REGULATION FCAS CONTRIBUTION FACTOR (CAUSER PAYS) PROCEDURE CONSULTATION

FINAL REPORT AND DETERMINATION

Published: **November 2018**

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

EXECUTIVE SUMMARY

The publication of this Final Report and Determination (Final Report) concludes the consultation process conducted by AEMO to consider proposed amendments to the Procedure made under clause 3.15.6A(k) of the National Electricity Rules. This Procedure describes how AEMO determines the contribution factors that are used as the basis for recovering costs associated with procuring regulating raise and lower Frequency Control Ancillary Services (regulation FCAS).

The contribution factors are intended to attribute the costs to those market participants determined to have contributed to the need for frequency regulation in the recent past.

On 5 December 2016, AEMO published an Issues Paper highlighting the key assumptions and settings used when calculating contribution factors, and identified practical options that may improve the current methodology. These options involved compromise between complexity, volatility, accuracy, and the utility of market signals provided. Submissions on the Issues Paper and views expressed in workshops reflected varying degrees of support for the options proposed, and a divergence of views on the optimal solutions to some of the issues.

During this Procedure consultation, AEMO initiated a separate body of work to better understand the degradation of frequency control performance in the NEM power system and any links to the causer pays framework, a concern that several stakeholders raised in response to the Issues Paper. As part of this work AEMO formed the Ancillary Service Technical Advisory Group (AS-TAG)[1], and engaged DigSILENT Pacific to investigate the degradation of frequency regulation in the normal operating frequency band.

In October 2017 AEMO published DigSILENT's report[2], which identified that the Procedure is perceived to be a factor in the degradation of frequency control. In July 2017 the AEMC initiated the Frequency Control Frameworks Review[3] (FCFR), which also considered the causes of degradation in frequency control and the role of regulation FCAS recovery. In July 2018 the AEMC published a final report which recommended that AEMO amend the Procedure as a priority to address disincentives for frequency control.

In light of the work by AEMO and the AEMC, AEMO's final determination is consistent with the Draft Report and Determination published on 6 April 2018. The substantive amendments to the Procedure at this stage are limited to those necessary to address the issues directly related to the degradation of frequency control. While this Final Report also sets out AEMO's conclusions on the remaining issues, the regulatory and systems changes required to implement the preferred solutions mean that Procedure amendments on those matters must be deferred. After this consultation, AEMO intends to progress a work program that will involve proposing changes to the NER, as well as further consultation to finalise the necessary Procedure changes.

AEMO has also taken the opportunity to rename, restructure and streamline the contents of the Procedure based on its objectives under the NER. While these changes are significant in number, they do not affect the process of determining contribution factors, only the clarity, accuracy and readability of the Procedure.

An amended Procedure is published with this Final Report. The amended Procedure will be effective for contribution factors applicable from 2 December 2018.

[1] Terms of reference and other material is located at: https://www.aemo.com.au/Stakeholder-Consultation/Industry-forums-and-working-groups/Other-meetings/Ancillary-Services-Technical-Advisory-Group

[2] Report is located at: https://www.aemo.com.au/-/media/Files/Stakeholder_Consultation/Working_Groups/Other_Meetings/ASTAG/371100-ETR1-Version-30-20170919-AEMO-Review-of-Frequency-Control.pdf

[3] Details of the review are published at: https://www.aemc.gov.au/markets-reviews-advice/frequency-control-frameworks-review

CONTENTS

1. STAKEHOLDER CONSULTATION PROCESS

As required by clause 3.15.6A(m) of the NER, AEMO is consulting on proposed amendments to the Causer Pays Procedure, to be renamed the Regulation FCAS Contribution Factor Procedure (Procedure), for the recovery of regulation Frequency Control Ancillary Service (FCAS) costs. This consultation was conducted under the Rules consultation process in rule 8.9 of the National Electricity Rules (NER).

AEMO's timeline for this consultation is outlined below.

Deliverable	Date
Notice of first stage consultation and Issues Paper published	5 December 2016
First stage submissions closed	24 February 2017
Draft Report & Notice of second stage consultation published	6 April 2018
Submissions due on Draft Report	4 May 2018
Final Report published	9 November 2018
Effective date for amended procedure	2 December 2018

All consultation documents, including AEMO's Issues Paper, Draft Report, Final Report, and submissions have been published in the stakeholder consultation section of AEMO's website, at: http://www.aemo.com.au/Stakeholder-Consultation/Consultations/Causer-Pays-Procedure-Consultation

1.1 First stage consultation

AEMO's Issues Paper described ten key issues relating to the current calculation of contribution factors, summarised in Section 2.3 of this Final Report.

Submissions in the first stage of consultation were received from:

1. Australian Energy Council (AEC)
2. AGL Energy
3. CS Energy
4. EnergyAustralia
5. Engie
6. ERM Power
7. Hydro Electric Corporation
8. Origin Energy
9. Uniting Communities
10. Infigen Energy (member of Wind Coalition)
11. Pacific Hydro (member of Wind Coalition)
12. Tilt Renewables (member of Wind Coalition)
13. Waterloo Wind Farm (member of Wind Coalition)
14. Woolnorth Wind Farm (member of Wind Coalition)
15. Consultant report from HARD software and Greenview Strategic Consulting[4]

In addition to the ten issues identified by AEMO, stakeholders also raised six issues AEMO considered to be material, and four other matters.

AEMO held two workshops with participants to discuss submissions:

[4] The consultant report was engaged by the members of the Wind Coalition, and provided as an attachment to each of the Wind Coalition submissions.

- Causer Pays Workshop #1, 20 March 2017
- Causer Pays Workshop #2, 21 April 2017

Minutes and actions from the workshops are published on the consultation page.

1.2 Second stage consultation

AEMO's Draft Report described 16 key issues relating to the current calculation of contribution factors, summarised in Section 2.5 of this Final Report.

Submissions in the second stage of consultation were received from:

1. Australian Energy Council (AEC)
2. CS Energy
3. ERM Power
4. Meridian Energy
5. Origin Energy
6. Tilt Renewables

In addition to the issues and other matters discussed in the Draft Report, some stakeholders also raised concerns about AEMO's decision to defer a number of proposed changes.

2. BACKGROUND

2.1 NER requirements

Clause 3.15.6A(k) of the NER requires AEMO to prepare and publish a procedure for determining contribution factors for regulation FCAS cost recovery, and sets out principles to be taken into account in preparing that procedure.

AEMO last reviewed the full Procedure with stakeholders in 2008. In March 2017, AEMO completed a consultation on the calculation of factors under clause 3.15.6A(j)(2) of the NER, to comply with an October 2016 decision by the Dispute Resolution Panel. That matter was run as a limited (single issue) consultation because of the tight timeframes associated with the Panel determination.

The matters considered in this consultation are broader and the outcomes from this consultation may ultimately revise or supersede the changes made through the March 2017 consultation.

2.2 Context for this consultation

2.2.1 Driver for review

In October and November 2015, multiple planned network outages in South Australia required regulation FCAS to be sourced locally, resulting in higher than average regulation FCAS costs. In December 2015, AEMO published a Market Event Report[5] analysing these market outcomes.

At the National Electricity Market Wholesale Consultative Forum held on 27 January 2016, AEMO summarised the methodology used to calculate contribution factors and stakeholders supported a review of the Procedure to ensure that it remained appropriate and effective.

In February 2016, a Market Participant initiated a dispute with AEMO under Rule 8.2 of the NER in relation to the FCAS recovery calculations in October and November 2015. To avoid prejudicing the outcomes of either process, AEMO suspended consultation on the Procedure until the disputed matter could be resolved by the Dispute Resolution Panel.

