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Australian Energy Market Commission

## **RULE DETERMINATION**

# NATIONAL ELECTRICITY AMENDMENT (MONITORING AND REPORTING ON FREQUENCY CONTROL FRAMEWORK) RULE 2019

### **PROponents**

Australian Energy Market Operator  
Australian Energy Regulator

25 JULY 2019

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# RULE

## INQUIRIES

Australian Energy Market Commission  
PO Box A2449  
Sydney South NSW 1235

E [aemc@aemc.gov.au](mailto:aemc@aemc.gov.au)  
T (02) 8296 7800  
F (02) 8296 7899

Reference: ERC0273

## CITATION

AEMC, Monitoring and reporting on frequency control framework, Rule determination, 25 July 2019

## ABOUT THE AEMC

The AEMC reports to the Council of Australian Governments (COAG) through the COAG Energy Council. We have two functions. We make and amend the national electricity, gas and energy retail rules and conduct independent reviews for the COAG Energy Council.

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## SUMMARY

- 1 The Australian Energy Market Commission (AEMC or Commission) has made a final rule that requires AEMO to report weekly and quarterly on the frequency performance of the power system and the AER to report quarterly on market ancillary services (commonly referred to as frequency control ancillary services, or FCAS) markets.
- 2 The key features of the final rule are:
  - a requirement for the AER to report quarterly on each market ancillary service (i.e. each type of FCAS), as well as provide an analysis of key trends and outcomes in the markets for market ancillary services
  - a requirement for AEMO to report weekly on key frequency performance metrics as well as on the amount of regulation services (i.e. regulation FCAS) that were dispatched and proportion of amount dispatched that was used
  - a requirement for AEMO to report quarterly on frequency performance.
- 3 The Commission considers that the final rule improves the transparency and consistency of information provided to the market in relation to frequency performance and market outcomes for market ancillary services. This should help market participants make efficient investment and operational decisions. This is especially important given the degradation of frequency performance in the NEM that is being observed.
- 4 This final rule has been made in response to two rule change requests submitted by AEMO and the AER in May 2019 and February 2019 respectively, to action the AEMC's recommendations made in its final report of the frequency control frameworks review.
- 5 The two rule change requests were subsequently consolidated. The Commission used the expedited process for this rule change as it considered it to be non-controversial. The final rule commences on 1 January 2020.

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# 1 AEMO AND AER RULE CHANGE REQUESTS

## 1.1 The rule change request

On 5 February 2019, the Australian Energy Regulator (AER) submitted the *Monitoring and reporting of FCAS market performance* rule change request to the Australian Energy Market Commission (AEMC or Commission) seeking to place reporting requirements on the AER in relation to outcomes in markets for ancillary services.<sup>1</sup>

On 8 May 2019, the Australian Energy Market Operator (AEMO) submitted the *Monitoring and reporting on frequency control framework* rule change request to the Commission seeking to establish ongoing reporting requirements on AEMO in relation to frequency performance and frequency control performance.

Both rule change requests are consistent with recommendations made by the Commission in its *Frequency control frameworks review* final report, published in July 2018.<sup>2</sup> Both rule changes sought to amend provisions of the National Electricity Rules (rules or NER) to improve information transparency around frequency control issues and existing frequency control markets.

Given that both rule change requests relate to frequency monitoring and reporting, the Commission determined under s.93 of the National Electricity Law (NEL), that the rule change requests be dealt with together and treated as one request. Both rule changes were progressed under the title and project code Monitoring and reporting on frequency control framework (ERC0273).

The AEMC considered the consolidated rule change as being non-controversial, and as a result, it was assessed under an expedited rule change process.

## 1.2 Relevant background

The AEMC commenced the *Frequency control frameworks* review in July 2017. The purpose of the review was to explore and provide advice to the COAG Energy Council and market participants on changes to the market and regulatory frameworks that may be required to meet the challenges in maintaining effective frequency control arising from, and harness the opportunities presented by, the changing generating mix. An overview of the frequency control framework is in appendix c.

Based on stakeholder input and the AEMC's own analysis, in the final report published in July 2018, the AEMC concluded that there is a lack of transparency regarding:

- the general performance of ancillary service markets
- the frequency performance of the power system under normal operating conditions.

<sup>1</sup> Throughout this final determination, the Commission uses the term "market ancillary services", which is a defined term in the NER. As these market services relate to frequency, they are commonly referred to as frequency control ancillary services (FCAS).

<sup>2</sup> For more information, see: <https://www.aemc.gov.au/markets-reviews-advice/frequency-control-frameworks-review>.

The Frequency control frameworks review explored ways in which the existing frequency reporting arrangements could be adjusted to enhance the operation of the frequency control framework. These were subject to extensive consultation with stakeholders.<sup>3</sup>

Among other recommendations, the final report proposed a number of changes to the NER to promote transparency of the frequency performance of the power system and the competitiveness of ancillary service markets for frequency. The AEMC recommended amending the NER to require:

- AEMO to publish:
  - weekly reports on frequency outcomes with respect to the frequency operating standard<sup>4</sup>
  - quarterly reports providing AEMO's analysis of key trends and specific events
- the AER to report quarterly on the performance of market ancillary services markets, specifically:
  - the total costs of FCAS
  - volumes (both enabled and utilised)
  - prices
  - number of participants
  - the technology types of those participants
  - commentary on key trends
  - an assessment of whether the market ancillary services markets are effective.

Stakeholders demonstrated strong support for such reporting requirements (including for more frequent and detailed reporting).

## 1.3

## Current arrangements

### 1.3.1

### Reporting on FCAS market performance

The existing reporting requirements in the NER primarily relate to individual events. Specifically, the AER must publish a report when market ancillary service prices at a regional reference node significantly exceed the spot price for energy and when market ancillary service prices exceed \$5,000 for a number of trading intervals in that period.<sup>5</sup>

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3 The AEMC established a Technical Working Group to provide technical advice to the AEMC and assist with the development of recommendations for the review. The group comprised representatives from the AER and AEMO, consumer groups, large energy users, conventional generators, renewable energy generators, retailers, energy service providers, and transmission and distribution network service providers. The AEMC also established a Reference Group comprising senior representatives of the AEMC, AEMO, the AER and the Senior Committee of Officials was established to provide high-level input and strategic advice to the AEMC throughout the course of the review.

4 The frequency operating standard defines the range of allowable frequencies for the electricity power system under different conditions, including normal operation and following contingencies. Generator, network and end-user equipment must be capable of operating within the range of frequencies defined by the frequency operating standard, while AEMO is responsible for maintaining the frequency within the ranges defined by the standard.

5 See clause 3.13.7(e) of the NER. For more information, see: [https://www.aer.gov.au/wholesale-markets/market-performance?f%5B0%5D=field\\_accr\\_aer\\_report\\_type%3A310](https://www.aer.gov.au/wholesale-markets/market-performance?f%5B0%5D=field_accr_aer_report_type%3A310)

The AER has an obligation under the NEL to monitor and report on the performance of wholesale electricity markets.<sup>6</sup> In December 2018, the AER released its inaugural report where, among other things, it assessed competition in the FCAS market.<sup>7</sup> The NEL only requires public reporting on the results of the performance of the AER's wholesale market monitoring functions at least once every two years.<sup>8</sup> It does not specifically require reporting on the performance of the ancillary service markets.

The AER also produces Electricity weekly reports. As part of these reports, the AER publishes ancillary service costs by service type. However, these reports are not published regularly given their focus on significant price variations between forecast and actual prices (monitoring whether any such significant variation has occurred is the AER's obligation under the NER<sup>9</sup>). The most recent AER's Electricity weekly report was published in January 2019.<sup>10</sup>

The statistics section of the AER's website also contains weekly ancillary services costs data since January 2009.<sup>11</sup>

### 1.3.2

#### Reporting on frequency performance of the power system

AEMO is required to report on frequency in relation to "reviewable operating incidents", which include incidents where the frequency of the power system is outside limits specified in the power system security standards.<sup>12</sup> The NER do not contain a requirement for AEMO to report regularly on power system frequency performance during normal operation.

