AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Ancillary Services Report for the WEM 2020

June 2020

System Management

Important notice

PURPOSE

AEMO publishes the Wholesale Electricity Market Ancillary Services report under clause 3.11.13 of the Wholesale Electricity Market Rules.

This publication has been prepared by AEMO using information available at 22 May 2020. Information made available after this date may be included in this publication where practicable.

DISCLAIMER

This document or the information in it may be subsequently updated or amended. This document does not constitute legal or business advice, and should not be relied on as a substitute for obtaining detailed advice about the Wholesale Electricity Market Rules or any other applicable laws, procedures or policies. AEMO has made every effort to ensure the quality of the information in this document, but cannot guarantee its accuracy or completeness.

Accordingly, to the maximum extent permitted by law, AEMO and its officers, employees and consultants involved in the preparation of this document:

- make no representation or warranty, express or implied, as to the currency, accuracy, reliability or completeness of the information in this document; and
- are not liable (whether by reason of negligence or otherwise) for any statements or representations in this document, or any omissions from it, or for any use or reliance on the information in it.

VERSION CONTROL

Version	Release date	Changes
1	29/5/2020	Submission to ERA
2	26/6/2020	Updates in sections 2.3 and 5.2 to reflect actions completed post ERA submission

Contents

Tables

Figures

1. Introduction

Each year AEMO is required to publish an Ancillary Services report for the Wholesale Electricity Market (WEM), including the Ancillary Service Requirements for the next year and an Ancillary Services plan to meet those requirements.

1.1 Purpose

Clause 3.11.2 of the Wholesale Electricity Market Rules (WEM Rules) requires AEMO to update Ancillary Service Requirements on an annual basis. The Ancillary Service Requirements must be set based on the facilities and configuration expected for the South West Interconnected System (SWIS) in the coming year.

Clause 3.11.6 of the WEM Rules requires AEMO to submit the Ancillary Service Requirements to the Economic Regulation Authority (ERA) for approval.

Clause 3.11.11 of the WEM Rules states:

> By 1 June each year, System Management must submit to the Economic Regulation Authority a report containing information on:
>
> (a) the quantities of each of the Ancillary Services provided in the preceding year, including Ancillary Services provided under Ancillary Service Contracts, and the adequacy of these quantities;
>
> (b) the total cost of each of the categories of Ancillary Services provided, including Ancillary Services provided under Ancillary Service Contracts, in the preceding year; and
>
> (c) the Ancillary Service Requirements for the coming year and the Ancillary Services plan to meet these requirements.

Clause 3.11.12 of the WEM Rules requires the ERA to audit the Ancillary Services plan.

Clause 3.11.13 of the WEM Rules requires AEMO to publish the Ancillary Services report (including the Ancillary Services plan).

1.2 Frequency operating standards

Clause 3.11.1 of the WEM Rules requires AEMO to determine all Ancillary Service Requirements in accordance with the SWIS Operating Standards and the Ancillary Service Standards.

The SWIS Operating Standards are defined as "the standards for the operation of the SWIS including the frequency and time error standards and voltage standards set out in clause 3.1". Clause 3.1 states that the frequency, time error standards and voltage standards for a Network in the SWIS are as defined in the Technical Rules that apply to that Network.

Table 1 summarises the frequency operating standards for the SWIS as defined in the Technical Rules[1]. AEMO uses these frequency operating standards to assess SWIS frequency performance.

The Ancillary Service Standards are intended to enable AEMO to ensure the SWIS operates within normal frequency bands and to restore the SWIS to the normal frequency bands within the target recovery time following a contingency event.

[1] Table 2.1 of the Technical Rules.