Following resolution of the dispute in October 2016, AEMO recommenced its process to undertake a comprehensive review of the Procedure.

2.2.2 Regulation FCAS and Contribution Factors

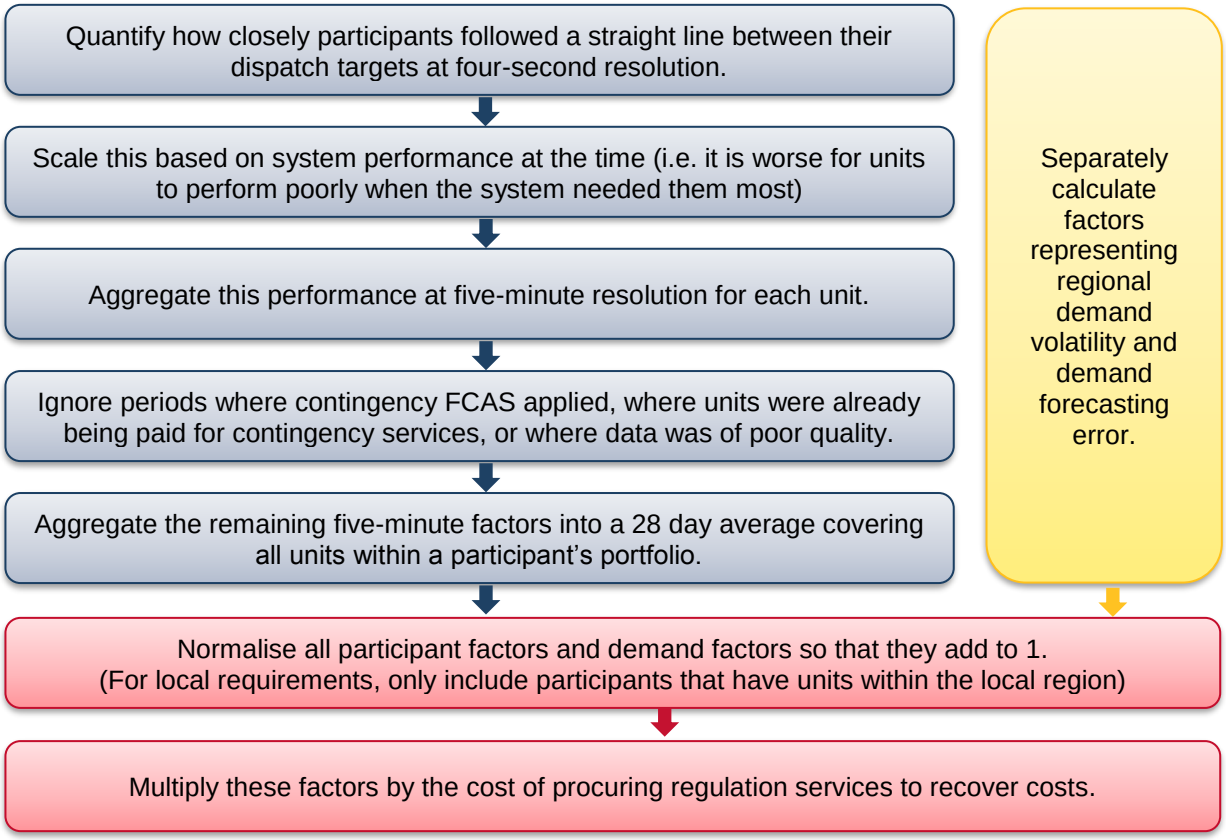
Regulation FCAS is used to correct small changes in power system frequency caused by changes in the supply-demand balance. Through a five-minute spot market, AEMO enables regulation FCAS to either raise or lower system frequency. Once enabled, these services are activated as needed every four seconds based on detected system frequency deviations.

The costs of procuring regulation FCAS are recovered from market participants on the basis of contribution factors that attribute costs to those market participants determined to have contributed to the need for frequency regulation in the recent past. This contribution is determined with respect to the performance of a market participant's facilities with four-second metering, assessed on how closely a facility follows their dispatch targets and whether any deviation is helpful or unhelpful to maintaining frequency. A residual contribution factor is then determined to cover the contribution of all load and generation without metering equipment capable of ascertaining individual four-second performance. The residual contribution is recovered from market customers in proportion to total customer energy.

Figure 1 summarises the current procedure for determining the contribution of market participants, and Appendix A provides a more detailed description of the approach.

[5] http://aemo.com.au/-/media/Files/PDF/NEM--Market-Event-Report--High-FCAS-Price-in-SA--October-and-November-2015.pdf

Figure 1 - Overview of current calculation process for market participant factors



2.3 Delay in consultation

The initial date proposed for publication of a final report and determination was June 2017. However during the initial stage of consultation fundamental issues were identified in relation to the interaction between the causer pays framework and NEM frequency control performance. Concerns were raised that the operation of the Procedure may discourage the provision of primary frequency control. AEMO considered that it would be prudent to clarify the impact of the Procedure on frequency control before proceeding with the consultation.

AEMO formed the Ancillary Service Technical Advisory Group (AS-TAG)[6] in May 2017 to assist AEMO in its analysis of current and future ancillary service arrangements. One of the first areas of focus for the AS-TAG was the factors contributing to frequency control issues. AEMO engaged DigSILENT Pacific to investigate the degradation in the performance of primary frequency regulation in the normal operating frequency band, and published a report from DigSILENT in October 2017[7].

The DigSILENT report found that the causer pays framework is perceived to be a factor in synchronous generation seeking to reduce governor response, and that this change to governor response is leading to degraded frequency control within the normal operating frequency band.

In July 2017, the AEMC initiated a review into the frequency control arrangements in the NEM, the Frequency Control Frameworks Review (FCFR)[8]. The review also considered the degradation in primary frequency control, and the appropriateness of the causer pays framework going forward. The AEMC considered a range of issues and options, some of which directly overlap with the matters under

[6] Terms of reference and other material is located at: https://www.aemo.com.au/Stakeholder-Consultation/Industry-forums-and-working-groups/Other-meetings/Ancillary-Services-Technical-Advisory-Group
[7] Report is located at: https://www.aemo.com.au/-/media/Files/Stakeholder_Consultation/Working_Groups/Other_Meetings/ASTAG/371100-ETR1-Version-30-20170919-AEMO-Review-of-Frequency-Control.pdf
[8] Details of the review are published at: https://www.aemc.gov.au/markets-reviews-advice/frequency-control-frameworks-review

consideration in this Procedure consultation. The FCFR was finalised in July 2018, and the AEMC made a number of recommendations with respect to causer pays:

- AEMO should finalise the Procedure consultation (this consultation) to remove disincentives for primary frequency control, and to publish FI closer to real time.
- Supports AEMO's continued refinement of the Procedure, specifically through actioning of the remaining issues considered by AEMO in this consultation.

Based on the DigSILENT findings and the outcomes of the Frameworks Review, AEMO is now finalising the current consultation process on the Procedure, focussing on short-term outcomes to address the governor response concerns. AEMO intends to progress the remaining areas in a subsequent work program, as discussed in Section 5.2.