Currently, AEMO produces frequency monitoring reports voluntarily on a periodic basis, with the most recent reports being published in December 2016 and August 2017.<sup>13</sup> These reports provide a summary of emerging trends in power system frequency performance in the NEM over a three-year period. Specifically, they include:

- monthly averages for the percentage of time that the power system frequency is within the normal operating frequency band over a 30-day period for the mainland national electricity market and Tasmania
- the number of exceedance events on a monthly basis for each of the bands in the frequency operating standard.

The AEMO website also contains an archive of frequency and time error monitoring reports.<sup>14</sup> This includes monthly reports from January 2011 through to June 2013, quarterly reports from the third quarter of 2013 through to the third quarter of 2014, reports for each quarter of 2017 (published in March 2018) and 2018. The most recent reports focus on:

6 The obligation was introduced in 2016 under Part 3, Division 1A of the NEL.

7 For more information, see: <https://www.aer.gov.au/wholesale-markets/market-performance/aer-wholesale-electricity-market-performance-report-2018>

8 See section 18C(2)(a) of the NEL.

9 Clause 3.13.7(a) of the NER.

10 For more information, see: <https://www.aer.gov.au/taxonomy/term/324?page=2>

11 For more information, see: <https://www.aer.gov.au/wholesale-markets/wholesale-statistics/weekly-ancillary-services-costs>

12 See clause 4.8.15(a)(iii) of the NER.

13 For more information, see: <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/Ancillary-services/Frequency-and-time-error-monitoring>

14 Ibid.

- whether the one per cent requirement of the frequency operating standard was met<sup>15</sup>
- events that resulted in excursions outside the normal operating frequency band
- events where the requirements of the frequency operating standard were not met (e.g. load or generation events)
- whether the requirements of the frequency operating standard with respect to accumulated time error were met
- area control error<sup>16</sup>
- planned actions to improve frequency control performance.

### 1.3.3

#### Related work

The AEMC's Frequency control frameworks review final report details the Frequency control work plan that sets out actions the Commission, AEMO and the AER will take to support the stable and secure operation of the power system in relation to frequency control. More transparent and regular reporting of frequency performance is part of this collaborative work plan. The work plan also includes new rules and operating techniques, in particular:

- AEMO-led trials and other actions to determine how frequency performance can be improved in the short term and to facilitate the integration of new business models like virtual power plants.
- Detailed consideration of ways to procure essential frequency services in the longer term in a way that recognises the capabilities of all potential technologies and service providers.
- New rules to enable new technologies and service providers to provide frequency control services.

An overview of the status of the Frequency control work plan could be found at the AEMC's website.<sup>17</sup>

## 1.4

### Rationale for the rule change request

#### 1.4.1

##### Reporting on ancillary service market outcomes by the AER

The AER proposes reporting requirements in relation to ancillary service market outcomes.

In its rule change request, the AER notes FCAS market dynamics have changed recently due to the entry of new providers, and changes in the types of technologies providing FCAS. Further, significant trends in the market can now manifest over comparatively short periods.<sup>18</sup> According to the AER, it is important to analyse the markets looking across a range of timeframes in order to draw robust conclusions about market outcomes.<sup>19</sup> The AER is of the

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15 A requirement of the frequency operating standard is that frequency must not exceed the normal operating frequency band for more than one per cent of the time over a 30-day period (excluding contingency events).

16 Automatic generation control system (AGC) estimates of the additional electrical power required to be produced or consumed to correct a given power system frequency deviation.

17 For more information, see: <https://www.aemc.gov.au/our-work/our-forward-looking-work-program/system-security/frequency-control-work-plan>

18 AER, Request for change to the National Electricity Rules - monitoring and reporting of FCAS market performance, February 2019, p. 7.



view that there is a gap between weekly FCAS costs data reporting, which currently occurs, and longer term trends in effectiveness of competition reporting, which is not an existing requirement.<sup>20</sup>

#### 1.4.2 Reporting on frequency performance of the power system by AEMO

AEMO proposes introducing reporting requirements in relation to frequency performance (of the system as a whole as against the frequency operating standard) and frequency control performance.

In its rule change request, AEMO notes the behaviour of system frequency in the NEM is of increasing concern, as has been reported in various reviews and analysis. It notes that a significant flattening of power system frequency can be seen over time, especially in the last four years, indicating that the power system is no longer being held near the nominal 50 Hz.<sup>21</sup>

As part of a broad range of initiatives to address unsatisfactory frequency performance, AEMO recognises the importance of information transparency and timeliness. Currently, there are no obligations in the NER for AEMO to report on frequency performance.<sup>22</sup>

### 1.5 Solution proposed in the rule change request

AEMO and the AER propose the following amendments to the NER to address issues identified above.

#### 1.5.1 Reporting on FCAS market outcomes

The AER proposes reporting requirements on it in relation to FCAS market outcomes, specifically to publish (on a quarterly basis) reporting on:<sup>23</sup>

- the total costs of FCAS
- volumes (both enabled and utilised), prices, number of participants for each of the eight FCAS markets and the technology types of those participants
- commentary on key trends.

These reports should be published by the AER as the AER considers that reporting on FCAS market outcomes aligns well with its formal responsibility under the NEL to publish performance reports into the operation of the markets, retailer performance and the performance of the network businesses.<sup>24</sup>

The AER considers that one of the benefits of having a formal reporting requirement in the rules in relation to the FCAS markets would be to ensure that stakeholders and policy-makers

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19 Ibid, p. 5.

20 Ibid.

21 AEMO, Electricity rule change proposal - monitoring and reporting of frequency and frequency control performance, May 2019, p. 2.

22 Ibid p.3.

23 AER, Request for change to the National Electricity Rules - monitoring and reporting of FCAS market performance, February 2019, p.4.

24 Ibid.

have access to FCAS market data on an ongoing basis.<sup>25</sup> Specifically, stakeholders would have ongoing access to data about costs to meet frequency requirements, and, given that the AER would report on costs and prices on an ongoing basis, stakeholders would have access to trend information that may be useful in making investment and operational decisions. Access to FCAS cost and price information would also help inform appropriate policy.<sup>26</sup>

The AER also considers that benefits of providing the information required by this rule change proposal outweigh the costs involved, given that the AER already reports on most of the information required.<sup>27</sup>

### 1.5.2

#### Reporting on frequency performance of the power system

AEMO proposes specific obligations to report on frequency and frequency control performance. The obligations proposed are for AEMO to publish weekly reports on:<sup>28</sup>

- frequency performance against the following measures specified in the frequency operating standard:
  - the proportion of time spent inside the normal operating frequency band
  - the recovery times where frequency has left the normal operating frequency band
  - the time error requirements.
- the regulating FCAS dispatched by AEMO per region
- measures indicating the average utilisation of the regulating FCAS dispatched.

AEMO also proposes an obligation to publish quarterly reports on:<sup>29</sup>

- the impact of any actions taken by AEMO to improve frequency control outcomes
- AEMO's assessment of achievement of the frequency operating standard
- the rate of change of system frequency associated with the largest frequency deviation in each month
- automatic generation control system (AGC) estimates of the additional electrical power required to be produced or consumed to correct a given power system frequency deviation (commonly referred to as "area control error")
- a list of any reviewable operating incidents that affected power system frequency.

