Market Ancillary Service Specification

November 2019

Issues paper

Important notice

Executive summary

AEMO publishes this Issues Paper with the Notice of First Stage of Consultation to consider proposed amendments to the Market Ancillary Services Specification (**MASS**)[1].

AEMO has prepared this Issues Paper to inform and seek feedback from *Registered Participants* and interested parties (**Consulted Persons**) on amendments to the MASS. The intent of the proposed amendments is to remove actual and perceived disincentives that contribute to *facilities* limiting or withdrawing primary frequency response (**PFR**). In particular, it focuses on how the current measurement of Contingency FCAS focuses only on how a *facility* changes its net power injection when *frequency* exits the *normal operating frequency band* (**NOFB**), and how this might not recognise the PFR that commences within the NOFB. AEMO has identified three methods by which this additional PFR could be valued as Contingency FCAS and AEMO proposed to amend the MASS to incorporate one of these methods.

AEMO invites Consulted Persons to suggest alternatives if they do not agree that AEMO's proposal would achieve the desired objectives. AEMO also asks Consulted Persons to identify any unintended adverse consequences of the proposed changes.

The scope of this consultation is limited to the identified issue. It is not intended to consider the broader framework of different or additional *ancillary services* that might be required because of the changing *generation* mix and nature of the *power system*.

Consulted Persons are invited to submit written responses on the issues and questions identified in this paper by 5.00 pm (Melbourne time) on 6 December 2019, in accordance with the Notice of First Stage of Consultation published with this paper.

[1] The existing MASS can be found on the AEMO webpage, at http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/Ancillary-services/Market-ancillary-services-specifications-and-FCAS-verification.

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1. Background

1.1 Context for this consultation

AEMO has recently submitted two proposals to the Australian Energy Market Commission (**AEMC**) requesting to amend the National Electricity Rules (**NER**) to facilitate the provision of primary frequency response (**PFR**) by *Generators* under normal operating conditions. The first proposal aims to remove disincentives and inconsistencies in the NER that are impeding the provision of more PFR in the NEM. The second proposal relates to mandatory PFR requirements for all *Scheduled* and *Semi-Scheduled Generators*.

AEMO's proposals, and the AEMC's Consultation Paper, can be found at: https://www.aemc.gov.au/news-centre/media-releases/consultation-commences-proposed-rules-better-control-power-system.

Concurrently with the AEMC consultation, AEMO has commenced a consultation on the *market ancillary services specification* (**MASS**).

While this consultation may have been prompted by potential new rules for the provision of PFR, the matter contemplated by this consultation does not depend on the making of those rules.

This consultation does not replace the need for a broader review of the MASS, which AEMO will conduct separately and, potentially, in parallel, with this consultation.

1.2 NER requirements

Clause 3.11.2(b) of the NER 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 30 June 2017. AEMO may amend the MASS from time to time under clause 3.11.2(c) of the NER.

Clauses 3.11.2(f) defines the additional monitoring required to provide *market ancillary services* while Clause 3.11.2(g) provides for AEMO to develop standards that must be met in installing and maintaining the required equipment.

At present, the requirements of both clause 3.11.2(b) and 3.11.2(g) are in the MASS.

When amending the MASS, AEMO must comply with the *Rules consultation procedures*.

The release of this Issues Paper with the Notice of First Stage of Consultation commences the first stage of that process.

2. Issues under consideration

2.1 Removal of disincentives on the provision of PFR within the MASS

The current structure of Contingency FCAS focuses on how *facilities* respond to provide frequency response during a *contingency event*.

Since the Frequency Operating Standard (**FOS**) allows the *frequency* to move outside the *normal operating frequency band* (**NOFB**) when a *contingency event* occurs, the MASS was developed around the assumption that Contingency FCAS is how *facilities* respond when the *frequency* departs the NOFB. Thus, the amount of Contingency FCAS a *facility* is seen to deliver is essentially the amount by which the *facility* changes its net power injection when the *frequency* departs the NOFB (ignoring timing considerations and other subtleties like *inertia*).

AEMO's Rule Change Proposals aim to increase the amount of PFR within the NOFB. This means that *facilities* providing PFR would be initiating a Local Frequency response at a deadband significantly within the NOFB. If this rule change were to proceed without suitable amendment to the MASS the PFR provided by an *enabled* Contingency FCAS *generating unit* prior to the *power system's* departing the NOFB would not be recognised as Contingency FCAS. This could result in *facilities* not being able to provide the same level of FCAS as they do currently under comparable situations. For instance, when FCAS delivery is limited by available headroom an early PFR response would use some of that headroom which would then be unavailable for Contingency FCAS delivery.