2.4 Summary of options from Issues Paper

The Issues Paper identified ten issues, and discussed several options for each. In particular:

No.	Issue	AEMO preferred option outlined in Issues Paper
1	Calculation of causer pays factors when regulation FCAS requirements apply within a local region	Calculate separate causer pays factors for each region and region combination. These factors would be based on the performance of units within the region or region combination, would be published in advance, and the appropriate factor would be applied based on the global or local FCAS requirements in effect.
2	Ability for positive and negative performance to balance within a portfolio	Causer pays factors would allow participants to leverage positive performance from one unit against negative performance from another unit within their portfolio (status quo).
3	Ability for positive and negative performance to balance across the sample period	Causer pays factors would be netted across the sample period, allowing a more representative view of average participant performance (status quo).
4	The most appropriate sample period, notice period, and application period	Causer pays factors will be calculated and published each week, based on unit performance over a one week period[9].
5	The treatment of non-metered market generation	Non-metered generators will be apportioned part of the residual factor, to align with their contributions to this factor. Currently non-metered generators are not apportioned any causer pays factor.
6	Resolving cases where all factors are positive	Where all causer pays factors are positive, regulation FCAS costs will be allocated to market customers through the residual demand factor.
7	Treatment of facilities with changing registration status during the sample period	In cases where units are registered or deregistered partway through the sample period, their causer pays factors will only be based on data collected while the units were classified as registered.
8	Producing factors when significant periods of input data are deemed unreliable or inapplicable	Where more than 80% of the sample period contains unreliable data, or uses contingency FCAS, the previous set of good causer pays factors will apply.
9	The appropriate form and granularity of published causer pays datasets	In addition to the causer pays factors for each participant, AEMO will publish the five-minute causer pays contributions for each unit, for regional demand variance, and for demand forecasting error, to allow participants to validate and analyse their factors.

[9] Note that the preferred option in the Issues Paper is not a recommendation from this draft report and determination.

No.	Issue	AEMO preferred option outlined in Issues Paper
10	Consolidation and clean-up of causer pays documentation	AEMO to clarify the current Procedure, and to include relevant sections of the design specification document in the Procedure.

2.5 Summary of material issues from Draft Report

The Draft Report identified 16 material issues: the ten issues identified in the Issues Paper, and an additional six issues identified by stakeholders during the first round of consultation.

No.	Issue	AEMO draft recommendation
1	Calculation of contribution factors when regulation FCAS requirements apply within a local region	Local contribution factors be adopted by a process of pre-calculating seven sets of factors – however changes would not be implemented through the current consultation, as a rule change would be required.
2	Ability for positive and negative performance to balance within a portfolio	Portfolio netting be retained, but that netting should not occur across regions with respect to local contribution factors.
3	Ability for positive and negative performance to balance across the sample period	Netting across the sample period should be retained.
4	The most appropriate sample period, notice period, and application period	The existing sample period, notice period, and application period should be retained in the short term.
5	The treatment of non-metered market generation	Recovery arrangements should be made to allow the residual factor of regulated FCAS cost recovery to be apportioned to both market customers and non-metered market generators – however changes would not be implemented through the current consultation, as a rule change would be required.
6	Resolving cases where all individual contribution factors are positive	Procedure should be amended to allocate all regulation FCAS costs to the residual factor when all individual participant contribution factors are zero – however changes would not be implemented through the current consultation, as the issue was a secondary priority.
7	Treatment of facilities with changing registration status during the sample period	Procedure should be amended to detail the treatment of registration changes during the sample and application period – however changes would not be implemented through the current consultation, as the issue was a secondary priority.
8	Producing contribution factors when significant periods of input data are deemed unreliable or inapplicable	Procedure should be amended to include a minimum threshold for reliable SCADA data – however changes would not be implemented through the current consultation, as the issue was a secondary priority.
9	The appropriate form and granularity of published datasets	Additional datasets are published, including aggregated five-minute performance of each DUID – however changes would not be implemented through the current consultation, as the issue was a secondary priority.
10	Consolidation and clean-up of procedure documentation	Procedure should be amended to consolidate and clean-up documentation, and to improve the clarity, accuracy and readability of the document.
11	Suitability of SCADA data as a basis for determining performance	Existing process of using SCADA data should be retained, but with an amendment to consider small negative SCADA values for generating units as 0MW – however changes would not be implemented through the current consultation, as the issue was a secondary priority.

No.	Issue	AEMO draft recommendation
12	The profile that is assumed when determining deviations	The existing linear profile is retained.
13	Reference trajectory used to determine deviations	The existing target-to-target reference trajectory be retained, however further work be undertaken to understand the potential for alternative reference trajectories to lead to improved incentives for frequency performance.
14	Suitability of frequency indicator as weighting factor for determining performance	The existing Frequency Indicator (FI) be retained, but the Procedure amended to ignore 4-second samples in which the FI and system frequency are mismatched.
15	Different treatment of contingency events when determining performance	The Procedure be amended to allow notification of generator trips – however changes would not be implemented through the current consultation, as the issue was a secondary priority.
16	Aggregation of performance in the calculation of contribution factors	The existing average calculation for aggregation of performance be retained.

3. SUBMISSIONS ON DRAFT REPORT

AEMO received six submissions on the Draft Report. Stakeholders expressed further views on most of the 16 material issues discussed in the Draft Report. No new material issues were raised, but four of the submissions expressed concern about AEMO's decision to limit the scope of amendments to the Procedure determined in the current consultation.

AEMO acknowledges these concerns but, as explained in Section 2.3, it is appropriate to prioritise the changes necessary to remove any unintended incentive to reduce primary frequency control. These priority changes can be made without the need for rule changes or material alterations to related real-time or settlement systems, which several of the remaining proposals would require.

This does not mean that the work undertaken on those other issues by AEMO and participants over the course of this consultation has been wasted. On the contrary, AEMO has been able to identify a preferred outcome and a path to resolution for all remaining issues, and those that require further action will be progressed after this consultation is closed. Section 5.2 provides further details of the proposed program of work. AEMO notes the following:

- The impact and complexities of some of the identified issues are continuing to change as the power system and generation mix evolves. Further detailed analysis will need to be conducted, particularly with respect to alternative options, in order to adequately understand the case for change and the most effective solution.
- Three of the issues identified require changes to the NER in order to implement. AEMO considers it appropriate to progress with the drafting of Procedure changes (if required) once the AEMC's NER consultation process change is nearing finalisation.
- A number of issues require AEMO to make significant IT system changes to implement. These changes would delay the IT system changes necessary to remove any unintended incentive to reduce primary frequency control.

Of the material issues raised during the consultation:

- Three have been directly addressed with the implementation of changes in this consultation.
- Six have been determined with the existing arrangements being retained.
- Seven have a recommendation to be adopted, and a work program to implement these has been outlined in this Final Report. Of these, three issues will require a change to the NER, and four issues can be directly addressed with changes to the Procedure and AEMO systems.

A detailed summary of the issues raised by Consulted Persons in submissions, together with AEMO's response, is contained in Appendix B. A high-level discussion of the further submissions on the 16 material issues, with AEMO's conclusions and reasons on each, is set out in Section 0.

4. DISCUSSION OF MATERIAL ISSUES

4.1 Calculation of contribution factors when regulation FCAS requirements apply within a local region

4.1.1 Issue summary and submissions

Section 4.1.1 of the Draft Report outlines this issue, and provides a summary of submissions received during the first stage of consultation. AEMO's draft recommendation was that local contribution factors should be adopted.

Two additional submissions were made with respect to this issue during the second stage of consultation, both supporting the draft recommendation.

4.1.2 AEMO's assessment

Section 4.1.2 of the Draft Report outlines AEMO's assessment of this issue, in summary that AEMO considers local contribution factors would improve the effectiveness of the Procedure, by improving locational signals for regulation services. As part of implementing local contribution factors, AEMO considers it is necessary to address the calculation of the residual contribution factor. AEMO has identified that this will require a change to the NER.

