Decision on the Australian Energy Market Operator's 2020/2021 Ancillary Services requirements

7 July 2020

Economic Regulation Authority
WESTERN AUSTRALIA

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Contents

1. Determination

The Economic Regulation Authority has conducted its audit of the 2020/21 Ancillary Services requirements and plan determined by the Australian Energy Market Operator (AEMO).

In accordance with clause 3.11.6 of the Wholesale Electricity Market Rules, the ERA approves AEMO's 2020/21 Ancillary Services requirements. AEMO's requirements are listed in Table 1.

Table 1: 2020/21 Ancillary Services requirements

Ancillary Services	Requirements
Load Following Upwards	85 MW between 5:30 am and 7:30 pm 50 MW between 7:30 pm and 5:30 am
Load Following Downwards	85 MW between 5:30 am and 7:30 pm 50 WM between 7:30 pm and 5:30 am
Spinning Reserve Services	At least the maximum of: a) 70% of the largest generator; and b) 70% of the largest contingency event that would result in generation loss.
Load Rejection Reserve Services	Up to a maximum of 90 MW[1]
Dispatch Support Service	There are no requirements for Dispatch Support Services.
System Restart Service	Three Facilities are required in diverse network areas

[1] AEMO will plan sufficient reserve to meet the minimum requirement but will use a dynamic requirement in real time that may reduce the requirement in real time where system conditions are suitable.

2. Introduction

Ancillary Services are required to maintain power system security and reliability, enable orderly trading in electricity and ensure that electricity supplies are of acceptable quality. These services maintain key technical characteristics of the power system, including frequency and voltage.

Terms capitalised in this report include terms defined under Chapter 11 of the Market Rules.

The Market Rules require AEMO to prepare an Ancillary Services report. The report details the Ancillary Services costs and quantities provided in the previous year and AEMO's Ancillary Services requirements and plan for the coming year.

In a letter to the ERA published on the ERA's website on 14 May 2020, AEMO outlined a review of several regulatory activities in response to the COVID-19 pandemic.[2] In this letter, AEMO proposed recommending that the 2019/20 Ancillary Service Requirements apply in 2020/21, subject to AEMO's ongoing monitoring. AEMO stated:

> The 2019/20 Ancillary Service requirements will remain largely adequate until June 2021. AEMO will monitor the Ancillary Service Requirements, including for LFAS to ensure that they remain appropriate and will propose updated values if changes are required.

AEMO assessed this proposal as low risk to the market. The ERA agrees with AEMO's proposed approach to reviewing the Ancillary Service Requirements and ongoing monitoring.

The Ancillary Services requirements must be determined in accordance with the South West Interconnected System (SWIS) Operating Standards and the Ancillary Service Standards. The requirements are the levels of services needed to meet the standards.

AEMO's Ancillary Services requirements and plan must be submitted to the ERA for audit and approval by 1 June each year. AEMO submitted its 2020/21 report to the ERA on 28 May 2020 and published this report in accordance with the Market Rules.

The Market Rules require the ERA to:

- Audit AEMO's determination of the Ancillary Services requirements for approval. The ERA may require AEMO to re-determine the requirements (clause 3.11.6 of the Market Rules).
- Audit AEMO's determination of the Ancillary Services plan to meet the requirements. The ERA may require AEMO to re-determine the plan (clause 3.11.12 of the Market Rules). There is no approval requirement for the plan.

The ERA has assessed AEMO's 2020/21 Ancillary Services requirements and plan against the following Market Rules:

- Clause 3.11.4, which requires AEMO to determine the Ancillary Services requirements for all Ancillary Service types.
- Clause 3.11.1, which requires AEMO to determine the requirements in accordance with the SWIS Operating Standards and the Ancillary Services Standards.
- Clause 3.11.2, which requires AEMO to determine the requirements based on the facilities and configuration expected for the SWIS in the coming year.

[2] AEMO's letter is available on the ERA's website at: https://www.erawa.com.au/electricity/wholesale-electricity-market/regulatory-papers/covid-19-aemo-review-of-regulatory-activities

- Clause 3.11.4 when read in conjunction with Market Rule 3.11.5, which provides AEMO with discretion to determine the requirements according to location, take into account differing load levels or other scenarios, and vary by type of day and/or by time of day and/or vary across the year.
- Clause 3.11.11(c), which requires AEMO to determine the Ancillary Services plan to meet the requirements at a) for the coming year.

AEMO's 2020/21 report contains its requirements for all classes of Ancillary Services, complying with the requirement at a) above. The ERA's consideration of the remaining obligations is discussed in the following sections.

3. Load Following Services

Load Following Ancillary Services (LFAS) ensure electricity supply and demand are balanced in real time to maintain the frequency of the power system within the SWIS Operating Standards.[3]

AEMO must determine Ancillary Service Requirement in accordance with the SWIS Operating Standards and the Ancillary Service Standards (Clause 3.11.1 of the Market Rules).