Table 1 Frequency operating standards for the South West Interconnected Network

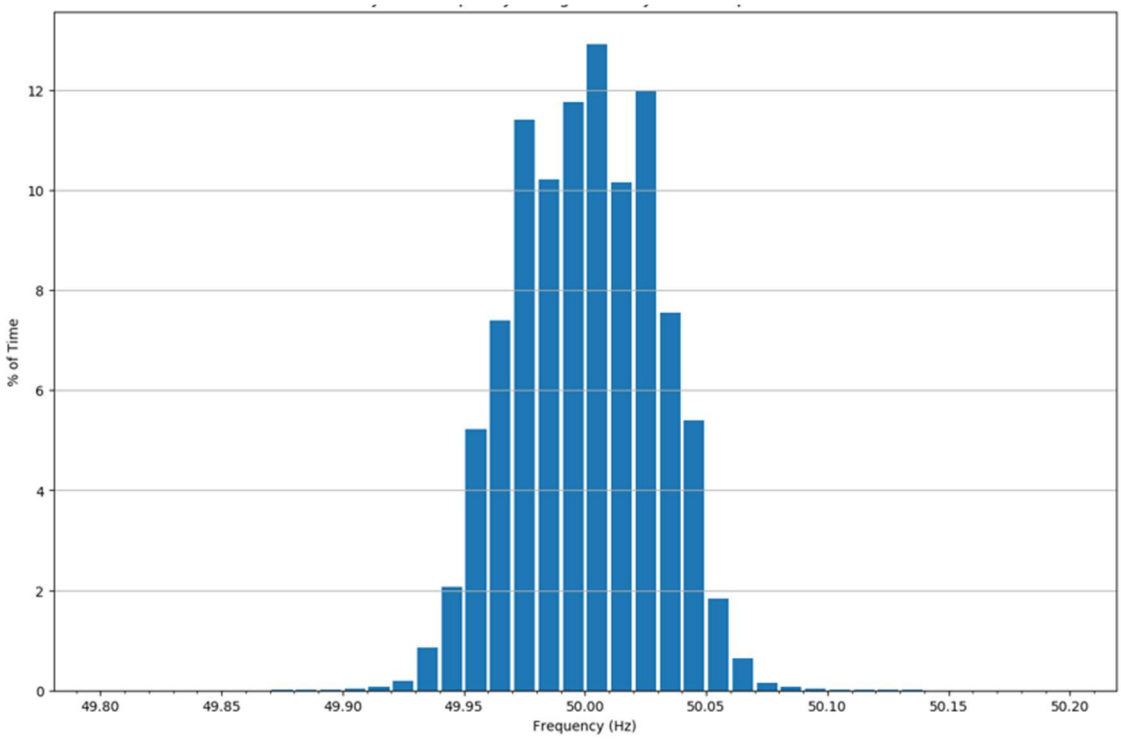
Condition	Frequency band	Target recovery time
Normal range: South West	49.8 to 50.2 Hz for 99% of the time	
Single Contingency Event	48.75 to 51 Hz	Normal range: within 15 minutes For over-frequency events: below 50.5 Hz within 2 minutes

There are different categories of frequency control Ancillary Services in the SWIS:

- The Load Following Service (LFAS) is used to continuously balance supply and demand. While contingency reserves arrest the frequency change following a contingency event, LFAS will restore the frequency to 50 Hz[2]. LFAS is dispatched using Automatic Generation Control (AGC). Clause 3.10.1(a) of the WEM Rules sets the standard for LFAS as a level that is the greater of 30 MW and 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. While LFAS is provided by specific generators cleared in the LFAS market for provision of this service, the above standard is also partially met by the governor droop response of all other synchronous generators.
- Spinning Reserve (SRAS) and the Load Rejection Reserve (LRR) are relied on as contingency reserves to arrest a frequency change following the unplanned loss of generation or demand. While some SRAS is provided by Interruptible Loads, SRAS and LRR are mostly provided using the governor droop response on specific synchronous generators able to maintain the response for the period of service.
- The frequency performance of the SWIS for the period under review is provided in Figure 1. The frequency remained in the normal operating band for 99.993% of the time. This meets the frequency operating standards specified in the Technical Rules. This performance was a product of the combination of active frequency control of the LFAS generators via AGC and the governor responses from all online generators.

[2] Depending on the size of the contingency, rebalancing may be required to restore frequency to 50 Hz. Depending on the shortfall additional generation may be required to be brought on. This might be in or out of merit depending on the timeframe of response required.

Figure 1 Frequency performance of the SWIS from May 2019 to April 2020



2. Ancillary Service quantities

This section describes the quantity of each Ancillary Service provided in the preceding year and the adequacy of those quantities. The period of reporting is May 2019 to April 2020.

2.1 Overview

Clause 3.9 of the WEM Rules defines the following Ancillary Services:

- Load Following Service (LFAS).
- Spinning Reserve Service (SRAS).
- Load Rejection Reserve Service (LRR).
- Dispatch Support Service (DSS).
- System Restart Service.

2.2 Load Following Service (LFAS)

The LFAS requirement approved for the 2019-20 Financial Year was 85 MW LFAS Upwards and Downwards between 5:30 AM and 7:30 PM, and 50 MW LFAS Upwards and Downwards between 7:30 PM and 5:30 AM to be enabled for each Trading Interval.

There are currently five certified LFAS providers in the WEM, and three of them actively participated in the LFAS Market in the 2019-20 Financial Year.

Backup LFAS in the range of 25 MW to 88 MW was utilised on 10 occasions, due to volatility in non-scheduled generation and rooftop photovoltaic (PV) significantly exceeding the cleared quantities.

The average quantity of LFAS Upwards and LFAS Downwards enabled by all providers in the reporting period is shown in Table 2.