AEMO considers that there are two key benefits to formalising reporting requirements in the NER in relation to frequency reporting:<sup>30</sup>

- to ensure all stakeholders have current, standardised access to relevant data that is readily available on an ongoing basis. The new information will give stakeholders the

<sup>25</sup> AER, Request for change to the National Electricity Rules - monitoring and reporting of FCAS market performance, February 2019, p.7.

<sup>26</sup> Ibid, p.8.

<sup>27</sup> Ibid, p.7.

<sup>28</sup> AEMO, Electricity rule change proposal - monitoring and reporting of frequency and frequency control performance, May 2019, p. 8.

<sup>29</sup> Ibid.

<sup>30</sup> Ibid, p.7.

ability to collect, store and trend information that will assist in making investment and operational decisions.

- to provide certainty to stakeholders regarding the ongoing availability of this reporting.

AEMO considers that the benefits of the rule change proposal outweigh the likely costs involved. AEMO expects costs to be small, but not negligible. In particular, AEMO will need to undertake further development of some supporting analytical systems. These are one-off costs, estimated at around \$100,000 to \$200,000.<sup>31</sup> AEMO states that these costs are not solely related to this reporting obligation; implementing such a system/process is also expected to deliver efficiency benefits for existing reporting processes.<sup>32</sup>

## 1.6 The rule making process

On 30 May 2019, the Commission published a notice advising of its commencement of the rule making process and consultation in respect of the rule change request.<sup>33</sup> A consultation paper identifying specific issues for consultation was also published. Submissions closed on 27 June 2019.

The Commission considered that the rule change request was a request for a non-controversial rule as defined in s.87 of the NEL. Accordingly, the Commission commenced an expedited rule change process, subject to any written requests not to do so. The closing date for receipt of written requests was 13 June 2019.

No requests to not carry out an expedited rule change process were received. Accordingly, the rule change request was considered under an expedited process.<sup>34</sup>

The Commission received nine submissions. Issues that are not discussed in the body of this document have been summarised and responded to in appendix a.

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31 Ibid, p.7.

32 Ibid.

33 This notice was published under s.95 of the National Electricity Law (NEL).

34 Section 96 of the NEL.

## 2 FINAL RULE DETERMINATION

### 2.1 The Commission's final rule determination

The Commission's final rule determination is to make the final rule largely as proposed by the AER and AEMO. The final rule places an obligation on AEMO and the AER to report on frequency performance and ancillary service market outcomes, respectively, and includes some consequential changes to remove duplication of reporting obligations.

Specifically, the final rule requires the AER to report quarterly on:

- the following information for each type of market ancillary service:<sup>35</sup>
  - the total costs paid to ancillary service providers for the provision of the market ancillary service for each region
  - the total quantity of the market ancillary service that was dispatched by AEMO in each region
  - the lowest, highest and average ancillary service price for each region for the market ancillary service
  - the number and types of ancillary service providers.
- the AER's analysis of key trends and outcomes in the markets for market ancillary services, and any other relevant information the AER considers necessary or convenient.

The final rule requires AEMO to report weekly on the following with respect to frequency performance outcomes:<sup>36</sup>

- an indicative comparison of power system frequency performance against the following measures specified in the frequency operating standard:
  - the proportion of time that the frequency of the power system was inside of the normal operating frequency band
  - the recovery times to return to the normal operating frequency band where frequency left the normal operating frequency band;
  - the time error requirements.
- the regulation services that were dispatched by AEMO in each region
- measures indicating the proportion of dispatched regulation services that were used by AEMO.

The final rule also requires AEMO to report quarterly with respect to power system frequency:<sup>37</sup>

- where applicable, AEMO's assessment of the impact of any actions taken by AEMO to improve power system frequency control outcomes

<sup>35</sup> See clause 3.112A(b) of the final rule.

<sup>36</sup> See clause 4.8.16(a) of the final rule.

<sup>37</sup> See clause 4.8.16(b) of the final rule.

- AEMO's assessment of the achievement of the frequency operating standard, including (where applicable) an analysis of how and why the frequency operating standard was not met
- the rate of change of power system frequency associated with the largest frequency deviation, and any other significant frequency deviation, in each month
- AGC estimates of the additional electrical power (in MW) required to be produced or consumed to correct a given power system frequency deviation (known as the 'area control error')
- a list of any reviewable operating incidents that affected power system frequency.

The final rule permits AEMO to present information in the weekly reports and quarterly reports separately for the Tasmania region and aggregated for the remaining regions. It also requires AEMO to publish, on its website, the methodology and assumptions used in preparing each weekly report and quarterly report.

The Commission's reasons for making this final rule determination are set out in section 2.4.

This chapter outlines:

- the rule making test for changes to the NER
- the assessment framework for considering the rule change request
- the Commission's consideration of the final rule against the national electricity objectives (NEO).

Further information on the legal requirements for making this final rule determination is set out in appendix b.

## 2.2 Rule making test

### 2.2.1 Achieving the NEO

Under the NEL the Commission may only make a rule if it is satisfied that the rule will, or is likely to, contribute to the achievement of the national electricity objective (NEO).<sup>38</sup> This is the decision-making framework that the Commission must apply.

The NEO is:<sup>39</sup>

to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to:

- (a) price, quality, safety, reliability and security of supply of electricity; and
- (b) the reliability, safety and security of the national electricity system.

### 2.2.2 Making a differential rule

Under the Northern Territory legislation adopting the NEL, the Commission may make a differential rule if, having regard to any relevant MCE statement of policy principles, a

<sup>38</sup> Section 88 of the NEL.

<sup>39</sup> Section 7 of the NEL.

different rule will, or is likely to, better contribute to the achievement of the NEO than a uniform rule. A differential rule is a rule that:

- varies in its term as between:
  - the national electricity system, and
  - one or more, or all, of the local electricity systems, or
- does not have effect with respect to one or more of those systems

but is not a jurisdictional derogation, participant derogation or rule that has effect with respect to an adoptive jurisdiction for the purpose of s. 91(8) of the NEL.

As the rule relates to parts of the NER that currently do not apply in the Northern Territory, the Commission has not assessed the rule against the additional elements required by the Northern Territory legislation.<sup>40</sup>

## 2.3 Assessment framework

In assessing the consolidated rule change request against the NEO the Commission has considered the following principles:

- **Improving transparency:** The provision of relevant and accurate information to the market in a manner desired by stakeholders may improve transparency regarding the performance of frequency control frameworks which, in turn, is important in supporting the overall efficiency of the power system.
- **Improving consistency:** The provision of consistent information, both in terms of how often it is published and metrics reported on, may inform market participants more regularly about the issues affecting the power system over time; this may assist the market in understanding the impact of any changes to existing mechanisms, or the introduction of new mechanisms.

## 2.4 Summary of reasons

The final rule made by the Commission is published with this final rule determination.

Having regard to the issues raised in the rule change request and during consultation, the Commission is satisfied that the final rule will, or is likely to, contribute to the achievement of the NEO for the following reasons:

- **Improving transparency:** The final rule improves transparency of the frequency control framework and FCAS markets by requiring AEMO and the AER to provide information on these respectively:
  - Requiring AEMO to publish both weekly and quarterly information on the frequency control framework will provide market participants with the relevant information that they need to understand the framework and how frequency is performing with

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<sup>40</sup> From 1 July 2016, the NER, as amended from time to time, apply in the NT, subject to derogations set out in regulations made under the NT legislation adopting the NEL. Under those regulations, only certain parts of the NER have been adopted in the NT. (See the AEMC website for the NER that applies in the NT.) National Electricity (Northern Territory) (National Uniform Legislation) Act 2015.

respect to the frequency operating standards. This, in turn, will promote efficiency of the power system through better information provided to market participants.