The SWIS Operating Standards include the frequency standards for a network defined in the Technical Rules (Table 2).[4]

Table 1: Frequency operating standards in the Technical Rules

Condition	Frequency band
Normal Range (South West)	49.8 Hz to 50.2 Hz for 99% of the time
Single Contingency Event	48.75 Hz to 51 Hz

The Ancillary Service Standard for LFAS is defined in Market Rule 3.10.1. This rule states:

> 3.10.1. The standard for Load Following Service is a level which is sufficient to:
>
> (a) provide Minimum Frequency Keeping Capacity, where the Minimum Frequency Keeping Capacity is the greater of:
>
> i. 30 MW; and
>
> ii. the capacity sufficient to cover 99.9% of the short-term fluctuations in load and output of Non-Scheduled Generators and uninstructed output fluctuations from Scheduled Generators, measured as the variance of one minute average readings around a thirty minute rolling average.

3.1 AEMO's proposed Load Following Service requirement

AEMO's LFAS requirements are procured from the LFAS market. The LFAS market is settled on the quantity of LFAS that is approved by the ERA in this report.

AEMO reported that there were five certified LFAS providers, but only three providers actively participated in the LFAS markets during 2019/20.

The LFAS requirement was changed from a static +/-72 MW in 2018/19 to a more dynamic requirement of +/-85 MW between 5:30 AM and 7:30 PM, and +/- 50 MW between 7:30 PM and 5:30 AM for 2019/20. AEMO stated that, based upon the observed frequency, this quantity of LFAS was adequate for the period.

[3] Market Rule 3.9.1 defines the Load Following Service.

[4] Market Rule 3.1.1 states that the frequency and time error standards for a Network in the SWIS are as defined in the Technical Rules that apply to that Network.

For the initial part of 2020/21, AEMO proposed to maintain the LFAS requirement at:

- +/-85 MW between 5:30 AM and 7:30 PM
- +/-50 MW between 7:30 PM and 5:30 AM.

AEMO expected that approximately 520 MW of additional intermittent non-scheduled generation would connect to the SWIS in the initial part of 2020/21. This new generation is expected to increase the requirement for LFAS. AEMO was unable to determine the extent to which this additional capacity would affect the LFAS requirements. If circumstances arise where the approved LFAS requirement is insufficient, AEMO will reassess the requirement and submit an updated proposal in accordance with clause 3.11.3 of the Market Rules.[5]

3.2 ERA assessment

The method AEMO used to determine the 2020/21 LFAS requirement was based upon the method approved in the 2019/20 Ancillary Services report. AEMO met the LFAS requirements at least 99 per cent of the time during 2019/20 and maintained the frequency within a normal operating range in excess of 99.9 per cent of the time.

The substantial addition of non-scheduled generation to the SWIS may materially change the LFAS requirements.

Where the quantity of LFAS required by AEMO is greater than the quantity of LFAS available for that Trading Interval, AEMO may use the Balancing Portfolio to provide the LFAS Quantity Balancing or the Increased LFAS Quantity (Clause 7B.4.1(b) of the Market Rules). AEMO used backup LFAS on 10 occasions in 2019/20, due to volatility resulting from non-scheduled generation, including rooftop photovoltaic, exceeding the cleared quantities.

The ERA's analysis indicates that dispatch of additional LFAS from the backup market is typically less economically efficient than an increased enablement of LFAS from the primary market.

The ERA considers that there may be additional opportunities for AEMO to minimise the cost of primary LFAS by undertaking further analysis into any change to the required quantity following connection of additional non-scheduled generation during 2020/21.

[5] Clause 3.11.3 of the Market Rules states If it considers that a considerable shortfall of any Ancillary Service relative to the applicable Ancillary Service Standard is occurring, or is likely to occur before the next update under clause 3.11.2, System Management may reassess the level of the Ancillary Service Requirements for that Ancillary Service at that time.

4. Spinning Reserve Service

Spinning Reserve Ancillary Service provides a rapid increase in generation following a sudden or unexpected shortfall in supply resulting from the loss of a large generator or transmission equipment.[6]

The SWIS Operating Standards require the frequency to remain within the 48.75 Hz to 51 Hz band for a single contingency event, such as an outage of one transmission line[7] (refer to Table 2).