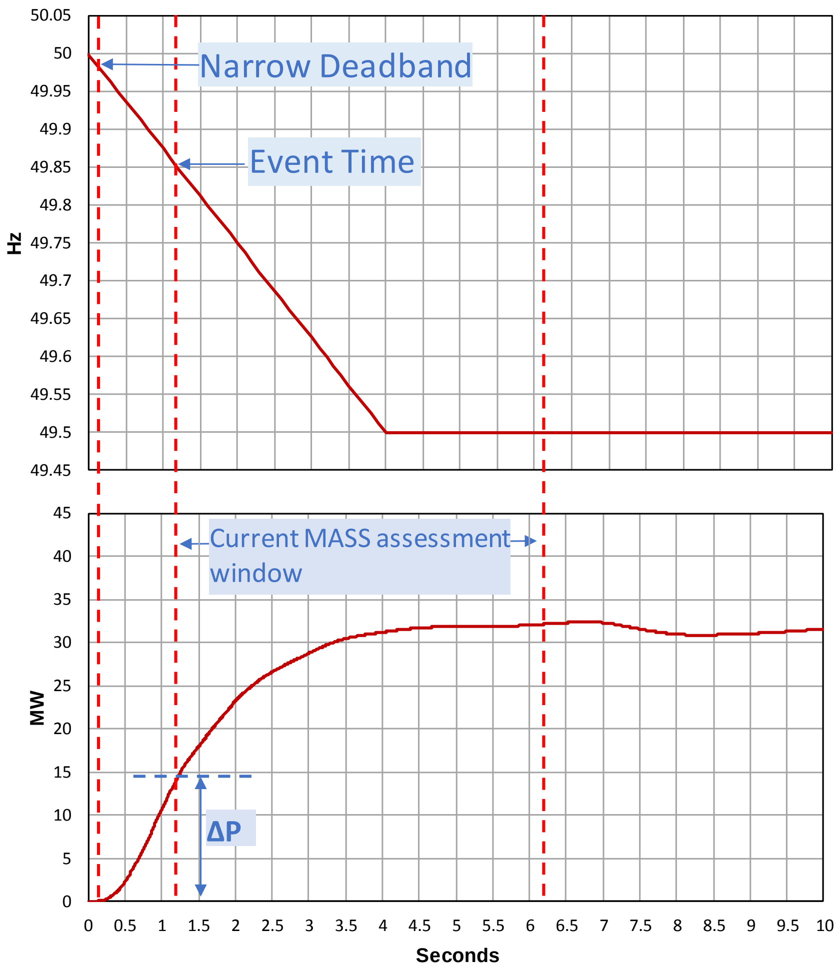
In AEMO's view, there is no reason not to recognise PFR provided by an *enabled* Contingency FCAS *generating unit* as Contingency FCAS before the *frequency* exits the NOFB. Any PFR provided by an *enabled* Contingency FCAS *generating unit* acts to contain a *frequency* deviation, and responding sooner can provide superior control, better system performance and increased resilience. For example, all other things being equal, when the provision of PFR is commenced earlier, a given *frequency* event will be arrested more quickly and efficiently. Noting this, AEMO proposes to amend the MASS to ensure that all an *enabled* Contingency FCAS *generating unit's* PFR is recognised as Contingency FCAS where this is appropriate.

2.2 Methods for verifying frequency response within the NOFB

There are various ways that Contingency FCAS can be measured to include PFR commencing within the NOFB. To compare the different methods AEMO has identified, AEMO proposes to start from the existing measurement method, and then add a 'ΔP' value representing the control action provided by the *facility* prior to the Frequency Disturbance Time; that is, before the *frequency* exits the NOFB.

An example of a *facility* responding with a narrow deadband set within the NOFB is given in Figure 1. In the existing MASS, the R6 Contingency FCAS value would be calculated between the event time until 6 seconds after the event time. This assessment window is shown on the below figure as "Current Assessment Window". The proposal is to update the MASS to credit the provision of response provided from the crossing of a facility's deadband, where it is set narrower than the NOFB. This additional response is shown in the figure below as 'ΔP'.

Figure 1 Fast FCAS ΔP with narrow deadband response (under frequency event)



There are several ways that ΔP could be derived. AEMO has considered three basic options, and invites suggestions from Consulted Persons on whether there are any better methods:

2.2.1 Method 1: Static ΔP value based on droop and deadband

This method ignores the dynamic behaviour of the *facility* and assume it has provided the full MW as per its droop function. In this case, there will be a static ΔP that would be calculated once for Contingency FCAS *generating unit*. The static value would then be applied for each the assessment of each event.

$$\Delta \mathrm{P} \;= \boldsymbol{P_{MAX}} \times \frac{\mathbf{(0.15 - deadband)/50}}{\boldsymbol{Droop}\ (\%)}$$

FCAS Provided = FCAS (as measured from the Frequency Disturbance Time) + ΔP

Discussion

While this method is simple and transparent, it is likely to be optimistic about what an *enabled* Contingency FCAS *generating unit* will provide. As the output will have time constants associated with it, meaning the full amount won't have been delivered. For a hydro *facility*, for example, it is possible that a significant portion of the initial movement would be in the opposite direction of the required FCAS response.