- Requiring the AER to publish quarterly information on market ancillary service markets will also promote transparency of those markets through the provision of regular information to stakeholders.
- **Improving consistency:** The final rule improves the consistency of information provided, by requiring AEMO and the AER to report on a regular basis, and within a specific deadline. Also, the final rule sets out a standard set of metrics against which AEMO and the AER must report. As market participants would know what to expect and when, the final rule will better assist market participants understand the changes, if any, occurring in the frequency control framework and ancillary service markets.

The Commission considered that the above benefits outweigh the administrative costs of introducing new reporting requirements.

## 3 ISSUES RAISED AND COMMISSION'S CONCLUSIONS

This chapter details the issues raised by the AER and AEMO in their rule change requests, issues raised in stakeholder submissions, and the Commission's analysis and conclusions.

Specifically:

- Section 3.1 sets out the Commission's conclusions with respect to the AER reporting on market ancillary services markets
- Section 3.2 sets out the Commission's conclusions with respect to AEMO reporting on frequency control performance
- Section 3.3 discusses other issues and implementation.

### 3.1 AER reporting on market ancillary services markets

#### 3.1.1 AER's quarterly reporting requirement

In its rule change request, the AER proposed quarterly reporting requirements on FCAS market outcomes.<sup>41</sup> All submissions were supportive of the AER's proposed rule change seeking to place quarterly reporting requirements on the AER in relation to FCAS market outcomes. As a result, the final rule introduces a requirement on the AER to publish a report within 30 business days of the end of each quarter providing information in relation to each market ancillary service for the quarter.

The metrics prescribed in the final rule, are largely consistent with the AER's proposed rule, with minor drafting changes made for clarity purposes. However, the final rule does not require the AER to report on the utilisation of each market ancillary service:

- with respect to regulation market ancillary services, AEMO is required, under the final rule, to report weekly on the proportion of regulation services that were used (i.e. utilisation). The Commission considers that this is sufficient and requiring the AER to also report on this quarterly would be duplicative. The AER may choose to report on this metric using AEMO's information.
- with respect to contingency market ancillary services, the Commission understands that it would be neither practicable nor useful to estimate utilisation with respect to this type of service. The final rule therefore does not require the AER to report on this metric.

The final rule, however, requires the AER to report on the total quantity of each market ancillary service dispatched in each quarter (i.e. both contingency and regulation services). The final rule also requires AEMO to report on regulation services, but on a weekly basis, as discussed in the next section. The Commission considers that it is appropriate for the AER to report on all types of market ancillary services dispatched so as to be comprehensive and consistent in how it reports on market ancillary services. The final rule also states that the

<sup>41</sup> AER, Request for change to the National Electricity Rules - monitoring and reporting of FCAS market performance, February 2019, p. 4



AER may report on any other relevant information, to make sure that the quarterly reporting requirement is flexible.

The Commission considers that the above reporting obligation is consistent with the AER's wholesale market reporting function under the NEL.<sup>42</sup> As a result, the final rule clarifies that the AER's quarterly reporting requirement forms part of this broader role.

The final rule also:

- requires this information to be provided regularly, as discussed in section 3.1.2
- requires the AER to provide commentary on the key trends in the ancillary service markets, discussed in section 3.1.3.

The final rule may help market participants make efficient investment and operational decisions by providing additional information on ancillary service markets and trends.

### 3.1.2

#### Timing of reporting

In its *Frequency control frameworks review* final report, the AEMC recommended the AER publish quarterly reports no later than four weeks after the end of each three month period.<sup>43</sup> The Commission also noted that ideally this would occur as soon as possible after the relevant reporting period has ended, but would also depend on how quickly AEMO is able to provide the relevant data to the AER. Other reporting requirements have similar time frames, for example the existing requirement for the AER to publish a report on significant variations between forecast and actual spot prices no later than four weeks after the end of each three month period.<sup>44</sup>

The AER's submission to the consultation paper noted the preference to have no time limit though proposes a deadline of 30 business days as an alternative to publishing as soon as practicable.<sup>45</sup> They also noted that a deadline of 30 business days would allow them to align the frequency quarterly report with the planned publication timing of the wholesale market quarterly report.<sup>46</sup> They also noted that coordinating the publication of interrelated reports would benefit market participants and policy-makers.<sup>47</sup>

ERM Power's submission stated that by not specifying a time limit in the Rules for the publication of the quarterly report the benefits of this new reporting obligation could be diminished.<sup>48</sup> AGL's submission stated that the AEMC should make an informed decision regarding the nature of the time limits on the reporting.<sup>49</sup>

A firm deadline of 30 business days would contribute to the consistent and ongoing availability of reports. This would provide certainty to stakeholders and the information

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42 Section 18C(2) of the NEL.

43 AEMC, *Frequency control frameworks review*, final report, July 2018, p. 150.

44 *Ibid.*, p. 149. See clause 3.13.7(b)(1) of the NEL.

45 AER, submission to the consultation paper, p.1.

46 *Ibid.*

47 *Ibid.*

48 ERM Power, submission to the consultation paper, p.1.

49 AGL, submission to the consultation paper, p.2.

needed to make informed investment and operational decisions. Further, aligning the publication dates of the AER and AEMO's quarterly reports would benefit market participants and policy-makers.

The final rule therefore sets a deadline of 30 business days for the publication of the AER's quarterly market outcomes report.

### 3.1.3 **Assessment of effectiveness of competition**

In its *Frequency control frameworks review* final report, the AEMC recommended the AER include in its quarterly reports the AER's assessment of whether the FCAS market is functioning efficiently and whether there is effective competition.<sup>50</sup>

In its rule change request, the AER noted that, under the NEL, it is required to monitor the wholesale market and report on its performance at least every two years.<sup>51</sup> As part of this, the AER is required to identify and analyse whether there is 'effective competition' within the relevant wholesale market.<sup>52</sup> The AER has done this for the FCAS markets as part of its inaugural report into effective competition.<sup>53</sup> The AER argued, for completeness and to maintain consistency, it makes sense to continue to consider all relevant wholesale markets (including FCAS) as part of its ongoing review into the effectiveness of competition in those markets.<sup>54</sup>

The AER's submission to the consultation paper stated that the proposed quarterly reports will include an assessment of any changes, such as barriers to entry, number of participants, participants' offers and underlying costs, and commentary on the likely impact of these changes on competition and efficiency of FCAS markets.<sup>55</sup> The AER queried whether the obligation to assess effective competition in the quarterly reports could be interpreted as requiring the AER to undertake a full assessment of all eight FCAS markets each quarter.<sup>56</sup>

AGL<sup>57</sup> and ERM Power's<sup>58</sup> submissions supported the AER's proposal to continue to report on the effectiveness of competition in FCAS markets as part of wholesale electricity market performance reporting required under the NEL. Mondo's submission suggested that quarterly reports should examine the drivers that are contributing to the observed costs, volumes and trends.<sup>59</sup> Mondo also indicated the AER should also include an examination of all key parameters within each of the individual FCAS markets.<sup>60</sup>

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50 Ibid, p.150.

51 AER, Request for change to the National Electricity Rules - monitoring and reporting of FCAS market performance, February 2019, p. 6.

52 Under Part 3, Division 1A of the NEL.

53 For more information, see: AER, Wholesale electricity market performance report, December 2018.

54 AER, Request for change to the National Electricity Rules - monitoring and reporting of FCAS market performance, February 2019, p. 6.

55 AER, Submission to consultation paper, p.2.

56 Ibid.

57 AGL, submission to the consultation paper, p.2.

58 ERM Power, submission to the consultation paper, p.2.

59 Mondo, submission to the consultation paper, p.2.

60 Ibid.

As proposed by the AEMC in its *Frequency control frameworks review* final report, the Commission's intent is not for the AER to undertake a full assessment of all eight ancillary service markets each quarter, but rather to provide commentary on key trends and outcomes on a regular basis.