Table 2 LFAS quantities

	Requirement	LFAS Upwards	LFAS Downwards
Average quantity enabled[A] (from 1 May 2019 to 30 April 2020)		92.64 MW	95.27 MW
Average quantity enabled from 1 May 2019 up to 8:00 AM on 28 August 2019[B].	72 MW	101.71 MW	102.71 MW
Average quantity enabled between 8:00 AM to 7:30 PM on 28 August 2019 and, between 5:30 AM to 7:30 PM from 29 August 2019 to 30 April 2020.	85 MW	101.64 MW	106.97 MW
Average quantity enabled between 7:30 PM and 5:30 AM from 28 August 2019 to 30 April 2020.	50 MW	69.38 MW	70.09 MW
Average number of minutes per day requirement not met		14.39 minutes	13.90 minutes
% of time requirement met[C]		99.00%	99.04%
Frequency within normal operating range for > 99.9% of the time[D]	met		

A. For non-Balancing Facilities, the quantity enabled is the LFAS Market cleared volume, while for Balancing Portfolio Facilities, it is the entire operating range. For the purpose of this analysis, half of the quantity enabled for Balancing Portfolio Facilities is assumed to be LFAS Upwards and the other half is assumed to be LFAS Downwards.

B. LFAS requirements were changed at 8:00 AM on 28 August 2019.

C. While AEMO endeavours through its operational planning to have the required level of LFAS available, real-time events result in less than 100% of this target being achieved.

D. Clause 3.1.1 of the WEM Rules 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. According to the Technical Rules, frequency should be within the normal band (49.8 Hz and 50.2 Hz) for 99% of the time.

Based on the observed frequency performance, the quantity of LFAS provided during the reporting period was adequate.

2.3 Spinning Reserve Service (SRAS)

Clause 3.10.2(a) of the WEM Rules requires the standard for SRAS to be a level that is 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 the time; and

ii. the maximum load ramp expected over a period of 15 minutes.

For the 2019-20 Financial Year, SRAS was provided by Balancing Portfolio Facilities and by Interruptible loads under two Ancillary Service Contracts. Generation Facilities in the Balancing Portfolio are not specifically enabled to provide SRAS. The available quantity from Balancing Portfolio Facilities is based on the spare capacity of SRAS-capable Balancing Portfolio Facilities operating. The available quantity from a non-Balancing Portfolio Facility is based on the Ancillary Service Contract, which requires the non-Balancing Portfolio Facility

to satisfy technical criteria and operate within a specific range. There was 63 MW provided under the two Ancillary Service contracts.

The SRAS requirement approved for the 2019-20 Financial Year was at least the maximum of:

- 70% of the largest generating unit; and
- 70% of the largest contingency event that would result in generation loss.

AEMO may relax the SRAS requirement by up to 12% where it expects a shortfall will be for a period of less than 30 minutes[3].

In the case of a shortfall of up to 12% for a period of less than 30 minutes, the availability of SRAS was considered to be adequate.

There was adequate Spinning Reserve for about 99.65% of the time during the reporting period. The average shortfall was 18.05 MW.

Analysis has shown that about 69% of the time, when there was a shortfall in SRAS, this was as a result of LFAS Upwards being utilised[4]. The inclusion of LFAS in SRAS means it is likely there will be times when the available SRAS is less than the requirement as some of the LFAS Upwards is utilised. In such situations, AEMO will assess the risk and where necessary take appropriate measures to minimise the risk to power system security. It is possible in such a scenario, that if the largest contingency were to occur during a time when there was inadequate SRAS and there was no other available response from other generators on the system, that under-frequency load shedding could occur. As part of the WEM Reform, the new Essential System Services will be designed so as to minimise this risk[5]. In the meantime, a situational awareness tool has been developed for the control room to assist in decision making during these infrequent circumstances.

During the reporting period, eight generator contingencies resulted in High Risk Operating States or Emergency Operating States.

One under-frequency load shedding event was recorded during the reporting period. The event, which occurred on 10 January 2020, was as a result of the combination of the loss of a generator followed by trips of other generators and the runback of two wind farms. The total loss of generation, which amounted to about 495 MW within four minutes, was more than the largest single contingency that AEMO was required to cater for to maintain power system security at the time. A detailed report on the under-frequency event has been submitted separately to the ERA and published on AEMO's website.

Overall, the quantity of SRAS provided during the reporting period was adequate.

[3] Clause 3.10.2(c) of the WEM Rules.

[4] This relates to LFAS provided by generators that is counted towards SRAS under the WEM Rules.