4.1.3 AEMO's conclusion

AEMO recommends that local contribution factors be adopted by a process of pre-calculating seven sets of factors through a change to the NER and subsequent Procedure and system changes.

Based on the additional processes and timeframes required to progress these changes, AEMO has not amended the Procedure to implement local contribution factors as part of this consultation. AEMO's approach to progressing this change is outlined in Section 5.2.

4.2 Ability for positive and negative performance to balance within a portfolio

4.2.1 Issue summary and submissions

Section 4.2.1 of the Draft Report outlines this issue, and provides a summary of submissions received during the first stage of consultation. AEMO's draft recommendation was to retain portfolio netting, and that netting should not occur across regions with respect to local contribution factors.

CS Energy made a further submission during the second stage of consultation, providing further information on an alternative netting proposal ("CS Energy netting proposal") that was raised in their previous submission.

4.2.2 AEMO's assessment

Section 4.2.2 of the Draft Report outlines AEMO's assessment of this issue, in summary that AEMO considers portfolio netting promotes positive frequency performance for generators not enabled for regulation FCAS.

AEMO considers that there may be merit in the CS Energy netting proposal, and intends to undertake further work and consultation on this proposal.

4.2.3 AEMO's conclusion

For the purposes of this Final Report, portfolio netting will be retained in the Procedure, and netting will continue to occur across regions with respect to local contribution factors. As outlined in Section 4.1.3, AEMO has not amended the Procedure to implement local contribution factors as part of this consultation.

4.3 Ability for positive and negative performance to balance across the sample period

4.3.1 Issue summary and submissions

Section 4.3.1 of the Draft Report outlines this issue, and provides a summary of submissions received during the first stage of consultation. AEMO's draft recommendation was to retain netting across the sample period.

No further submissions were received on this issue during the second stage of consultation.

4.3.2 AEMO's assessment

Section 4.3.2 of the Draft Report outlines AEMO's assessment of this issue, in summary that AEMO considers netting across the sample period promotes positive frequency performance for generators not enabled for regulation FCAS.

4.3.3 AEMO's conclusion

AEMO's determination is that netting across the sample period be retained.

4.4 The most appropriate sample period, notice period, and application period

4.4.1 Issue summary and submissions

Section 4.4.1 of the Draft Report outlines this issue, and provides a summary of submissions received during the first stage of consultation. AEMO's draft recommendation was to retain the existing 28 day sample and application period.

ERM Power made a further submission in the second round of consultation, which did not support AEMO's draft recommendation. ERM Power considered that the sample period should be a maximum of 7 days, with a notice period of 2 or 3 days.

4.4.2 AEMO's assessment

Section 4.4.2 of the Draft Report outlines AEMO's assessment of this issue, in summary that AEMO considers that the existing sample and application period should be retained in the short term, and for real-time factors to be considered amongst related issues as part of the AEMC and AEMO's work program following the initial investigations of the FCFR.

During the FCFR, the AEMC considered a range of alternative options at a high level. This included arrangements based on real-time calculation of contribution factors. The discussion of these options and AEMO and stakeholder feedback may be found in Section B.1 of the AEMC's final FCFR report[10].

In summary, application and notice period must balance the competing objectives of:

[10] https://www.aemc.gov.au/sites/default/files/2018-07/Final%20report.pdf

- Cost recovery certainty – longer notice periods provide more time for participants to make operational decisions to manage their regulation FCAS costs.
- Applicability and accuracy – shorter notice periods allow contribution factors to be applied to periods that are closer to the sample period, and so may be more reflective of plant performance.

The FCFR described how while there could be advantages to aligning sample, notice and application periods closer to real-time, there were a range of possible disadvantages. Given that stakeholder feedback was mixed, the AEMC concluded that it was appropriate to retain the current notice period of 10 business days at this point in time.

4.4.3 AEMO's conclusion

AEMO's determination is that the existing sample and application period to be retained. However, AEMO recommends that the notice period could be reviewed as part of a rule change proposal, as outlined in Section 5.2.

4.5 The treatment of non-metered market generation

4.5.1 Issue summary and submissions

Section 4.5.1 of the Draft Report outlines this issue, and provides a summary of submissions received during the first stage of consultation. AEMO's draft recommendation was that the NER be changed to allow the residual factor of regulating FCAS cost recovery to be apportioned to both market customers and non-metered market generation.

ERM Power made a further submission with respect to this issue during the second stage of consultation, supporting the draft recommendation.

4.5.2 AEMO's assessment

Section 4.5.2 of the Draft Report outlines AEMO's assessment of this issue, in summary that AEMO considers that recovery from both market customers and non-metered market generation is a more efficient allocation of the costs for regulation FCAS. In order to implement this change, AEMO has identified that a change to the NER is required.

4.5.3 AEMO's conclusion

AEMO recommends that the NER be changed to allow the residual factor of regulated FCAS cost recovery to be apportioned to both market customers and non-metered market generation.

As additional processes and timeframes are required to progress these changes, AEMO has not amended the Procedure to implement changes to the treatment of non-metered market generation as part of this consultation. AEMO's approach to progressing this change is outlined in Section 5.2.

4.6 Resolving cases where all individual contribution factors are positive

4.6.1 Issue summary and submissions

Section 4.6.1 of the Draft Report outlines this issue, and provides a summary of submissions received during the first stage of consultation. AEMO's draft recommendation was that the Procedure be amended to allocate all regulation FCAS costs to the residual factor when all individual participant contribution factors are positive.

ERM Power made a further submission with respect to this issue during the second stage of consultation, supporting the draft recommendation.

4.6.2 AEMO's assessment

Section 4.6.2 of the Draft Report outlines AEMO's assessment of this issue, in summary that AEMO considers that allocating all regulation FCAS costs to the residual factor when all individual participant contribution factors are positive is consistent with the NER.

4.6.3 AEMO's conclusion

AEMO recommends that the Procedure be amended to allocate all regulation FCAS costs to the residual factor when all individual participant contribution factors are positive. However, because of the current priority of addressing frequency control, AEMO has not amended the Procedure to implement changes to address resolving cases where all participant contribution factors are positive. AEMO's approach to progressing this change is outlined in Section 5.2.

4.7 Treatment of facilities with changing registration status during the sample period

4.7.1 Issue summary and submissions

Section 4.7.1 of the Draft Report outlines this issue, and provides a summary of submissions received during the first stage of consultation. AEMO's draft recommendation was that the Procedure be amended to detail the treatment of registration changes during the sample and application period.

No further submissions were received on this issue during the second stage of consultation.

4.7.2 AEMO's assessment

Section 4.7.2 of the Draft Report outlines AEMO's assessment of this issue, in summary that AEMO considers that there is benefit in providing additional clarity to participants on how changes in registration during the sample and application period are handled.

4.7.3 AEMO's conclusion

AEMO recommends that the Procedure be amended to detail the treatment of registration changes during the sample and application period. However, because of the current priority of addressing frequency control, AEMO has not amended the Procedure to implement changes to address the treatment of registration changes. AEMO's approach to progressing this change is outlined in Section 5.2.

4.8 Producing contribution factors when significant periods of input data are deemed unreliable or inapplicable

4.8.1 Issue summary and submissions

Section 4.8.1 of the Draft Report outlines this issue, and provides a summary of submissions received during the first stage of consultation. AEMO's draft recommendation was that the Procedure be amended to include a minimum threshold for reliable SCADA data, and to use a recent set of good performance data if the threshold is not met.