The final rule requires the AER to provide an analysis of key trends and outcomes in markets for market ancillary services, on a quarterly basis. The AER will be required to publish shorter-term data (i.e. quarterly trends) that will inform the broader analysis that it carries out every two years. The final rule does not require the AER to undertake a full assessment of effective competition in markets for market ancillary services.

## 3.2 AEMO reporting on frequency performance of the power system

### 3.2.1 Reporting requirement

In its rule change request, AEMO proposed weekly and quarterly reporting requirements on frequency and frequency control performance.<sup>61</sup> All submissions were supportive of this proposal.

The final rule introduces a requirement on AEMO to report weekly and quarterly on frequency performance. The final rule may help market participants make efficient investment and operational decisions by providing additional information on frequency performance.

Some submissions were concerned about the specific metrics that AEMO would report on within the weekly and quarterly reports and how they were related to the frequency operating standard (FOS) set out in the power system security standards.<sup>62</sup> The final rule balances setting prescriptive requirements within the NER against providing AEMO with flexibility to develop and report on additional metrics based on changing power system conditions, if required. The Commission also had regard to the need to link the frequency control performance metrics to the FOS. The next few sections discuss the metrics chosen in more detail, as well as the Commission's rationale for choosing them.

The final rule is largely the same as proposed by AEMO, although it includes two main changes:

- The final rule, as with the reporting requirement on the AER, makes it clear that the requirement on AEMO is not exhaustive. AEMO may choose to report on additional metrics should it choose to do so.
- The final rule introduces a requirement for AEMO to publish on its website the methodology and assumptions it used in preparing each weekly report and quarterly report.

Requiring AEMO to provide information about its methodology and assumptions provides more transparency to stakeholders around the metrics used, and how they were calculated. For example, the Commission expects that AEMO might include, in its reporting on methodology and assumptions, some of the information suggested by stakeholders in

<sup>61</sup> AEMO, Request for change to the National Electricity Rules - monitoring and reporting of frequency and frequency control performance, May 2019, p. 4

<sup>62</sup> See ERM Power and Delta Electricity: submissions to consultation paper.

submissions,<sup>63</sup> including the location of the measurement of frequency, and how it calculates the proportion of dispatched market ancillary services used.

### 3.2.2

#### **AEMO's weekly reports**

In its *Frequency control frameworks review* final report, the AEMC recommended AEMO publish weekly reports on:

- Frequency outcomes with respect to the requirements of the frequency operating standard (FOS).<sup>64</sup>
- Quantities of regulation services enabled and utilised in each region.<sup>65</sup>

#### **Power system frequency performance outcomes with respect to the FOS**

In its rule change request, AEMO proposed measures indicating whether "key measures" in the FOS were met, rather than a complete test indicating compliance/non-compliance with the FOS. According to AEMO, the numerous conditions of the FOS make it infeasible to automate a reliable compliance test. The measures proposed by AEMO were the proportion of time spent inside the Normal Operating Frequency Band (NOFB), recovery times where frequency has left the NOFB, and the time error requirements.<sup>66</sup>

ERM Power's<sup>67</sup> and Delta Electricity's<sup>68</sup> submissions to the consultation paper stated that the proposed reporting metric "the proportion of time spent within the normal operating frequency bands"<sup>69</sup> should be reversed to be the proportion of time spent outside the NOFB absent a contingency or load event to be more consistent with the FOS. Both stakeholders also provided additional suggestions on which other metrics AEMO could report on.<sup>70</sup>

Reporting of power system frequency performance against the FOS is necessary to provide the market with relevant information. In considering the level of prescription to be set out in the NER for the quarterly report, the Commission had regard to the practicality, and ease of automation, balanced against the benefits of increased information being provided to the market. The weekly report on frequency control metrics is meant to be an automated report - as a result, the Commission considers that AEMO should not be required to report on every single measure of the FOS in this report.

However, the measures included should be consistent with the FOS and provide enough detail to inform the market. The final rule, with respect to the weekly metrics, is largely as proposed by AEMO. The metrics represent an appropriate balance between the necessary regularity and granularity of information, and the administrative burden of providing

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63 For example, see Delta Electricity and Snowy Hydro's submissions to the consultation paper.

64 AEMC, *Frequency control frameworks review*, final report, July 2018, p. 143.

65 AEMC, *Frequency control frameworks review*, final report, July 2018, p. 143.

66 AEMO, *Electricity rule change proposal - monitoring and reporting of frequency and frequency control performance*, May 2019, p. 5.

67 ERM Power, submission to the consultation paper, p.2.

68 Delta Electricity, submission to the consultation paper, p.3.

69 AEMO, *Request for change to the National Electricity Rules - monitoring and reporting of frequency and frequency control performance*, May 2019, p.8.

70 ERM Power and Delta Electricity: submissions to consultation paper.

information. For example, AEMO already currently publishes some the metrics chosen, such as the proportion of time that frequency was inside the NOFB.<sup>71</sup>

Specifically, the weekly metrics in relation to the FOS are:<sup>72</sup>

- the proportion of time that the frequency of the power system was inside of the normal operating frequency band
- the recovery times to return to the normal operating frequency band where frequency left the normal operating frequency band
- the time error requirements.

The final rule makes it clear that AEMO is required to report on metrics consistent with the FOS.<sup>73</sup> The FOS is assessed on a 30-day rolling basis. While the weekly report will provide regular and timely information to stakeholders, care should be taken in assessing this information against the FOS. Instead, therefore, it is intended to provide an indicative comparison against the FOS.

The final rule also includes some minor changes from AEMO's proposal.

The final rule clarifies that AEMO is required to report on frequency performance consistent with the measures specified in the FOS. The reporting requirements in the final rule are not exhaustive and therefore, AEMO may choose to provide additional information and report against additional metrics that are not specifically provided for by the final rule. The NER do not restrict AEMO from including further metrics for comparison against the FOS, where it is practicable to be included in the weekly report. AEMO may choose, should systems change in the future making it easier to automate more data, report on additional metrics on a weekly basis, or indeed, on any other basis, provided the minimum requirements set out in the NER are met.

### **Quantities of regulation services enabled and utilised in each region**

In its rule change request, AEMO proposed that regulation services should be reported as dispatched alongside measures indicating the average utilisation.<sup>74</sup>

ERM Power's<sup>75</sup> submission to the consultation paper proposed that the word "average", in relation to the utilisation of regulation services, should be deleted. Delta Electricity's submission to the consultation paper stated that the rule wording or a supporting procedure should clearly define what is meant by "utilisation" and that there should be some level of time of day comparison.<sup>76</sup>

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71 See, for example, [http://www.aemo.com.au/-/media/Files/Electricity/NEM/Security\\_and\\_Reliability/Ancillary\\_Services/Frequency\\_and\\_time\\_error\\_reports/Regulation-FCAS-factsheet.pdf](http://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Ancillary_Services/Frequency_and_time_error_reports/Regulation-FCAS-factsheet.pdf)

72 See clause 4.8.16(a)(1) of the final rule.

73 See clause 4.8.16(a)(1) of the final rule.

74 AEMO, Request for change to the National Electricity Rules - monitoring and reporting of frequency and frequency control performance, May 2019, p. 8

75 ERM Power, submission to the consultation paper, p.2.

76 Delta Electricity, submission to the consultation paper, p.2.

The final rule does not use the word "utilised" nor the term "utilisation" but instead, clarifies what the requirement is. Specifically, the final rule requires AEMO to report on measures indicating the proportion of dispatched regulation services that were used by AEMO.<sup>77</sup> The final rule is more transparent with respect to what AEMO is required to report on. The final rule also does not use the word "average". This term "average" without any additional context (e.g. time period) may be ambiguous. Instead, the Commission expects AEMO to set out its methodology for how it calculates the proportion of dispatched regulation services that were actually used in its methodology report. The final rule is also more flexible as it does not prescribe exactly what methodology AEMO is to use (e.g. average).

