that the service is to be provided progressively over a five minute period. We believe the underlying question is whether that that is what AEMO actually requires the service to deliver.	*AEMO* notes the comment and believes that the definition should include some requirements for performance within the five minute periods Covered in clauses 4.8 and 4.12
86.	ERM Power	It is clear the Regulation FCAS services would benefit from a clear description of the service to be actually supplied.	Covered in clause 4.8
87.	ERM Power	We also believe the MASS would benefit from the inclusion of at least one clear example of the service to be provided for each of the eight FCAS.	*AEMO* notes the comment and will attempt to define the services clearly
88.	ERM Power	With regard to the provision of Contingency FCAS services as set out in the issues paper which sets out a theoretical ramped handover between the Fast, Slow and Delayed services, whilst we support the objective behind this, in practice this may be unachievable.	Covered in clause 4.9
89.	ERM Power	Rather than AEMO attempting to specify a theoretical description, perhaps it would be better that all contingency services providers provide a description of the manner in which their plant transitions from one service to the other. AEMO would then be able to account for the sum total of these transitions, based on the contingency service providers enabled at any point in time.	*AEMO* notes the comment Covered in clause 4.13

No.	Consulted person	Issue	AEMO response
90.	ERM Power	Also, in this theoretical world, provision of services is limited to enabled service providers only; this fails to recognise that other in-service generators will also provide non-enabled services in accordance with the requirements of Schedule S5.2.5.11 Frequency Control of the NER.	*AEMO* notes the comment. To be considered by the Ancillary Services Technical Advisory Group
91.	ERM Power	We agree with AEMO concerns with regards to oversupply of Contingency FCAS, in particular the Delayed service when frequency has returned to the normal operating band with a very short timeframe.	Covered in clause 4.10
92.	ERM Power	Participants incurred considerable expense in installing switching controllers to meet these specific requirements included in the MASS. Changes inferred in the current consultation may result in participants incurring additional expense to modify or replace these switching controllers and this should be minimized if possible.	*AEMO* does not intend that the existing *market participants* should need to make fundamental changes to their systems as a result of the proposed amendments to the MASS
93.	ERM Power	We also agree with AEMO's view regarding the interaction of Regulating and Contingency FCAS but again the existing systems were the result of the current and previous versions of the MASS. We are concerned that these changes will result in additional costs being incurred to yet again modify control systems to meet changed AEMO requirements.	*AEMO* does not intend that the existing *market participants* should need to make fundamental changes to their systems as a result of the proposed amendments to the MASS
94.	ERM Power	We support AEMO's view that the ability to verify the performance of units enabled to provide market ancillary services is a key element of the MASS. We also believe that performance parameters and uniform standard of verification requirements should apply equally to all service providers regardless of the technology used to supply the service.	*AEMO* will attempt to ensure the MASS is technology neutral. Covered in clauses 4.11 and 4.12
95.	ERM Power	With regard to the provision of FCAS, AEMO's systems need to ensure that generating units are not dispatched beyond the current capabilities as indicated in their current bid with regard to maximum availability and ramp rate capability.	*AEMO* notes the comment
96.	ERM Power	In assessing a service provider's performance, AEMO needs to consult on and provide a proven methodology to compensate for the variable latency of SCADA data.	*AEMO* notes the comment. To be considered by the Ancillary Services Technical Advisory Group
97.	ERM Power	When assessing performance for Regulation FCAS, we believe this should be based on activated and not the enabled amount.	*AEMO* notes the comment and agrees. To be considered further by the Ancillary Services Technical Advisory Group

No.	Consulted person	Issue	AEMO response
98.	ERM Power	We are concerned that AEMO's proposed requirement that: "when the frequency returned to the normal operating frequency band, any unit away from its anticipated energy dispatch point (because it is responding to the contingency event) must verify that it has ramped gently and in a linear fashion back to its energy target or, if it is providing regulation services through the AGC system, has resumed responding to those signals." This may result in unintended consequences, particularly when the current output of a service provider is well away from its current Energy Dispatch Target following a Contingency event. Ramping back to this Energy Dispatch Target may result in further undesirable frequency deviations and suggest that service providers are only required to ramp to Energy Dispatch Targets following a Contingency event when new Energy Dispatch Targets are issued.	Covered in clause 4.10
99.	ERM Power	We agree that in the future it may be possible to use an aggregated group of inverters to provide FCAS, however, the verification process should ensure that sufficient historical data can be supplied to ensure that the inverter was not already responding in the desired operational mode immediately prior to the FCAS requirement.	*AEMO* notes the comment and will consider it in the registration process
100.	ERM Power	With regards to the settings for switching controllers...This consultation should determine what MASS requirements are required going forward and if deemed necessary provide sufficient time for existing service providers to modify or replace control systems if required. Alternatively, existing service providers could be designated to supply services at their existing setting with new service providers required to provide services in accordance with any new expanded range of settings.	*AEMO* does not intend that the existing *market participants* should need to make fundamental changes to their systems as a result of the proposed amendments to the MASS Covered in clause 4.14
101.	Hydro Tasmania	Hydro Tasmania believes that requiring a non-scheduled generating unit or a non-scheduled load to ramp back to its pre-contingency state is unreasonable. Given that they do not follow specific energy targets in normal dispatch, as the system frequency has returned to normal, there should be no requirement on non-scheduled loads/generators to return to a pre-contingent state following FCAS delivery. In the case of either generating units or loads, providing FCAS via tripping the circuit breaker to reduce generation or load, this requirement is impractical as it would require an operator to restart and would therefore be unable to return to a pre-contingency state automatically.	Comment noted Covered in clauses 4.4 and 4.9