ERM Power made a further submission with respect to this issue during the second stage of consultation, supporting the draft recommendation.

4.8.2 AEMO's assessment

Section 4.8.2 of the Draft Report outlines AEMO's assessment of this issue, in summary that AEMO considers that there is benefit in establishing a minimum threshold for reliable SCADA data, and to use a recent set of good performance data if the threshold is not met.

4.8.3 AEMO's conclusion

AEMO recommends that the Procedure be amended to include a minimum threshold for reliable SCADA data, and to use a recent set of good performance data if the threshold is not met. However, because of the current priority of addressing frequency control, AEMO has not amended the Procedure to implement changes to address unreliable data. AEMO's approach to progressing this change is outlined in Section 5.2.

4.9 The appropriate form and granularity of published datasets

4.9.1 Issue summary and submissions

Section 4.9.1 of the Draft Report outlines this issue, and provides a summary of submissions received during the first stage of consultation. AEMO's draft recommendation was that additional datasets be published, including the aggregated five-minute performance of each DUID.

Three additional submissions were made with respect to this issue during the second stage of consultation, both supporting the draft recommendation. Meridian Energy and Tilt Renewables also urged AEMO to publish additional datasets as a priority.

4.9.2 AEMO's assessment

Section 4.9.2 of the Draft Report outlines AEMO's assessment of this issue, in summary that AEMO considers that there is benefit in publishing additional datasets, to more easily analyse the performance of generators over time. AEMO also acknowledges that participants frequently request AEMO to provide aggregated 5-minute factors for their portfolio, which currently involves AEMO operational staff to manually provide this data.

As an interim option, AEMO intends to begin publishing the 5-minute performance data for all DUIDs as part of the monthly publication of contribution factors. In the longer term, AEMO expects to make system changes to automatically publish 5-minute performance data at regular intervals (for instance, every 5 minutes, or every day).

4.9.3 AEMO's conclusion

AEMO has concluded that additional datasets should be published, including the aggregated five-minute performance of each DUID. AEMO intends to begin publishing this data as soon as possible.

AEMO notes that no change to the Procedure is required for publication of data to occur.

4.10 Consolidation and clean-up of procedure documentation

4.10.1 Issue summary and submissions

Section 4.10.1 of the Draft Report outlines this issue, and provides a summary of submissions received during the first stage of consultation. AEMO's draft recommendation was that the Procedure be amended to as proposed.

Tilt Renewables made a further submission with respect to this issue during the second stage of consultation, supporting the draft recommendation.

4.10.2 AEMO's assessment

Section 4.10.2 of the Draft Report outlines AEMO's assessment of this issue, in summary that AEMO considers that there is benefit in having a Procedure which clearly sets out the calculations of contribution factors for both global and local requirements.

4.10.3 AEMO's conclusion

AEMO's determination is to amend the Procedure to:

- Remove detailed equations and specifications that are confusing and not required to understand the calculation methodology.
- Address anomalies and ambiguity that has come to light with market development over the past 10 years, making terminology more precise and consistent.
- Clarify the circumstances under which multiple dispatchable units shall be treated as a single unit for performance assessment, where they represent a single physical facility.
- Generally to improve clarity, accuracy and readability of the document.

As these amendments have resulted in a number of existing provisions being moved, expanded or in some cases removed, a mapping reference is provided in Section 5.1 of this Final Report to assist stakeholders.

4.11 Suitability of SCADA data as a basis of determining performance

4.11.1 Issue summary and submissions

Section 4.11.1 of the Draft Report outlines this issue, and provides a summary of submissions received during the first stage of consultation. AEMO's draft recommendation was that the existing process of using SCADA data be retained, however the Procedure should be amended to consider small negative SCADA values for generating units as 0MW.

ERM Power made a further submission with respect to this issue during the second stage of consultation, supporting the draft recommendation, but further raising concern about the potential for time delays to have impact on the accuracy of calculation.

4.11.2 AEMO's assessment

Section 4.11.2 of the Draft Report outlines AEMO's assessment of this issue, in summary that AEMO considers that SCADA data is an appropriate basis for determining performance, and that adequate arrangements are in place to manage the quality of this data.

AEMO acknowledges the concerns raised by participants in respect to time delays, and considers that concerns with SCADA delays for specific facilities be managed within the existing operational functions between AEMO, the participant, and relevant Network Service Providers.

4.11.3 AEMO's conclusion

AEMO recommends that the existing process of using SCADA data be retained, however the Procedure should be amended to consider small negative SCADA values for generating units as 0MW. However, because of the current priority of addressing frequency control, AEMO has not amended the Procedure to implement changes to address small negative SCADA values. AEMO's approach to progressing this change is outlined in Section 5.2.

4.12 The profile that is assumed when determining deviations

4.12.1 Issue summary and submissions

Section 4.12.1 of the Draft Report outlines this issue, and provides a summary of submissions received during the first stage of consultation. AEMO's draft recommendation was to retain the existing linear profile.

ERM Power made a further submission with respect to this issue during the second stage of consultation, outlining that it did not support retaining the existing linear profile.

4.12.2 AEMO's assessment

Section 4.12.2 of the Draft Report outlines AEMO's assessment of this issue, in summary that AEMO considers that the existing linear profile best reflects the operational requirements of the power system.

AEMO does not consider the ability for some plant to ramp faster that a linear ramp, or the potential for delays in receiving dispatch instructions, are an adequate basis to move away from assessing performance in the basis of a linear profile.

4.12.3 AEMO's conclusion

AEMO's determination is to retain the existing linear profile.

4.13 Reference trajectory used to determine deviations

4.13.1 Issue summary and submissions

Section 4.13.1 of the Draft Report outlines this issue, and provides a summary of submissions received during the first stage of consultation. AEMO's draft recommendation was to retain the existing target-target reference trajectory.

Two stakeholders made a further submission with respect to this issue during the second stage of consultation, outlining that they do not support retaining the existing reference trajectory.

4.13.2 AEMO's assessment

Section 4.13.2 of the Draft Report outlines AEMO's assessment of this issue, in summary that AEMO considers that an adequate case for change had not been identified.

However, AEMO has subsequently identified further challenges with the existing target-to-target reference trajectory, particularly with respect to emerging technologies like energy storage systems. AEMO now considers that a target-to-target reference trajectory may not be the most appropriate basis of determining deviations with respect to the changing generation mix.

AEMO also acknowledges that alternative reference trajectories (including an initial-to-target trajectory) may provide a stronger incentive for frequency control, and therefore further work should be undertaken to understand the relative merits.

4.13.3 AEMO's conclusion

For the purposes of this Final Report, the existing target-to-target reference trajectory will be retained in the Procedure, as an adequate case for change has not yet been established.

However, AEMO recognises that the changing generation mix may result in a stronger case for change, and that alternative reference trajectories may lead to improved incentives for frequency performance. AEMO therefore intends to undertake further work to investigate the merits of alternative reference trajectories. AEMO's approach to progressing this work is outlined in Section 5.2.

4.14 Suitability of frequency indicator as weighting factor for determining performance

4.14.1 Issue summary and submissions

Section 4.14.1 of the Draft Report outlines this issue, and provides a summary of submissions received during the first stage of consultation. AEMO's draft determination was that the Procedure be amended to provide that 4-second samples in which the FI and system frequency are mismatched will be ignored, and that AEMO will publish FI values close to real-time.