The Ancillary Service Standard for Spinning Reserve Service is defined in Market Rule 3.10.2. This rule states:

> 3.10.2. The standard for Spinning Reserve Service is a level which satisfies the following principles:
>
> (a) the level must be sufficient to cover the greater of:
>
> i. 70% of the total output, including Parasitic Load, of the generation unit synchronised to the SWIS with the highest total output at that time; and
>
> ii. the maximum load ramp expected over a period of 15 minutes;
>
> (b) the level must include capacity utilised to meet the Load Following Service standard under clause 3.10.1, so that the capacity provided to meet the Load Following requirement is counted as providing part of the Spinning Reserve requirement;
>
> (c) the level may be relaxed by up to 12% by System Management where it expects that the shortfall will be for a period of less than 30 minutes; and
>
> (d) the level may be relaxed following activation of Spinning Reserve and may be relaxed by up to 100% if all reserves are exhausted and to maintain reserves would require involuntary load shedding. In such situations the levels must be fully restored as soon as practicable.

4.1 AEMO's proposed Spinning Reserve requirement

AEMO's proposed Spinning Reserve requirement for 2020/21 is at least the maximum of:

- 70 per cent of the largest generating unit
- 70 per cent of the largest contingency event that would result in generation loss.

4.2 ERA's assessment

The purpose of Spinning Reserve as defined in Market Rule 3.9.1 is to manage system frequency after the failure of equipment and prevent involuntary disconnections.

The standards for Spinning Reserve mean that the Spinning Reserve requirement is not a static megawatt level. It is a dynamic requirement that AEMO sets in the planning horizon and adjusts closer to real-time according to system conditions. The requirement is not used for

6 The Spinning Reserve Service is defined in clause 3.9.2 of the Market Rules.

7 A single contingency is defined in the Technical Rules as '…a sequence of related events which result in the removal from service of one transmission line, transformer or other item of equipment…'.

settlement purposes, rather the Market Rules require compensation for the provision of Spinning Reserve services to be determined through the margin values process or by contract.

As a result, the ERA's assessment of AEMO's Spinning Reserve requirement is limited to considering:

- Whether the wording of AEMO's proposed requirement is consistent with the standards.
- Whether there is any historical evidence that the real-time requirement derived from AEMO's wording was not adequate.

Under the Market Rules, AEMO is obliged to set the Spinning Reserve requirement in accordance with the SWIS Operating Standards and the Ancillary Service Standard. The Market Rules require the application of standards under different frameworks (for example, the SWIS Operating Standards are found in the Technical Rules which apply to the network and the Ancillary Services Standards are in the Market Rules). This may create ambiguity when deriving the wording of a requirement to meet both standards. This is not the case with AEMO's requirement at paragraph 30 because it specifically refers to its obligations under both these standards. The ERA has not found any evidence to conclude AEMO has failed to satisfy both sets of requirements, or that indicates the requirements proposed by AEMO are insufficient.

The ERA also assessed the historical information provided in AEMO's 2019/20 Ancillary Services report. AEMO's report shows AEMO's performance in managing frequency in 2018/19 exceeded the SWIS Operating Standards. Frequency was maintained in the normal operating range for over 99.9 per cent of the time and there were no frequency excursions below 48.75 Hz in 2018/19, which was the applicable level for Spinning Reserve.

On 10 January 2020, an under-frequency load shedding event occurred when a scheduled generator tripped. This was followed by the loss of several other generators with a total reduction of approximately 495 MW of supply. AEMO is currently investigating the matter and will publish a detailed summary in due course.

The ERA also considered AEMO's plan to procure the services to meet the Spinning Reserve requirements in 2020/21. AEMO's plan is summarised in Table 2.

Table 2: AEMO's 2020/21 plan for Spinning Reserve

Ancillary Service	Summary of procurement plan for 2020/21
Spinning Reserve Services	42 MW supplied by long term interruptible load contract. 21 MW sourced from a short-term interruptible load contract at a discount to the Synergy administered price. Reserves above contracted amounts will be provided by the Balancing Portfolio. (Synergy is the default provider of Spinning Reserve Services).

5. Load Rejection Reserve service

Load Rejection Reserve services are provided by generators that are instructed to decrease their output quickly where load is lost, such as when a transmission line trips. This service is required to maintain system frequency within acceptable limits.

The SWIS Operating Standards require the frequency to remain below 51 Hz for a single contingency event, such as an outage of one transmission line[8] (refer to Table 2).

The Ancillary Service Standard for Load Rejection Reserve is defined in Market Rule 3.10.4. This rule states:

> 3.10.4. The standard for Load Rejection Reserve Service is a level which satisfies the following principles:
>
> (a) the level sufficient to keep over-frequency below 51 Hz for all credible load rejection events;
>
> (b) may be relaxed by up to 25% by System Management where it considers that the probability of transmission faults is low.

5.1 AEMO's proposed Load Rejection Reserve requirement

For 2020/21 AEMO specified a requirement of up to 90 MW for Load Rejection Reserve.[9] The Market Rules allow AEMO to relax the Load Rejection Reserve requirement by up to 25 per cent where it considers that the probability of transmission faults is low (clause 3.10.4(b) of the Market Rules). AEMO will plan to meet the requirement of 90 MW. This is consistent with the ERA's determination and the approach AEMO applied operationally in recent years.