[5] http://www.wa.gov.au/sites/default/files/2019-12/Information%20Paper%20-%20ESS%20Scheduling%20and%20Dispatch%20_final.pdf

Table 3 SRAS availability

	Quantity
Highest minimum requirement (catering for 340 MW contingency)[A]	238 MW
% of time requirement met[B]	99.65%
Average minutes per day requirement not met	5.08 minutes
Events resulting in a frequency excursion below 48.75 Hz[C]	1

A. The largest single generating unit in the SWIS is 340 MW.
B. While AEMO endeavours through its operational planning to have the required level of SRAS available, real-time events result in less than 100% of this target being achieved.
C. Clause 3.9.2 of the WEM Rules defines the purpose of SRAS as, among other things, to retard frequency drops following the failure of one or more generating works or transmission equipment. Table 2.1 of the Technical Rules sets the minimum frequency operating standard for a single contingency event as 48.75 Hz.

2.4 Load Rejection Reserve Service (LRR)

LRR was provided by generation Facilities in the Balancing Portfolio that were capable of doing so. These generators are not specifically enabled to provide LRR. A generator can provide LRR when it is online, and its output is in the correct range. The quantity of the available reserve is determined by the generator's output and its ability to respond when the frequency increases.

Since the beginning of April 2019, AEMO has been conducting a LRR trial using a dynamic requirement in real time. The dynamic formulation incorporates physical aspects of the power system, including setting the upper limit of the LRR requirement based on the largest credible contingency in real time[6]:

1. Allowing for the consequential corresponding change in load as a result of an increase in frequency, known as load relief; and
2. Where required by the Network Operator as a requirement of connection to the SWIS, allowing for the operation of Facility protection systems in response to frequency fluctuations.

The purpose of the trial was to determine whether it is possible to practically manage a dynamic LRR requirement while still ensuring power system security. The trial has been successful, and this has formed the basis for the proposed requirements for 2020-21 Financial Year.

The LRR requirement approved for the 2019-20 Financial Year was up to a maximum of 120 MW. During the year, between April and September, AEMO planned for 120 MW LRR in the planning horizon while operating with a dynamic requirement in real time. The LRR requirement in the planning timeframe has since been reduced to 90 MW.

The adequacy of LRR is described by the percentage of time that the quantity of LRR provided at each point in time was in the indicated range in real time.

Although adequate LRR was planned for and made available pre-dispatch, there were periods when the minimum requirement for LRR was not met in real time (approximately 0.56% of the time). This was a consequence of changes in power system conditions, particularly where variability in non-scheduled generation and load affected the availability of LFAS Downwards (which is considered as providing part of LRR). Based on experience of past events, even when the quantity of LRR available was lower than the requirement, the standard for LRR service was still met, as the frequency would not have exceeded 51 Hz for credible load rejection events.

During the reporting period there were no frequency excursions greater than 51 Hz.

Overall, the quantity of LRR provided during the reporting period was adequate.

[6] This has been set to a maximum of 120 MW.

Table 4 LRR availability

	Quantity
Approved LRR requirement	Up to 120 MW
LRR requirement in planning horizon (between April 2019 and September 2019)	120 MW
LRR requirement in planning horizon (between September 2019 and April 2020)	90 MW
Real time LRR requirement	Dynamic LRR
% of time dynamic LRR requirement met	99.44%
% of time less than dynamic requirement was provided[A]	0.56%
Frequency excursions above 51 Hz[B]	0

A. While AEMO endeavours through its operational planning to have the required level of LRR available, real-time events result in less than 100% of this target being achieved.
B. Clause 3.10.4(a) of the WEM Rules requires the LRR standard to be a level sufficient to keep over-frequency below 51 Hz for all credible load rejection events.

2.5 System Restart Service

There were three System Restart Ancillary Service Contracts in place during the 2019-20 Financial Year.

At least two services were available at all times during the reporting period.

Successful restart tests for two of the three contracts were completed during the reporting period.

No events occurred during the reporting period that required a system restart.

Table 5 System Restart Service availability

Services	Availability requirement[A]
At least two System Restart services available at all times[A]	Met

A. AEMO plans to ensure there are at least two System Restart Services available at all times to cater for a forced outage on one service.

3. Cost of Ancillary Services provided

Clause 3.11.11(b) of the WEM Rules requires this report to include the total cost of each Ancillary Service category provided in the preceding year. The period of reporting is April 2019 to March 2020.[7]

The cost of Ancillary Services as calculated by AEMO for the period from 1 April 2019 to 31 March 2020 is set out in Table 6. This period reflects the most recently available settlement data. The cost of each Ancillary Service is determined in accordance with the calculations specified in the WEM Rules, which are summarised in Table 6.

For comparative purposes, the cost of each Ancillary Service in the previous year is also provided.

[7] The period is one month earlier than that used in Section 2. This reflects the most recently available settlement data.