Specifically, the final rule requires AEMO to report on the following in its weekly report:

- the regulation services that were dispatched by AEMO in each region<sup>78</sup>
- measures indicating the proportion of dispatched regulation services that were used by AEMO.<sup>79</sup>

### 3.2.3

#### **AEMO's quarterly reports**

The final rule requires AEMO to report quarterly on the following in respect of power system frequency:<sup>80</sup>

- AEMO's assessment of the impact of any actions taken by AEMO to improve power system frequency control outcomes
- AEMO's assessment of the achievement of the frequency operating standard, including (where applicable) any analysis of how and why the frequency operating standard was not met
- the rate of change of power system frequency associated with the largest frequency deviation, and any other significant frequency deviation, in each month
- Automatic generation control system (AGC) estimates of the additional electrical power (in MW) required to be produced or consumed to correct a given power system frequency deviation (known as the 'area control error')
- list of any reviewable operating incidents that affected power system frequency.

These metrics represent an appropriate balance between what regularity and granularity of information, and the administrative burden of providing information. The quarterly metrics are more comprehensive than the weekly metrics in recognition of the longer amount of time that AEMO has to publish the quarterly report. For example, the quarterly metrics require AEMO to assess the FOS more broadly.

Specific metrics that were subject of stakeholder feedback are discussed in more detail next.

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<sup>77</sup> See clause 4.8.16(1)(3)

<sup>78</sup> See clause clause 4.8.16(a)(2) of the final rule.

<sup>79</sup> See clause 4.8.16(1)(3).

<sup>80</sup> See clause 4.8.16(b) of the final rule.

### Rate of change of frequency

In its Frequency control frameworks review final report, the AEMC recommended that AEMO report on rates of change of frequency, but did not specify the exact metrics for doing this.<sup>81</sup> In AEMO's proposed rule drafting, AEMO suggested to report on the rate of change of frequency associated with the largest frequency deviation in each month of a quarter.<sup>82</sup>

Stakeholders expressed support for including this metric although views differed on the form that it should take. AGL's submission to the consultation paper stated support for AEMO reporting on rates of change of frequency.<sup>83</sup> MEA Group's submission stated support for AEMO reporting on the three largest rates of change of frequency during normal operating conditions.<sup>84</sup> ERM's submission stated that reporting of the rate of change of frequency should be based on frequency deviations less than 49.75Hz and greater than 50.25Hz.<sup>85</sup> Delta Electricity's submission stated that the methodology to be used for calculating the rate of change should be clearly defined so that market participants can prepare comparable data.<sup>86</sup>

Frequency excursions outside limits specified in the power system security standards are already captured by AEMO's requirement to report on frequency in relation to "reviewable operating incidents".<sup>87</sup> However, under AEMO's proposal to report on the largest frequency deviation in each month, there is a possibility that some significant frequency events would not be reported on, if they occur during the same month. This is because AEMO would only be required to report on the largest frequency deviation. To address the potential for significant events to be missed and to provide AEMO with reporting flexibility for each month over the quarter, the final rule, therefore, requires AEMO to report on:

- the rate of change of frequency associated with the largest frequency deviation in each month, and
- the rate of change of frequency associated with any other significant frequency deviation in each month.<sup>88</sup>

### Reviewable incidents affecting frequency

In its Frequency control frameworks review final report, the AEMC recommended AEMO publish a summary of any reports prepared by AEMO on reviewable operating incidents which

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81 AEMC, Frequency control frameworks review, final report, July 2018, p. 144. The rate at which the frequency changes following a contingency event determines the amount of time that is available to arrest the change in frequency before it moves outside of the permitted bands of the frequency operating standard. The rate of change of frequency is proportional to the change in supply or demand as a result of the contingency event and inversely proportional to the level of system inertia at the time that the contingency occurs. The greater the size of the contingency event, or the lower the system inertia, the faster the frequency will change. More inertia in the power system means a lower initial decline of power system frequency. However, inertia is not able to stabilise or restore the power system frequency on its own – this is a role for frequency control services.

82 AEMO, Electricity rule change proposal - monitoring and reporting of frequency and frequency control performance, May 2019, p. 8.

83 AGL, submission to the consultation paper, p.2.

84 MEA Group, submission to the consultation paper, p.2.

85 ERM Power, submission to the consultation paper, p.3.

86 Delta Electricity, submission to the consultation paper, p.4.

87 See clause 4.8.15(a)(1)(iii) of the NER.

88 See clause 4.8.16(b)(3) of the final rule.



affect frequency over the reporting period.<sup>89</sup> In its rule change request, AEMO proposed to change how reviewable operating incidents may be referred to in the quarterly reports. According to AEMO, this is in light of the significant amount of time it can take to investigate when such incidents occur. Therefore, AEMO proposed that reviewable incidents that occurred during the reporting period are listed in the quarterly report, not summarised.<sup>90</sup>

AGL's submission to the consultation paper supported the inclusion of a list of reviewable incidents affecting frequency.<sup>91</sup> ERM Power's submission supported the inclusion of a list and a summary of all reviewable incidents impacting frequency over the reporting period.<sup>92</sup>

The Commission notes that AEMO is already required to report on frequency in relation to "reviewable operating incidents".<sup>93</sup> The Commission considers that given AEMO has stated that it takes a significant amount of time to investigate such incidents a summary of each event is not a suitable inclusion in the quarterly reports.

The final rule, therefore, requires AEMO to publish a list of reviewable operating incidents which affect frequency over the reporting period.

#### **Timing of reporting**

In its rule change request, AEMO proposed that the quarterly reports be published within 30 days of the end of the reporting period, rather than two weeks - as recommended by the AEMC in its Frequency control frameworks review final report. According to AEMO, this is guided by its assessment of the effort required to produce these reports. AEMO also believes this timing will still provide the required and appropriate level of information on frequency performance for stakeholders, especially when combined with the ongoing weekly summaries.<sup>94</sup>

The NER should provide AEMO with the required time to produce fulsome qualitative and quantitative analysis into the frequency performance of the power system. Analysis included in this report should provide valuable insights to market participants. The Commission considers it desirable to have consistency with the AER's quarterly reporting timing requirements of 30 business days.

The final rule, therefore, sets an obligation on AEMO to publish the quarterly reports within 30 business days of the end of the reporting period.<sup>95</sup> The Commission therefore expects the AER and AEMO's reports to be published around the same time, for the same quarter.

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89 AEMC, Frequency control frameworks review, final report, July 2018, p. 144.

90 AEMO, Electricity rule change proposal - monitoring and reporting of frequency and frequency control performance, May 2019, p. 6.

91 AGL, submission to the consultation paper, p.2.

92 ERM Power, submission to the consultation paper, p.2.

93 See clause 4.8.15(a)(iii) of the NER.

94 Ibid, p. 5.

95 See clause 4.8.16(b) of the final rule.



### 3.2.4 Reporting Tasmanian region separately

In its rule change request, AEMO stated that proposed statistics for regulation service quantities and utilisation within the weekly reporting requirement are best reported for the mainland and for Tasmania. This is rather than by region as proposed by the Commission in the *Frequency Control Frameworks Review*, as the services are not generally procured or used regionally, except in rare circumstances.

The Commission agrees with AEMO and considers that this should be extended across the weekly and quarterly reporting requirements to provide AEMO with flexibility in its reporting requirements.