2.2.2 Method 2: Derive a static ΔP on standard site test or historic data

In this method ΔP is calculated as the change in the MW output from when *frequency* crosses its deadband until *frequency* reaches the edge of the NOFB for the injection of a standard frequency ramp into the *facilities* active power control system. Once calculated the ΔP would be applied to the assessment of each subsequent event.

Discussion

This method is simple and transparent, but more representative of an individual *enabled* Contingency FCAS *generating unit's* response than Method 1. This approach would require suitable test data from all Contingency FCAS providers, which might not be available without retesting FCAS responses.

Some *facilities*, for example thermal units with purely mechanical governors, may not have the capability to inject a standard frequency test signal. It is feasible to use data from a number of events, rather than standardised test signal. If events were used the assessment would not be completely uniform between *facilities.*

2.2.3 Method 3: Calculate ΔP based on the event response

In this method, ΔP is calculated as the change in the MW output from the last time *frequency* crossed its deadband until *frequency* reaches the edge of the NOFB. The assessment is made for each event.

Discussion

This method would result in a more accurate assessment of the response provided.

This method would need a longer pre-event time recording than the current MASS arrangements, which requires minimum pre-event recording of 5 seconds for Fast services and 20 seconds for Slow and Delayed services. If the time between crossing the deadband and NOFB was long, there may also be a need to account for the dispatch reference trajectory when making assessment of the initial response.

2.2.4 Favoured method

AEMO favours Method 3 because it should provide the most accurate verification of PFR and is able to be applied uniformly across all *facilities.*

2.2.5 Application of the revised verification

The intent of this change would be to ensure *facilities* are not penalised for providing PFR with a narrower deadband, rather than increasing the amount of FCAS *facilities* can offer. In some circumstances changes to *facilities* to meet the PFRR may mean that generators can provide more Contingency FCAS. In these cases, *facilities* may wish to re-assess their registered FCAS values.

AEMO proposes that the additional credit for the initial response beyond a narrow deadband only be applicable in the verification of performance, rather than in establishing the amount of service for dispatch purposes.

Clauses S3.3 and S3.4 (Fast Service), S4.3 and S4.4 (Slow Service) as well as S5.3 and S5.4 (Delayed Service) that relate to how much FCAS service a facility can offer would remain unchanged. The sections of the MASS that relate the verification of post event FCAS provision (S3.7, S4.7 and S5.7) would be amended to contain an additional step to credit the ΔP value to the overall measured response.

If the additional response were to be credited to the amount of service for dispatch purposes a *generating unit* may respond slowly between its deadband and the NOFB, with this slow response contributing to its FCAS capability. It is important, particularly for fast FCAS that, that the speed of response specified in the MASS not be slowed by introducing measures to recognise the PFR response within the NOFB.

Questions

1. Why do you support/not support the general concept of recognising PFR within the NOFB as Contingency FCAS?
2. Should the recognition of Contingency FCAS provided inside the NOFB apply to all Contingency FCAS (ie. Fast, Slow and Delayed), or only to some services? Why?
3. What kind of measurement approach do you believe should be applied to assessing the total volume of Contingency FCAS delivered?
4. Is an increased pre-event recording window easily achieved? Are there thresholds above which this would become problematic?
5. Is the approach of recognising PFR within the NOFB only for verification of response, rather than for dispatch purposes, appropriate?

A1. Glossary

In this paper, words in italics have the same meaning as under the NER. Capitalised terms are as defined below.

Term or acronym	Meaning
Contingency FCAS	Any of the following: • *fast raise service*; • *fast lower service*; • *slow raise service*; • *slow lower service*; • *delayed raise service*; and • *delayed lower service*.
Delayed [Contingency FCAS]	*Delayed raise service* and *delayed lower service*.
Fast [Contingency FCAS]	*Fast raise service* and *fast lower service*.
FCAS	*frequency* control *ancillary services*
Frequency Disturbance	An occasion when the *power system frequency* moves outside the NOFB.
Frequency Disturbance Time	The time at which the Local Frequency fall or rises outside the NOFB during a Frequency Disturbance referenced to Australian Eastern Standard Time.
FOS	*frequency operating standards*
Local Frequency	The *frequency* of the electricity delivered by an *ancillary service generating unit* or consumed by an *ancillary service load*, measured in Hz.
MASS	The *market ancillary service specification* contemplated by clause 3.11.2(b) of the NER.
Slow [Contingency FCAS]	*Slow raise service* and *slow lower service*.