Table 6 Ancillary Service costs for 2018-19 and 2019-20[8]

Ancillary Service	WEM Rule	1 April 2019 – 31 March 2020		1 April 2018 – 31 March 2019	
		Quantities	Cost ($)	Quantities	Cost ($)
LFAS total			79,768,570		87,060,056
LFAS capacity	9.9.2(q)	• 72 MW (applied from 1 April 2019 to 27 August 2019) • 85 MW between 5:30 AM and 7:30 PM; 50 MW between 7:30 PM and 5:30 AM (applied from 28 August 2019 to 31 March 2020)	9,455,204	72 MW	9,027,097
LFAS Upwards	9.9.2(a)	• 72 MW (applied from 1 April 2019 to 27 August 2019) • 85 MW between 5:30 AM and 7:30 PM; 50 MW between 7:30 PM and 5:30 AM (applied from 28 August 2019 to 31 March 2020)	33,825,624	72 MW	29,590,394
LFAS Downwards	9.9.2(b)	• 72 MW (applied from 1 April 2019 to 27 August 2019) • 85 MW between 5:30 AM and 7:30 PM; 50 MW between 7:30 PM and 5:30 AM (applied from 28 August 2019 to 31 March 2020)	36,487,742	72 MW	48,442,565
SRAS peak **SRAS off-peak**	9.9.2(f)	SRAS peak • 224.1 MW (1 April 2019 to 30 June 2019) • 235.40 MW (1 July 2019 to 31 March 2020) SRAS off-peak • 189.0 MW (1 April 2019 to 30 June 2019). • 236.40 MW (1 July 2019 to 31 March 2020)	11,701,593	SRAS peak • 221.8 MW (1 April 2018 to 30 June 2018) • 224.1MW (1 July 2018 to 31 March 2019) SRAS off-peak • 190.2 MW (1 April 2018 to 30 June 2018). • 189.0MW (1 July 2018 to 31 March 2019)	17,093,703
Contract LRR[A]	9.9.4(a)	-		-	-
LRR[B]	9.9.1	Up to 120 MW	974,794	120 MW	583,853
Contract System Restart Service	9.9.4(a)	3 Facilities	3,044,429	3 Facilities	1,868,004
System Restart Service paid via Synergy AS Payment	9.9.1	Default payment for the System Restart Service component via the Synergy Ancillary Service Payment.	1,782		-
Dispatch Support Service[C]	9.9.3A		-		620,185
Total			**95,491,168**		**107,225,801**

A. AEMO has not entered into any LRR Ancillary Service contracts.

[8] All dates specified are on Trading Day basis.

B. Synergy's payment for LRR as the default provider.
C. There were no Dispatch Support Service contracts during the relevant period.

3.1 LFAS Costs

LFAS is provided through a market mechanism, and the availability costs are driven by the combination of prices offered by Market Participants and quantities cleared in the LFAS Market.

The LFAS requirements for 2019-20 changed on 28 August 2019 from 72 MW to 85 MW between 5:30 AM and 7:30 PM and 50 MW between 7:30 PM and 5:30 AM. In 2019-20 two additional facilities commenced participation in the LFAS Market. This increase in competition placed downward pressure on LFAS prices.

In 2019-20, due to increased competition in the LFAS Market and the introduction of more efficiently sculpted LFAS requirements there was an overall net reduction in total LFAS availability costs of approximately $7.72M[9] compared to 2018-19.

- The LFAS availability costs for LFAS Upwards (LFAS Up) increased by $4.23M in 2019-20 compared to those in 2018-19, primarily due to an increase in the LFAS Up requirement during the peak periods, when the LFAS Up prices are typically higher. In addition, the weighted average prices for LFAS Up increased from $23.41/MW to $26.96/MW for 2018-19 and 2019-20 respectively.
- The LFAS availability costs for LFAS Downwards (LFAS Down) decreased by $11.95M in 2019-20 compared to those in 2018-19, primarily due to a decrease in LFAS Down quantities during the off-peak periods, when the LFAS Down prices are typically higher. In addition, the weighted average prices for LFAS Down decreased from $38.29/MW to $29.00/MW for the 2018-19 and 2019-20 respectively.

The LFAS Capacity cost is calculated by multiplying the LFAS capacity requirement by the administered Reserve Capacity Prices[10]. In 2019-20, the increase in LFAS Capacity costs were due to the higher administered Reserve Capacity Prices for the 2019-20 reporting period[11] compared to the 2018-19 reporting period[12].

3.2 SRAS Costs

SRAS costs include services provided by Synergy and those provided under Ancillary Service Contracts. SRAS costs are driven predominantly by the Margin Values. Each year AEMO submits a report with proposed Margin Values and the ERA makes a determination, which sets the Margin Values to be applied to the Balancing Price. The decrease in SRAS costs was mainly driven by the Margin Values reducing from 25% and 50% (peak and off-peak respectively) in 2018-19 to 17.32% and 12.92% in 2019-20. Further information on the changes in the Margin Values can be found in AEMO's proposal and the ERA's determination of the Margin Values for 2019-20[13].