Several stakeholders made further submissions with respect to this issue during the second stage of consultation, specifically:

- ERM Power, Origin Energy and Tilt Renewables supported the proposed approach.
- CS Energy raised concerns that the proposed approach would be a retrograde step, because of the reduction in the size of the sample of data used to allocate costs. As an alternative, CS Energy suggested the AGC process should be amended to avoid secondary control requirement opposing system frequency.
- ERM Power considered local frequency to be a more preferable weighting measure in the medium term.
- Tilt Renewables took the view that the proposed approach would only be a short-term fix, and that a more appropriate measure is needed.

4.14.2 AEMO's assessment

Section 4.14.2 of the Draft Report outlines AEMO's assessment of this issue, in summary that AEMO's preferred approach is to implement changes to ignore 4-second samples where FI and system frequency are mismatched.

In considering stakeholder submissions and the objectives of the weighting factor, AEMO's assessment is:

- A change to the Procedure and AEMO's causer pays calculation to ignore 4-second samples where the FI and system frequency is the most appropriate way to address concerns with frequency control in the short-term.
- AEMO acknowledges that using FI as a weighting factor in the long term may not provide the best signal for frequency control, particularly in light of the changing power system and generation mix. Alternative options such as local frequency may provide clearer signals for frequency control, but changes to accommodate local frequency as a weighting factor are more significant.
- AEMO does not support changing the AGC process to avoid secondary control requirements opposing system frequency. AEMO considers that it is not appropriate to alter the control systems responsible for delivering power system security in order to avoid undesirable recovery outcomes.

4.14.3 AEMO's conclusion

AEMO's determination is to amend the Procedure to provide that 4-second samples in which the FI and system frequency are mismatched will be ignored, and that AEMO will publish FI values close to real-time.

In addition to amending the Procedure to address the current concerns with frequency control, AEMO will also be undertaking further detailed analysis on the future suitability of FI in light of the changing power system and generation mix, as outlined in Section 5.2.

4.15 Different treatment of contingency events when determining performance

4.15.1 Issue summary and submissions

Section 4.15.1 of the Draft Report outlines this issue, and provides a summary of submissions received during the first stage of consultation. AEMO's draft recommendation was that the Procedure be amended to allow for notification of generator trips to AEMO, and where an unforced outage has been confirmed that the corresponding dispatch interval is excluded from the contribution factor assessment.

ERM Power made a further submission with respect to this issue during the second stage of consultation, supporting the draft recommendation, however raising concern that changes have not been adopted in the current consultation.

4.15.2 AEMO's assessment

Section 4.15.2 of the Draft Report outlines AEMO's assessment of this issue, in summary that AEMO considers that there is benefit in allowing small generator trips to be excluded from the performance assessment, thereby removing any discrimination between generation (and also metered loads) of different sizes.

AEMO acknowledges that it would be preferable for changes to be implemented to address small generator trips immediately, however notes that further work is required to establish a process to enable this arrangement to work in practise. In light of the current priority of addressing frequency control, AEMO is intending to progress small generator trips as part of a subsequent Procedure consultation.

4.15.3 AEMO's conclusion

AEMO recommends that the Procedure be amended to allow for notification of generator trips to AEMO, and where an unforced outage has been confirmed that the corresponding dispatch interval is excluded from the contribution factor assessment. However, because of the current priority of addressing frequency control, AEMO has not amended the Procedure to implement changes to address generator trips. AEMO's approach to progressing this change is outlined in Section 5.2.

4.16 Aggregation of performance in the calculation of contribution factors

4.16.1 Issue summary and submissions

Section 4.16.1 of the Draft Report outlines this issue, and provides a summary of submissions received during the first stage of consultation. AEMO's draft recommendation was to retain the existing average calculation for aggregation of performance in the calculation of contribution factors.

No further submissions were received on this issue during the second stage of consultation.

4.16.2 AEMO's assessment

Section 4.16.2 of the Draft Report outlines AEMO's assessment of this issue, in summary that AEMO considers that the existing average calculation best reflects the frequency performance of metered and non-metered facilities, and that a change is not warranted.

4.16.3 AEMO's conclusion

AEMO's determination is to retain the existing average calculation for aggregation of performance in the calculation of contribution factors.

5. FINAL DETERMINATION

After considering the submissions received, AEMO's final determination is to amend the Procedure to:

- Adopt changes to address issue 14, as set out in Section 4.14. This is consistent with the findings from the DigSILENT report and the AEMC's FCFR, and AEMO's assessment of the need to address concerns with primary frequency control as a priority.
- Consolidate and clean-up the Procedure documentation to address issue 10, as set out in Section 4.10. These drafting changes are intended to streamline the documentation, ensure consistency with the purpose of the Procedure as specified in the NER, and improve the readability, accuracy and clarity of the Procedure.

AEMO will also commence publication of additional datasets to address issue 9, but this does not require a change to the Procedure.

In order to align with the current cycle of determination and publication of contribution factors, the amended Procedure will be applied in the determination of contribution factors effective from **2 December 2018**. Contribution factors that apply to periods on or after this date will be determined under the amended Procedure.

AEMO remains committed to improving the causer pays framework, and intends to progress the outstanding issues not addressed in the current consultation as part of an ongoing program of work, as set out in Section 5.2.

5.1 Amended procedure

The amended Procedure is published with this Final Report. The amended Procedure remains unchanged from the version published with the Draft Report, except for the following minor changes:

- Equations 16 and 17 in Table 9 have been amended to clarify the aggregation of performance factors in deriving area portfolio factors.
- Several minor corrections.

In addressing issue 10, the amended Procedure is significantly different to the previous Procedure, although the extent of material changes is relatively small. AEMO is therefore not able to provide a change-marked version of the amended Procedure. However to assist participants in understanding the scope and structure of the new document, the following table maps the provisions of the previous Procedure to the amended Procedure, and indicates any deleted material.

Previous Procedure Section	Previous Procedure section title or note	Amended Procedure Section	Amended Procedure section title or note
1	Introduction		
1.1	Purpose and scope	1.1	Purpose and scope
1.2	Definitions and interpretation	1.2	Definitions and interpretation
1.3	Related documents	1.3	Related documents
2	General principles	2	General principles
3	Calculation of contribution factors		
3.1	Process overview	3	Overview of the calculation process
3.2	Gather and store data		
3.2.1	Data sources and types	4.1	Gather 4-second data
-	Note: Not in existing Procedure	4.2	Estimating FIs and pre-processing
3.2.2	Process	5.1	Determine 4-second deviation values

Previous Procedure Section	Previous Procedure section title or note	Amended Procedure Section	Amended Procedure section title or note
3.3	Determine reference trajectories	5.1	Determine 4-second deviation values
3.4	Calculate and store deviations for all causer types		
3.4.1	Overview	5.1	Determine 4-second deviation values
3.4.2	Deviation components	-	Note: Section removed, as not relevant to Procedure
3.4.3	Determine the deviation components	5.1	Determine 4-second deviation values
3.4.4	Process to calculate the deviation components	5.1	Determine 4-second deviation values
3.4.5	Allocate the deviation components	5.1	Determine 4-second deviation values
3.5	Calculate and assign 5-minute factors		
3.5.1	Calculate 4-second performance measures	5.2	Scale deviations by the FI
3.5.2	Calculate 5-minute factors	6.1	Categorise and aggregate 4-second performance measures
3.5.3	Remove factors that have been affected by contingency events	6.2	Exclude periods affected by contingencies or bad SCADA
3.6	Settlement factor calculation	3	Overview of the calculation process
3.7	Allocate each 5-minute factor to a category	6.1	Categorise and aggregate 4-second performance measures
3.8(a) – (e)	Sum the 5-minute factors	6.3	Aggregate to 28-day factors for a unit or load
3.8(f) – (k)	Sum the 5-minute factors	7.2	Aggregate unit or load factors into area portfolio factors
3.8(l) – (o)	Sum the 5-minute factors	7.3	Calculate area totals for component types
3.8(p)	Sum the 5-minute factors	7.4	Calculate additional derived totals
3.9	Normalise factors across all regions	7.5	Normalise to produce area contribution factors
3.10	Aggregate contribution factors	7.3	Calculate area totals for component types
3.11	Process for positive contribution factors	7.3	Calculate area totals for component types
3,12	Determine monthly contribution factors (percentage attributable)	7.3	Calculate area totals for component types
3.13	Determine the residual	7.3	Calculate area totals for component types
3.14	Applying contribution factors in AEMO's settlement systems	-	Note: Section removed, as not relevant to Procedure
3.15	Allocate residual costs	-	Note: Section removed, as not relevant to Procedure
-	Note: Not in existing Procedure	7.6	Normalise to produce global requirement contribution factors
4	Published information	9	Published data
5	Dealing with regions when they become electrically separated		
5.1	Separation during sample period	8	Local requirement contribution factors
5.2	Contribution factors for periods of asynchronous operation		