The final rule therefore states that where necessary or convenient, AEMO may present the information in the weekly reports and quarterly reports separately for the Tasmania region and aggregated for the remaining regions.<sup>96</sup>

## 3.3 Other issues

### 3.3.1 Removal of specific reporting requirements

In the rule change request, AEMO suggests removing some existing reporting requirements. AEMO is of the view that they will conflict and overlap with the proposed rule. Specifically, AEMO proposed to delete:<sup>97</sup>

- Clause 3.13.4A(b1) of the NER, which requires AEMO to publish annually the actual quantities and types of market ancillary services.
- Clause 3.13.5(a) of the NER, which requires AEMO to publish annually the costs of all its operations associated with its acquisition of market ancillary services and non-market ancillary services.

AEMO explains that ancillary service quantities and prices are published daily as for energy. Further, AEMO states that for non-market ancillary services<sup>98</sup>, clauses 3.13.5(b)<sup>99</sup> and 3.13.5(c)<sup>100</sup> of the NER deal with network support and control ancillary services, while clause 3.11.10(a)<sup>101</sup> of the NER covers system restart ancillary services.

MEA Group's submission states that whilst there is overlap between the two clauses the information included within the reporting requirements is still valuable to market participants in a concise and easily accessible report.

It is important to reduce duplicative reporting requirements whilst making sure that no subject matter is lost. With respect to the first proposal, this is captured by the new

<sup>96</sup> See clause 4.8.16(c) of the final rule

<sup>97</sup> Ibid, pp. 8-9.

<sup>98</sup> Non-market ancillary services include network support and control ancillary services, and system restart ancillary services.

<sup>99</sup> Clauses 3.13.5(b) of the NER provides that AEMO must publish annually the quantities and types on network support and control ancillary services covered under existing ancillary services agreements.

<sup>100</sup> Clauses 3.13.5(c) of the NER provides that information published under clauses 3.13.5(b) of the NER must include a breakdown of the actual costs and quantities relating to each facility contracted under ancillary services agreements.

<sup>101</sup> Clauses 3.11.10(a) of the NER provides that at least once each year, AEMO must prepare and publish a report detailing the total estimated annual cost for the provision of system restart ancillary services, broken down to charges for availability and use, for each electrical sub-network and for each region.

requirement of the final rule for the AER to report on the quantities of each type of ancillary service dispatched and used by AEMO in each region.<sup>102</sup> As a result, the final rule removes the existing reporting requirement in clause 3.13.4A(b1).

Clause 3.13.5(a) of the NER requires AEMO to report on its annual costs of procuring market ancillary services, whereas the requirements introduced in this final rule requires the AER to report on the costs paid to ancillary service providers. The final rule removes clause 3.13.5(a) of the NER because although there appears to be a difference between AEMO's costs and the amounts paid to ancillary service providers. AEMO's own operating costs are not part of the rule. The remaining paragraphs in clause 3.13.5 relating to non-market ancillary services, which are not within scope of this rule change, are not amended by the final rule.

### 3.3.2

#### Implementation

In its rule change request, AEMO suggested that at least a six-month period should be allowed following finalisation of the final rule before it takes effect to give AEMO sufficient time to implement the necessary system and process changes.<sup>103</sup>

This is particularly the case for the weekly reports, which require systems changes. As a result, the final rule commences on 1 January 2020.

The Commission expects that AEMO and the AER will publish their first quarterly report 30 business days after the fourth quarter of the 2019 calendar year, covering the three-month period starting on 1 October 2019, with an expected publication date of February 2020.

The Commission expects AEMO to publish its first weekly report in early January.

Both AEMO and the AER are encouraged to publish earlier to the extent that it is possible for them to do so.

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<sup>102</sup> See clause 3.11.2A(b)(1)(ii) and (iii) of the final rule.

<sup>103</sup> AEMO, rule change request, p. 6.

## ABBREVIATIONS

AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AGC	Automatic generation control system
Commission	See AEMC
FCAS	Frequency control ancillary services
FOS	Frequency Operating Standard
NEL	National Electricity Law
NEM	National electricity market
NER	National Electricity Rules
NEO	National electricity objective
NOFB	Normal Operating Frequency Band

## A SUMMARY OF OTHER ISSUES RAISED IN SUBMISSIONS

This appendix sets out the issues raised in the first round of consultation on this rule change request and the AEMC's response to each issue. If an issue raised in a submission has been discussed in the main body of this document, it has not been included in this table.

**Table A.1: Summary of other issues raised in submissions**

STAKEHOLDER	ISSUE	AEMC RESPONSE
MEA Group, submission to consultation paper, p. 2.	MEA Group suggested it would be beneficial for the market to understand the quantum of frequency services provided by scheduled and semi-scheduled generators during each reporting period, allowing for this metric to be monitored by the market over time.	The Commission does not consider it appropriate to prescribe this level of granularity to the rules. However, the final rule makes it clear that AEMO may choose to report on additional metrics if it would be useful to stakeholders.
Energy Queensland, submission to consultation paper, p. 4.	Energy Queensland suggested that the AEMC consider a review of under-frequency load shedding schemes. Energy Queensland also provided feedback on the Commission's frequency control frameworks review.	The Commission notes Energy Queensland's feedback. A review of under-frequency load shedding schedules is outside of the scope of this rule change.
Snowy Hydro, submission to consultation paper, p. 2.	Snowy Hydro noted that given AEMO would be required to report on AGC estimates, care should be taken in proposing the need for changes to governor action and control systems response without trials with market participants prior to forming a view of the need for the use of primary frequency response.	The final rule only requires AEMO to publish information and assess performance against the FOS. AEMO has submitted a rule change request in relation to primary frequency control ("removal of disincentives to primary frequency response"). Consultation will commence shortly.
Delta Electricity, submission to consultation paper, p. 2.	Delta Electricity noted that the need for mandatory change to technical control	The final rule only requires AEMO to publish information and assess performance against the

STAKEHOLDER	ISSUE	AEMC RESPONSE
	<p>mechanisms to correct observed conditions of system frequency should be drawn from comparisons of trends of existing conditions measured against the objectives of the FOS, and only pursued after it is clearly demonstrated that attempts to find market solutions have been exhausted.</p>	<p>FOS.</p> <p>The scope this rule change only included information provision. The case or need for changes to primary frequency response is outside of this rule change.</p> <p>AEMO has submitted a rule change request in relation to primary frequency control ("removal of disincentives to primary frequency response"). Consultation will commence shortly.</p>
<p>Delta Electricity, submission to consultation paper, p. 1.</p>	<p>Delta Electricity suggested that AEMO may not be considered by independent observers to be the most appropriate organisation to propose rules regarding metrics related to the achievement of the FOS.</p>	<p>Any person (with the exception of the Commission) may submit a rule change request to the AEMC at any time. Each rule change request is assessed on its own merits against the NEO.</p>
<p>Delta Electricity, submission to consultation paper, p. 3.</p>	<p>Delta Electricity suggested that the final determination include recommendations for AEMO to produce a supporting document describing the technical and procedural details for how AEMO will observe the proposed rules, and that it is to be done through consultation with industry.</p>	<p>The final rule includes a requirement in the NER for AEMO to develop and publish a methodology and assumptions document. However, the Commission did not consider it necessary to require AEMO to consult with industry on this document as it would be administratively burdensome. The final rule clarifies that AEMO is required to report against the frequency operating standard, which provide additional clarity as to what AEMO is required to report on.</p>

STAKEHOLDER	ISSUE	AEMC RESPONSE
		<p>The document is intended to provide additional transparency as it will provide additional information to the public as to how AEMO will implement the new reporting requirements, consistent with the FOS.</p> <p>Broader concerns with the FOS were outside of the scope of this rule change.</p>

## B LEGAL REQUIREMENTS UNDER THE NEL

This appendix sets out the relevant legal requirements under the NEL for the AEMC to make this final rule determination.