In accordance with the WEM Rules, the total quantity of SRAS that is compensated for is the average requirement for peak periods and off-peak periods assumed in the modelling done for the Margin Values determination. Synergy, the default provider of SRAS under the WEM Rules, receives an administered payment for the difference between the determined average quantity less any available contracted SRAS and less any component allocated to LFAS Up. The quantity paid to other Market Participants under SRAS Ancillary Service Contracts is subject to the availability of the service and must be based on a contract price that is lower than Synergy's administered payment[14].

[9] Net decrease in LFAS Availability Costs of $7,719,593, due LFAS Upwards cost increasing by $4,235,230 and the LFAS Downwards cost decreasing by $11,954,823.

[10] In accordance with clause 9.9.2 of the WEM Rules.

[11] For the 2019-20 reporting period the Reserve Capacity Prices were $126,683.47 (1/4/19-30/9/19) and $114,134.15 (1/10/19-1/4/20).

[12] For the 2018-19 reporting period the Reserve Capacity Prices were $111,752.53 (1/4/18-30/9/18) and $126,683.47(1/10/18-31/3/19).

[11] In accordance with clause 9.9.2(f) of the WEM Rules.

[13] See https://www.erawa.com.au/electricity/wholesale-electricity-market/ancillary-services-parameters/spinning-reserve-margin_peak-and-margin_off-peak.

[14] In accordance with clause 3.11.8 of the WEM Rules.

3.3 System Restart Service and LRR Costs

AEMO entered into System Restart Service contracts and the costs were $1,868,004 and $3,044,429 for 2018-19 and 2019-20 respectively. The increase in System Restart Service costs were the result of a new service being available throughout 2019-20, whereas this service was only available partly through 2018-19.

The LRR cost is calculated relative to the Cost_LR parameter less any payments for LRR contracts and System Restart Service contracts[15]. AEMO submits a report with the proposed Cost_LR parameter and ERA makes a determination on the Cost_LR parameter to be used. AEMO did not enter into any LRR Ancillary Service contracts for either 2018-19 or 2019-20[16]. Instead, all LRR costs were paid to Synergy as the default provider, and settled through the Synergy AS Provider Payment, in accordance with clause 9.9.1 of the WEM Rules. Under clauses 9.9.1 and 9.9.3A of the WEM Rules, the LRR costs are relative to the Cost_LR parameter determined by the ERA and the contract System Restart Service costs. For a trading month, if the contract System Restart Services costs exceed the 'R' parameter in the Cost_LR parameter determined by the ERA, it will decrease[15] the LRR cost which is paid to compensate to Synergy as the default of LRR provider.

For the reporting periods 2018-19 and 2019-20, the Cost_LR parameter was $1,972,210[17] and $3,750,559[18] and the adjusted costs for contract System Restart Services were $1,388,357 and $2,775,765 respectively. This resulted in LRR costs of $583,853 and $974,794 for 2018-19 and 2019-20 respectively. The main driver for the lower LRR costs in 2018-19 was that the adjusted costs for contract System Restart Services were a higher proportion of the Cost_LR parameter in 2018-19, in comparison to 2019-20. This is consistent with the LRR cost outcome that when contract System Restart Services costs exceeds the 'R' parameter in the Cost_LR parameter, it will result in a decrease[15] to the LRR cost.

3.4 Dispatch Support Service Costs

AEMO did not incur costs for Dispatch Support Service in 2019-20, as there were no DSS contracts.

[15] In accordance with clause 9.9.3A of the WEM Rules, any decrease to LRR costs caused by excess contract System Restart Service costs must be capped to the monthly amount attributed of Cost_LR parameter.

[16] Expressions for Interest for contracting LRR Services were conducted for 2019-20, however no submissions were received. Historically, the value of this service has been relatively low.

[17] The Cost_LR parameter is determined on a financial year basis. The cost comprises of $489,081 (1/4/2018-30/6/2018) and $1,483,128 (1/7/2018-31/3/2019). Included in the Cost_LR parameter is the Load Rejection Reserve Service payment of $1,400,000.

[18] The Cost_LR parameter is determined on a financial year basis. The cost comprises of $492,572 (1/4/2019-30/6/2019) and $3,257,988 (1/7/2019-31/3/2020). Included in the Cost_LR parameter is the Load Rejection Reserve Service payment of $1,400,000.

4. Ancillary Services Requirements for 2020-21 Financial Year

Clause 3.11.11(c) of the WEM Rules requires this report to include the Ancillary Services Requirements for the coming year, and the Ancillary Services plan to meet those requirements. Clause 3.11.12 requires the ERA to audit this plan.