Previous Procedure Section	Previous Procedure section title or note	Amended Procedure Section	Amended Procedure section title or note
5.2.1	Overview	8.1	General
5.2.2	Identifying relevant market participants	8.2	Identifying relevant market participants
5.2.3	Calculating CMPF, CRMPF and RAMPF values	8.3	Calculating CMPF, CRMPF and RAMPF values
5.2.4	Calculating individual market participant contribution factors for asynchronous operation	8.4	Individual and residual contribution factors
5.2.5	Calculating aggregate residual contribution factors for asynchronous operation	8.4	Individual and residual contribution factors
5.2.6	Estimating CMPF and CRMPF values	8.5	Estimating CMPF and CRMPF values

5.2 Subsequent work program

As discussed in Section **Error! Reference source not found.**, the scope of change implemented in this current consultation was reduced in order to focus on short-term issues arising from degradation in frequency control. AEMO remains committed to improving the causer pays framework, and intends to progress the outstanding issues that have not been implemented or ruled out as part of this consultation.

AEMO intends to progress the outstanding recommendations through a subsequent work program, which consists of the following activities:

Activity	Description (issues to be addressed)	Indicative timeframes
Develop and initiate NER change	A NER change will be developed to address the following issues: • Calculation of contribution factors when regulation FCAS requirements apply within a local region • Notice period • The treatment of non-metered market generation	Industry consultation: Q2 2019 Submit rule change: Q3 2019
Minor improvements to process, involving: • Procedure consultation	Conduct a Procedure consultation to address the following issues: • Resolving cases where all individual contribution factors are positive • Treatment of facilities with changing registration status during the sample period • Producing contribution factors when significant periods of input data are deemed unreliable or inapplicable • Different treatment of contingency events when determining performance	Commence Procedure consultation: Q2 2019 Finalise Procedure consultation: Q4 2019

Activity	Description (issues to be addressed)	Indicative timeframes
Detailed analysis of performance assessment	Conduct detailed analysis in light of changing generation mix to assess the impact and case for change for the following issues: • Reference trajectory used to determine deviations • Suitability of frequency indicator as weighting factor for determining performance	Commence analysis: Q2 2019 Industry consultation: Q3 2019
Implementation of rule change, involving: • Procedure Consultation • System changes	Implementation of changes (if rule is made) to address: • Calculation of contribution factors when regulation FCAS requirements apply within a local region • Notice period • The treatment of non-metered market generation	To be determined, based on timeframe of rule change.

This work program will also be undertaken in coordination with activities associated with outcomes of the FCFR. AEMO will continue to engage with stakeholders on the progress of improvements to causer pays through existing forums, including:

- Ancillary Services Technical Advisory Group
- Frequency Control Working Group
- NEM Wholesale Consultative Forum

APPENDIX A. GLOSSARY

Term or acronym	Meaning
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator Limited
AGC	Automatic generation control
Application period	The period over which calculated Market Participant Factors are used to allocate Regulation FCAS costs to individual participants.
Appropriate metering	Metering (of generating plant or load) sufficient to allow the individual contribution of the relevant Market Participant to the aggregate deviation in frequency of the power system to be addressed.
AS-TAG	Ancillary Service Technical Advisory Group
Asynchronous	Not connected to another part of the NEM transmission grid by an operational alternating current (AC) link.
AWEFS	Australian Wind Energy Forecasting System
Business Specification	The Efficient Dispatch and Localised Recovery of Regulation Services Business Specification as published by AEMO.
Causer pays factor	Same as MPF
Causer Pays Procedure or CPP	The "Causer Pays: Procedure for Determining Contribution Factors" prepared under clause 3.15.6A(k) of the NER.
CMPF	Constraint Market Participant Factor – the sum of the MPFs applicable to the recovery of the costs of a local requirement from Market Participants with appropriate metering in the region(s) where that requirement applies.
Contribution factor	Same as MPF
CPT	Cumulative Price Threshold
CRMPF	Constraint Residual Market Participant Factor – the RMPF applicable to the recovery of the costs of a local requirement from Market Customers without appropriate metering in the region(s) where that requirement applies.
DRP	Dispute Resolution Panel constituted for a decision under rule 8.2 of the NER.
DRP determination	Determination of the DRP (PRD Gray QC, GH Thorpe and LM McMillan) dated 3 October 2016 and Reasons dated 2 September 2016 in relation to a dispute between Origin Energy Electricity Ltd, AEMO, a group of South Australian wind farm operators, and others.
FCAS	Frequency control ancillary services
FCFR	The AEMC's Frequency Control Frameworks Review
FI	Frequency indicator, a parameter derived from AGC that indicates the requirement for Regulation FCAS.
Global, global requirement	Global ancillary service requirement as defined in the NER
Local, local requirement	Local ancillary service requirement as defined in the NER (this arises from a constraint imposed by AEMO that requires FCAS to be sourced from an identified NEM region or regions).
MPC	Market Price Cap

Term or acronym	Meaning
MPF	Market Participant Factor (contribution factor) for a Market Participant with appropriate metering (NER clause 3.15.6A(i)(1)).
Negative (unhelpful) performance	Refers to a frequency performance that results in a greater need for regulation FCAS.
NEM	National Electricity Market
NER	National Electricity Rules
Positive (helpful) performance	Refers to frequency performance that reduces the need for regulation FCAS.
Regulation FCAS	A regulating raise service or regulating lower service as defined in the NER.
Residual factor or RMPF	The residual factor represents frequency deviations not caused by facilities with adequate metering. This component of regulation FCAS costs are currently recovered from market customers in proportion to their energy.
SA	The South Australia region of the NEM.
Sample period	The period over which 4-second performance data is collected and processed to calculate Market Participant Factors.
SCADA	Supervisory Control and Data Acquisition
Wind Coalition	Group of Registered Participants, consisting of Infigen Energy, Pacific Hydro, Tilt Renewables, Waterloo Wind Farm, and Woolnorth Wind Farm Holdings