5.2 ERA's assessment

When assessing AEMO's Load Rejection Reserve requirement, the ERA considered the results of a trial AEMO has been conduction for a dynamic Load Rejection Reserve requirement. AEMO states "the trial has proved to be successful, and AEMO will now use a dynamic requirement in real time".

Given the successful results of AEMO's trial, the ERA approves AEMO's proposal and plan.

8 A single contingency is defined in the Technical Rules as '…a sequence of related events which result in the removal from service of one transmission line, transformer or other item of equipment…'.

9 AEMO will plan sufficient reserve to meet the minimum requirement but will use a dynamic requirement in real time that may reduce the requirement in real time where system conditions are suitable.

6. Contracted services

The Market Rules state that AEMO may enter into an Ancillary Service Contract with a participant for Load Rejection Reserve, System Restart or Dispatch Support services (clause 3.11.8A of the Market Rules). Load Rejection Reserve services were discussed in section 5. The remaining two services that are defined under the Market Rules, System Restart and Dispatch Support services are discussed below.

6.1 System Restart

System Restart services are provided by generators capable of starting up in total blackout system conditions, and able to energise the power system to enable other generators to be started up.

The Ancillary Service Standard for System Restart is defined in Market Rule 3.10.6. This rule states:

> 3.10.6 The standard for System Restart Service is a level which is sufficient to meet System Management's operational plans as developed in accordance with clause 3.7.1.

Clause 3.7.1 requires AEMO in its capacity as System Management to make operational plans and preparations to restart the SWIS in the event of a blackout. There is no external oversight of these operational plans under the Market Rules. The clause states:

> 3.7.1 System Management must make operational plans and preparations to restart the SWIS in the event of a system shutdown

For 2020/21, AEMO requires three system restart facilities. These facilities should not be in the same location, to mitigate the risk of total service failure due to a common reason. AEMO reasoned that three facilities were required in case one or more of the facilities could not provide the service due to planned or unplanned outages.

AEMO contracted three services in three different geographical locations (North Metropolitan, South Metropolitan and South Country).

Under the Market Rules, AEMO must determine a requirement for System Restart that is consistent with its own operational plans. This effectively means that AEMO is the decision maker for the System Restart service requirement, where the requirement is consistent with its operational plans. The ERA is not aware of any evidence to indicate any inconsistencies.

6.2 Dispatch Support Services

Market Rule 3.9.9 defines Dispatch Support Services. This rule states:

> 3.9.9. Dispatch Support Service is any other ancillary service that is needed to maintain Power System Security and Power System Reliability that are not covered by the other Ancillary Service categories. Dispatch Support Service is to include the service of controlling voltage levels in the SWIS, where that service is not already provided under any Arrangement for Access or Network Control Service Contract.

There is no Ancillary Service standard for Dispatch Support Services. Instead the need for the service is determined by AEMO. This service is to be procured under contract (clause 3.11.8A of the Market Rules).

AEMO's 2020/21 Ancillary Services report states that there are no current requirements for Dispatch Support Services, but did identify emerging challenges that may require these services. AEMO may seek approval from the ERA for a Dispatch Support Services contract should these challenges threaten power system security.

7. Ancillary Services Costs 2019/20

The total cost of Ancillary Services for 2019/20 was approximately $11.7 million less than 2018/19 (and $8 million less than 2017/18). This decrease was primarily due to a $12 million decrease in the total LFAS downwards costs and a $5 million decrease in Spinning Reserve costs. These reductions were partially offset by increases to the cost of LFAS upwards and System Restart Services.

Total LFAS costs reduced by approximately $7.7 million in 2019/20 compared to 2018/19, due to a reduction in the weighted average cost of LFAS Downwards, and approved changes to the LFAS requirements during the reporting period.

The reduction in Spinning Reserve costs is predominantly driven by a reduction in the margin values from 25 per cent and 50 per cent in 2018/19 to 12.92 per cent and 17.32 per cent in 2018/19.

8. Conclusion and recommendations

The ERA approves AEMO's 2020/21 Ancillary Service requirements as set out in Table 1. To make its determination the ERA considered:

- AEMO's historical performance maintaining power system security and reliability.
- AEMO's requirements for 2020/21, which take into account results from the dynamic LRR trial.
- The requirement under the Market Rules for AEMO to monitor whether changes are required to the service levels during 2020/21. Should there be any changes, AEMO will need to reassess these and seek the ERA's approval under Market Rule 3.11.6.

The ERA recommends that AEMO actively monitor the adequacy of the new LFAS requirement during 2020/21. AEMO should keep the ERA informed of the progress of any changes throughout the year, and provide advance notice of any amendments, refinements or other proposed changes to the requirements prior to submission of the 2021/22 requirements.