No.	Consulted person	Issue	AEMO response
102.	Hydro Tasmania	In verifying the performance of plant, Section 3.3.2 states that "plant with a performance outside a tolerance limit may be considered as non-conforming". It is unclear how this definition would be interpreted and applied. One interpretation could imply that only units being dispatched by AEMO should provide FCAS and units that are not being dispatched should not provide FCAS. These governors are providing a valuable market service that would otherwise need to be paid for. In verifying the performance of the plant, however, these units may be performing outside a tolerance limit (i.e. over delivery) and may therefore be considered to be non-conforming.	The verification clauses are only intended to apply to *ancillary service facilities* enabled to provide the service.
103.	United Energy	AEMC state that network service providers demand response programs are independent of this and hence do not need to comply with the MASS. In UE's opinion any equipment or services that could provide ancillary services and benefits to both parties and ultimately to consumers at the lowest cost should not be precluded, even if this includes services provided by networks (DNSP).	*AEMO* notes the comment. To be considered by the Ancillary Services Technical Advisory Group
104.	United Energy	There appears to be some barriers associated with DNSPs being able to participate in the MASS in relation to demand side participation using shared network assets. Furthermore, many DNSPs including UE are increasingly deploying energy storage technology and demand management programmes for network support purposes. Such technology and programmes could also be leveraged for ancillary services when available in sufficient aggregated volume.	*AEMO* notes the comment. To be considered by the Ancillary Services Technical Advisory Group
105.	United Energy	The Market Ancillary Services Specification (MASS) should not limit technology opportunities to only those connected to the Automatic Generation Control (AGC) when there may be other solutions to achieve the same frequency control. Conformance to the AGC should not be a barrier to the opportunity for emerging battery technology to participate in ancillary services markets.	*AEMO* notes the comment. To be considered by the Ancillary Services Technical Advisory Group
106.	United Energy	We believe that 'baselining' techniques similar to those used in demand management programmes can be used for verifying total changes in power. Alternative techniques can also involve measuring the step change responses at the start and conclusion of the response, or agreeing on mathematical models that predict the behaviour.	*AEMO* notes the comment. To be considered by the Ancillary Services Technical Advisory Group
107.	United Energy	We agree with the linear interpolation method.	Covered in clause 4.4
108.	United Energy	It is possible to use multiple sources of recordings including aggregating smart meter high speed data capture of individual sites, coupled with SCADA recordings for aggregated sites, or even recordings from other intelligent electronic devices deployed throughout the networks. It is important that AEMO allow some flexibility for a range of solutions in the MASS.	Covered in clause 4.5

No.	Consulted person	Issue	AEMO response
109.	United Energy	We would like to see an Inertia Service also captured as a standalone market ancillary service to signal a market value for inertia which is required in circumstances where there is a high rate of change of frequency.	*AEMO* notes the comment. The addition of additional services is beyond the scope of this review To be considered by the Ancillary Services Technical Advisory Group
110.	United Energy	AEMO should consider the range of capability of the service from best case to worst case performance characteristics, or assume a level of reliability of service in instances where the ancillary service has some uncertainty, such as in voluntary demand response programmes for example.	*AEMO* notes the comment. To be considered by the Ancillary Services Technical Advisory Group
111.	United Energy	What amendments are required to the FCASVT to better represent the performance of your plant? It needs to also cover voltage control providing frequency ancillary services where a change in voltage at customer supply points results in a change in active power consumption	*AEMO* notes the comment. To be considered by the Ancillary Services Technical Advisory Group
112.	United Energy	Use multiple sources of recordings including aggregating smart meter high speed data capture of individual sites, coupled with SCADA recordings for aggregated sites	*AEMO* notes the comment. To be considered by the Ancillary Services Technical Advisory Group Covered in clause 4.6
113.	United Energy	What limits exist in switching controllers on potential range of frequency settings and can this be adjusted? We would need to modify our control systems (hardware, software and configurations) to be able to provide ancillary services. If this is done we don't envisage any limits	Covered in clause 4.14

ATTACHMENT 1 – DRAFT MARKET ANCILLARY SERVICE SPECIFICATION