APPENDIX B. SUMMARY OF SUBMISSIONS AND AEMO RESPONSES

No.	Name	Issue	AEMO response
Issue 1: Calculation of contribution factors when regulation FCAS requirements apply within a local region			
1.	ERM Power	Supports the recommended approach to calculate and publish separate local factors.	This is consistent with AEMO's recommendation, as set out in Section 4.1.
2.	Origin Energy	Believes the recommendation to implement local factors should be implemented as a priority, and that preliminary work on establishing a Rule change should begin immediately.	AEMO agrees that implementation of local factors should be progressed, and Section 4.1 outlines AEMO's approach and timing to achieve this.
Issue 2: Ability for positive and negative performance to balance within a portfolio			
3.	CS Energy	CS Energy provided further information on an alternative netting proposal ("CS Energy netting proposal") that was raised in their previous submission.	AEMO thanks CS Energy for providing further information on an alternative netting proposal, and intends to work further on assessing the merits of this arrangement.
Issue 4: The most appropriate sample period, notice period, and application period			
4.	ERM Power	Does not support the recommended approach to retain the existing sample, notice and application period. ERM Power considers that the sample period should be a maximum of 7 days, with a 2 or 3 day notice period.	AEMO does not consider there is merit in changing the sample and application period in the short term, however acknowledges that further consideration should be given as part of alternative arrangements, such as those outlined in the AEMC's FCFR. AEMO does not have any concerns with changing the notice period, but notes that this requires a rule change to amend.
Issue 5: The treatment of non-metered market generation			
5.	ERM Power	Supports the recommended approach to include non-metered market generation in the recovery.	This is consistent with AEMO's recommendation, as set out in Section 4.5.
Issue 6: Resolving cases where all individual contribution factors are positive			
6.	ERM Power	Supports the recommended approach to allocate costs to the residual when no negative performance is identified.	This is consistent with AEMO's recommendation, as set out in Section 4.6.
Issue 8: Producing contribution factors when significant periods of input data are deemed unreliable or inapplicable			
7.	ERM Power	Supports the recommended approach to identify a minimum threshold for reliable SCADA data, and to use recent good performance data if the threshold is not met.	This is consistent with AEMO's recommendation, as set out in Section 4.8.

No.	Name	Issue	AEMO response
Issue 9: The appropriate form and granularity of published datasets			
8.	ERM Power	Supports the recommended approach to publish 5-minute performance factors.	This is consistent with AEMO's recommendation, as set out in Section 4.9.
9.	Meridian Energy	Expectation that the recommendation should be implemented immediately, as it was not linked or reliant upon the current priority of addressing primary frequency control.	AEMO agrees that publication should not be delayed, and Section 4.9 outlines AEMO's approach to publication of additional datasets.
10.	Tilt Renewables	Urges AEMO to include the publication of 5-minute performance data as part of the current consultation.	AEMO agrees that publication should not be delayed, and Section 4.9 outlines AEMO's approach to publication of additional datasets.
Issue 10: Consolidation and clean-up of procedure documentation			
11.	Tilt Renewables	Supports the re-write of the Procedure, noting it is much clearer, particularly in the explanation of the FI.	This is consistent with AEMO's recommendation, as set out in Section 4.10.
Issue 11: Suitability of SCADA data as a basis for determining performance			
12.	ERM Power	Supports the recommended approach to treat small negative SCADA values as 0MW. However remains concerned that there is the potential for time delay in SCADA time transmission, which can impact on the accuracy of calculation.	AEMO considers that any further issues with respect to delays in SCADA transmission should be managed within the existing operational functions between AEMO, the participant, and relevant Network Service Providers – as set out in Section 4.11.
Issue 12: The profile that is assumed when determining deviations			
13.	ERM Power	Does not support retaining the existing linear profile, as it does not reflect the ability for some plant to ramp faster across the dispatch interval. Also considers that delays of 15 to 20 seconds in receiving dispatch instructions may also penalise facilities under the current Procedure.	AEMO does not agree, and considers that retaining the existing linear profile best reflects the operational requirements of the power system – as set out in Section 4.12.
Issue 13: Reference trajectory used to determine deviations			
14.	ERM Power	Does not support retaining the existing target-to-target trajectory, and urges AEMO to consider alternative reference trajectories.	AEMO acknowledges that alternative trajectories have the potential to improve incentives for frequency control, and Section 4.13 outlines AEMO's approach to progressing this work.
15.	Meridian Energy	Believes that the reference trajectory has a clear and immediate impact on the Procedure, and should be addressed by AEMO without delay.	AEMO acknowledges that several stakeholders consider the reference trajectory to be an important issue, and Section 4.13 outlines AEMO's approach to progressing this work.

No.	Name	Issue	AEMO response
Issue 14: Suitability of frequency indicator as weighting factor for determining performance			
16.	CS Energy	Concerned that the proposed approach effectively reduces the sample of data used to allocate costs, and that this is a retrograde step. CS Energy suggested an alternative approach would be to amend the AGC process to avoid secondary control requirement opposing system frequency.	AEMO does not consider the expected reduction in sample size to have a material impact on the integrity of the process, and does not agree with changing the AGC process to avoid undesirable recovery outcomes.
17.	ERM Power	Supports the recommendation to disregard 4 second samples where the FI and system frequency are mismatched. However considers that the local frequency is a more preferable weighting measure in the medium term.	This is consistent with AEMO's recommendation, as set out in Section 4.14.
18.	Origin Energy	Supports the recommendation to disregard 4 second samples where the FI and system frequency are mismatched.	This is consistent with AEMO's recommendation, as set out in Section 4.14.
19.	Tilt Renewables	Considers that the recommended approach may reduce disincentives to primary frequency control provision, but is only a short-term fix. Tilt Renewables believes that the weighting factor should consistently represent the frequency control needs of the power system, and a more appropriate measure is needed.	AEMO acknowledges that the changes implemented may not be the most appropriate long-term approach, as set out in Section 4.14.
Issue 15: Different treatment of contingency events when determining performance			
20.	ERM Power	Supports the recommendation to allow contingency events to be notified to AEMO. However expressed disappointment that AEMO had determined to not implement this change during the current consultation.	This is consistent with AEMO's recommendation, as set out in Section 4.15. AEMO acknowledges the concern with not implementing the change in the current consultation, as discussed in Section **Error! Reference source not found.**.
New Issue: Limited scope of changes implemented in current consultation			
21.	Australian Energy Council	The AEC believes the draft report and determination is inadequate, particularly with respect to the limited number of material issues that have been addressed. The AEC considers that 12 of the 16 material issues identified have been abandoned as a low priority and will not be implemented.	AEMO acknowledges the concern with respect to the limited changes being made to the Procedure in the current consultation, but does not agree that the remaining material issues have been abandoned. AEMO has proposed an approach and program to progress the remaining changes recommended in this Final Report.
22.	ERM Power	Disappointing and counterproductive outcome that a number of worthwhile changes have not been implemented as part of the current consultation.	AEMO acknowledges the concern, but considers that implementation of changes to address degradation of frequency control is an appropriate priority in light of the findings from the DigSILENT report and the AEMC's FCFR. Most of the remaining

No.	Name	Issue	AEMO response
			recommended changes require significant further processes, but AEMO intends to progress them.
23.	Meridian Energy	Concerned regarding the approach to not amend the Procedure or propose the necessary rule changes until such time as the Frequency Control Frameworks Review process is complete.	AEMO acknowledges the concern, but notes that the FCFR work is now complete and that AEMO will be progressing further improvements to the causer pays framework.
24.	Origin Energy	Consultation on the Procedure has been developed after extensive work with industry over several years, and additional consultation on issues should be conducted in an expedited manner.	AEMO agrees that a significant amount of work has been invested, and this has enabled AEMO to make recommendations on proceeding with a number of improvements. The Final Report outlines AEMO's approach to progressing these.

ATTACHMENT 1 – REGULATION FCAS CONTRIBUTION FACTOR PROCEDURE

Refer to separate document published with this Final Report.