Clause 3.10 of the WEM Rules defines the Ancillary Services Standards. Clause 3.11.1 requires that AEMO determine all Ancillary Service Requirements in accordance with the SWIS Operating Standards (defined in clause 3.1) and the Ancillary Services Standards.

4.1 Load Following Ancillary Service (LFAS)

As indicated in section 2.2 of this report, from a power system security perspective, the provision of LFAS for the previous year has been adequate. Despite this, due to increasing rooftop PV penetration and commissioning of additional windfarms on the SWIS, the response from generators providing LFAS has increased. As has previously been the case, in the current environment, additional sources of frequency response contribute to the ability to manage frequency within the normal operating band. Thus, although the requirement to respond to volatility of rooftop PV generation and wind generation has increased, power system security continues to be maintained. This is expected to continue through 2020-21, even with increasing rooftop PV connections.

Between now and the end of quarter one of 2020-21, about 520 MW of intermittent generation will connect to the SWIS[19]. AEMO does not have sufficient information to determine the specific impact of this variable generation on the LFAS requirement, though the requirement is expected to increase. The correlation between output of the various facilities is a key consideration when determining the LFAS requirements, and can only be understood through operational experience. If the commissioning of these Facilities results in a shortfall of LFAS, AEMO will reassess the requirement as contemplated by clause 3.11.3 of the WEM Rules[20].

As such, for the purpose of this report, the requirements for LFAS will remain unchanged for the initial part of the 2020-21 year.

Additional analysis correlating LFAS utilisation with specific weather conditions, particularly impacting the requirements in the middle of the day, shows a wide range of requirements, depending on the type of weather. In order to ensure adequate LFAS is available for days when volatile weather is likely to require a higher level of LFAS response, during 2020-21, AEMO will introduce further processes to utilise weather forecasts to predict when a higher LFAS requirement is likely to be required on a day-ahead basis. Further analysis will be required to determine whether it will be better to lock down in advance a likely requirement for additional LFAS and procure from the market or wait until closer to real time to confirm additional LFAS is required and then utilise Back-up LFAS.

[19] 390 MW of wind generation, an additional 130 MW of grid-scale PV.

[20] WEM Rule 3.11.3: 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.

The following LFAS requirement is proposed for the 2020-21 Financial Year:

1. LFAS Upwards: 85 MW between 5.30 AM and 7.30 PM; 50 MW between 7.30 PM and 5.30 AM.
2. LFAS Downwards: 85 MW between 5.30 AM and 7.30 PM; 50 MW between 7.30 PM and 5.30 AM.

Operational experience after the connection of the new Facilities will allow AEMO to propose new requirements and a possible transitional arrangement.

4.2 Spinning Reserve Ancillary Service (SRAS)

The SRAS requirement must meet the SWIS Operating Standards and the Ancillary Service Standards. The SWIS Operating Standards require that the frequency remain within the band of 48.75-51 Hz for a single contingency event. Clause 3.10.2(a) of the WEM Rules requires the standard for SRAS to be a level that is sufficient to cover the greater of:

iii. 70% of the total output, including Parasitic Load, of the generation unit synchronised to the SWIS with the highest total output at the time; and

iv. the maximum load ramp expected over a period of 15 minutes.

Two large wind farms which will connect on a single transmission line are likely to be the largest generation contingency event for a significant number of intervals. AEMO will continue to manage the SRAS to match the operational conditions to ensure power system security.

The SRAS requirement proposed for 2020-21 is at least the maximum of:

1. 70% of the largest generating unit; and
2. 70% of the largest contingency event that would result in generation loss.

4.3 Load Rejection Reserve (LRR)

The LRR Requirement must meet the SWIS Operating Standards and the Ancillary Service Standards. The SWIS Operating Standards[21] require that frequency be maintained below 51 Hz and to be restored below 50.5 Hz within two minutes following a single contingency event. Clause 3.10.4(a) of the WEM Rules requires the standard for LRR to be the level sufficient to keep over-frequency below 51 Hz for all credible load rejection events (this requirement may be relaxed by up to 25% if AEMO considers that the probability of transmission faults is low).

The largest credible load rejection event is approximately 120 MW[22], and is typically the loss of a transmission line. This may be a radial line feeding the Eastern Goldfields region under specific conditions, or a single line feeding a particular customer.

LRR is a response of the power system to a sudden drop in load. The mandatory generator governor droop response capability required by the Technical Rules for all generators operating above their minimum stable load will also act to mitigate the loss of load as the frequency initially increases.

As discussed in section 2.4 of this report, AEMO has been conducting a trial for a dynamic LRR requirement. The trail has proved to be successful, and AEMO will now use a dynamic LRR requirement in real time.

The proposed LRR requirement for 2020-21 is up to a maximum of 90 MW[23]

[21] See clause 2.2.1 and Table 2.1 of the Technical Rules.