### B.1 Final rule determination

In accordance with s.102 of the NEL the Commission has made this final rule determination in relation to the rule proposed by the AER and AEMO.

The Commission's reasons for making this final rule determination are set out in section 2.4.

A copy of the final rule is attached to and published with this final rule determination. Its key features are described in chapter 3.

### B.2 Power to make the rule

The Commission is satisfied that the final rule falls within the subject matter about which the Commission may make rules. The final rule falls within s.34 of the NEL as it relates to regulation of the operation of the national electricity system for the purposes of the safety, security and reliability of that system, and the activities of persons (including registered participants) participating in the national electricity market or involved in the operation of the national electricity system.<sup>104</sup>

### B.3 Commission's considerations

In assessing the rule change request the Commission considered:

- its powers under the NEL to make the rule
- the rule change request
- submissions received during first round consultation
- the Commission's analysis as to the ways in which the proposed rule will or is likely to, contribute to the NEO.

There is no relevant Ministerial Council on Energy (MCE) statement of policy principles for this rule change request.<sup>105</sup>

### B.4 Civil penalties

The Commission cannot create new civil penalty provisions. However, it may recommend to the COAG Energy Council that new or existing provisions of the NER be classified as civil penalty provisions.

<sup>104</sup> Section 34(1)(a)(i) NEL

<sup>105</sup> Under s. 33 of the NEL the AEMC must have regard to any relevant MCE statement of policy principles in making a rule. The MCE is referenced in the AEMC's governing legislation and is a legally enduring body comprising the Federal, State and Territory Ministers responsible for energy. On 1 July 2011, the MCE was amalgamated with the Ministerial Council on Mineral and Petroleum Resources. The amalgamated council is now called the COAG Energy Council.

The final rule does not amend any clauses that are currently classified as civil penalty provisions under the NEL or National Electricity (South Australia) Regulations. The Commission does not propose to recommend to the COAG Energy Council that any of the proposed amendments made by the final rule be classified as civil penalty provisions.

## B.5 Conduct provisions

The Commission cannot create new conduct provisions. However, it may recommend to the COAG Energy Council that new or existing provisions of the NER be classified as conduct provisions.

The final rule does not amend any rules that are currently classified as conduct provisions under the NEL or National Electricity (South Australia) Regulations. The Commission does not propose to recommend to the COAG Energy Council that any of the proposed amendments made by the final rule be classified as conduct provisions.



## C FREQUENCY CONTROL FRAMEWORK

Frequency control is an important technical parameter of power system security.<sup>106</sup> The frequency of the power system varies whenever the supply from generation does not precisely match customer demand. Effective control of power system frequency involves the provision of inertia,<sup>107</sup> the use of emergency frequency control schemes and the coordination of a range of frequency control ancillary services (FCAS).

AEMO is required under the National Electricity Rules (NER) to operate and maintain the power system in a "secure operating state".<sup>108</sup> To maintain a stable system frequency, AEMO must instantaneously balance the supply of electricity into the power system against consumption of electricity at all times.

The regulatory framework was developed to enable AEMO to meet its obligations with respect to frequency control. The key components of the framework are:

- **Frequency operating standard.** The frequency requirements that AEMO must meet are set out in the frequency operating standard, which is defined in the NER and determined by the Reliability Panel.<sup>109</sup> The purpose of the frequency operating standard is to define the range of allowable frequencies for the electricity power system under different conditions, including normal operation and following contingencies. Generator, network and end-user equipment must be capable of operating within the range of frequencies defined by the frequency operating standard, while AEMO is responsible for maintaining the frequency within the ranges defined by the standard. These requirements then inform how AEMO operates the power system, including through applying constraints to the dispatch of generation, or procuring ancillary services. The frequency operating standard currently consists of two separate standards - one for the mainland NEM and one for Tasmania - to reflect the different physical and market characteristics of the Tasmanian region as opposed to the mainland NEM.
- **Frequency control ancillary services.** FCAS are procured by AEMO to increase or decrease active power over a time frame that satisfies the frequency operating standard. There are two types of FCAS: regulating and contingency. Regulating FCAS regulate the power system frequency to keep it within the normal operating frequency band defined in the frequency operating standard. There are two types of regulating FCAS: 1) Regulating raise service - used to correct a minor drop in frequency; 2) Regulating lower service - used to correct a minor rise in frequency. Contingency FCAS is procured by AEMO to respond to larger deviations in power system frequency that are usually the result of contingency events such as the tripping of a large generator or load. Contingency FCAS is divided into raise and lower services at three different speeds of response and sustain time: fast (6 seconds), slow (60 seconds) and delayed (5 mins). In the NEM, FCAS is

<sup>106</sup> In Australia, all generation, transmission, distribution and load components connected to the power system are standardised to operate at a nominal system frequency of 50 Hertz (Hz).

<sup>107</sup> Inertia is a measure of the ability of the system to resist changes in frequency due to sudden changes in supply and demand. It is naturally provided by synchronous generators such as coal, hydro and gas-fired power stations.

<sup>108</sup> Clause 4.2.6(a) of the NER.

<sup>109</sup> Chapter 10 of the NER and clause 4.4.1 of the NER.

sourced from markets operating in parallel to the wholesale energy market, with the energy and FCAS markets being optimised simultaneously so that total costs are minimised. There are eight markets in the NEM for FCAS, one for each type of regulating and contingency service.<sup>110</sup>

- **Generator technical performance standards.** Equipment that makes up and connects to the power system must perform to certain levels of technical capability.<sup>111</sup> The generator technical performance standards in the NER cover a range of technical capabilities for connecting generators to the network, including, among other things, frequency control and response to frequency disturbances during and following contingency events.
- **Emergency frequency control schemes.** Emergency frequency control schemes are schemes that help restore power system frequency in the event of extreme power system events, such as the simultaneous failure of multiple generators and/or transmission elements.<sup>112</sup> The operational goal of emergency frequency control schemes is to act automatically to arrest any severe frequency deviation prior to breaching the extreme frequency excursion tolerance limit, and hence avoid a cascading failure and widespread blackout.

Satisfactory control of frequency is a fundamental requirement of the power system, as poor system frequency behaviour leads to a range of control issues and system security issues, including tripping of generation and load, power system oscillations, and in the worst cases, partial or total loss of the system (e.g. a state-wide blackout, such as the one that occurred in September 2016 in South Australia).

The behaviour of system frequency in the national electricity market (NEM) is of increasing concern, as has been reported in various reviews and analysis such as DIGSILENT's Review of Frequency Control Performance in the NEM under Normal Operating Conditions,<sup>113</sup> AEMC's Frequency Control Frameworks Review,<sup>114</sup> and AEMO's Final Report – Queensland and South Australia system separation on 25 August 2018.<sup>115</sup>

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110 FCAS" is not a term defined by the NER, but it refers to eight "market ancillary services" defined by the NER.

111 For more information, see clause 5.2.1(b), 5.2.5(a), 5.3.7(b) and schedule 5.2 of the NER.

112 See for example, clause 4.2.6 of the NER.

113 For more information, see: [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](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)

114 For more information, see: <https://www.aemc.gov.au/sites/default/files/2018-07/Final%20report.pdf>

115 For more information, see: [https://www.aemo.com.au/-/media/Files/Electricity/NEM/Market\\_Notices\\_and\\_Events/Power\\_System\\_Incident\\_Reports/2018/Qld---SA-Separation-25-August-2018-Incident-Report.pdf](https://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Power_System_Incident_Reports/2018/Qld---SA-Separation-25-August-2018-Incident-Report.pdf)