[22] This is based on loss of Eastern Goldfields region or the Boddington Gold Mine, which are connected to the SWIS by a single transmission line.

[23] This is a dynamic requirement in response to a sudden drop of up to 120 MW load less a minimum of 30 MW load relief.

4.4 Dispatch Support Services (DSS)

There are no current requirements for DSS.

4.5 System Restart Service

AEMO requires three system restart facilities with the capability to start up under black system conditions and energise the rest of the system. The three system restart facilities should not be in the same location, to mitigate the risk of common failure in the same geographic or electrical area. Three facilities are required, to ensure service provision following a failure of one when another is undergoing planned maintenance.

The proposed System Restart Service requirement for the 2020-21 Financial Year is three facilities with system restart capability.

5. Ancillary Services Plan for 2020-21 Financial Year

While this report focuses on the requirements for 2020-21 and the plan to meet these requirements, it should be noted that as part of the government's Energy Transformation Strategy, a key focus will be a move to co-optimised energy and ancillary services. This will result in a clearer definition of services, improving the ability to more accurately determine the requirements.

5.1 Load Following Ancillary Service (LFAS)

To meet the requirements for 2020-21, LFAS will be sourced through the LFAS Market. 85 MW LFAS Upwards and LFAS Downwards between 5.30 AM and 7.30 PM, and 50 MW between 7.30 PM and 5.30 AM will be required from Market Participants. On an exceptional basis, and based on appropriate weather forecasts, AEMO may increase the requirements above the minimum requirements on a day-ahead basis. It is expected that this will only be for 4-6 hours in the middle of the day. The frequency and magnitude of these additional requirements will be reviewed and will inform the reassessment of requirements submitted to the ERA triggered by the commissioning of the new Facilities.

The price paid for LFAS will depend on the clearing price within the LFAS Market.

5.2 Spinning Reserve Ancillary Service (SRAS)

For the 2020-21 financial year, SRAS will be sourced as follows:

1. There will be 42 MW sourced from a long-term interruptible load contract.
2. There will be 21 MW sourced from a short-term interruptible load contract at a discount to the Synergy administered price.
3. The remainder of the real-time requirements will be provided by the Balancing Portfolio.

5.3 Load Rejection Reserve (LRR)

A maximum of 90 MW of LRR will be provided by the Balancing Portfolio. AEMO will use a dynamic LRR requirement in real time[24].

5.4 Dispatch Support Services (DSS)

AEMO is not currently party to any DSS Ancillary Service Contracts.

No new DSS has been identified at the time of writing this report. However, AEMO may seek approval from the ERA for a DSS Ancillary Service Contract should emerging challenges such as low system inertia, due to an increase in non-synchronous generation, threaten power system security.

[24] Due to the time, effort and complexity in contracting LRR, particularly the proposed dynamic requirements, it is anticipated that contracting LRR Service is unlikely to result in lower LRR costs.

5.5 System Restart Service

The North Metropolitan System Restart Service contract will continue to apply for the 2020-21 Financial Year. This contract ends on 30 June 2021.

The South Metropolitan System Restart Service contract will continue to apply for the 2020-21 Financial Year. This contract ends on 30 June 2021.

The South Country System Restart contract will continue to apply for the 2020-21 Financial Year. This contract ends in October 2028.

AEMO has started the procurement process to replace the North and South Metropolitan contracts which expire on 30 June 2021.

5.6 Summary Ancillary Services plan for 2020-21 Financial Year

Table 7 Summary of Ancillary Services requirements and plan to procure for 2020-21 Financial Year

	Requirement	Requirement compared to previous year	Method to procure	Cost
LFAS Upwards	85 MW between 5.30 AM and 7.30 PM. 50 MW between 7.30 PM and 5.30 AM.	Unchanged	LFAS Market	LFAS Market clearing price
LFAS Downwards	85 MW between 5.30 AM and 7.30 PM. 50 MW between 7.30 PM and 5.30 AM.	Unchanged	LFAS Market	LFAS Market clearing price
SRAS	At least the maximum of 70% of largest generating unit and 70% of largest contingency event that would result in generation loss	Unchanged	42 MW from long-term interruptible load contract	Contract price
			Quantity from short-term contracts currently being finalised	Contract price as discount of Synergy administered price
			Remainder provided by Balancing Portfolio	Administered price to be paid based on the ERA's Margin Values determination.
LRR	Up to 90 MW[A]	Modified to continue previous approach	A maximum of 90 MW of LRR will be provided by the Balancing Portfolio.	Annual price paid based on the ERA's Cost_LR determination for 2020-21
DSS	None	Unchanged		N/A
System Restart Service	Three facilities	Unchanged	Contracts with three providers	Contract price

A. AEMO will plan for 90 MW but use a dynamic LRR requirement in real time.