Ancillary Services Report 2016

System Management

1 June 2016

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1 Introduction

1.1 System Management

Western Power is established under section 4(1)(b) of the *Electricity Corporations Act 2005* and has the functions conferred under section 41 of that Act.

Part 9 of the *Electricity Industry Act 2004* makes provision for a wholesale electricity market and provides for the establishment of Market Rules.

Regulation 13 of the *Electricity Industry (Wholesale Electricity Market) Regulations 2004* provides that the Market Rules may confer on an entity the function of operating the South West Interconnected System (SWIS) in a secure and reliable manner.

Clause 2.2.1 of the *Wholesale Electricity Market Rules* (**Market Rules**) confers this responsibility upon Western Power, acting through the segregated business unit known as System Management.

1.2 Ancillary Services Report Market Rule Obligations

The Market Rules require System Management to prepare an annual Ancillary Services report and submit it to the Australian Energy Market Operator (AEMO)[1] as per the following clauses:

> *3.11.11. By 1 June each year, System Management must submit to AEMO 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 (Chapter 2 of this report);*
>
> *(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 (Chapter 3 of this report); and*
>
> *(c) the Ancillary Service Requirements for the coming year and the Ancillary Services plan to meet those requirements (Chapter 4 of this report).*

System Management has prepared this report in accordance with the above obligations.

Clause 2.1A of the Market Rules defines the obligations of AEMO. These include:

> *(m) to carry out any other functions conferred, and perform any obligations imposed, on it under these Market Rules*.

In particular, the Market Rules provide for the following:

> *3.11.6 System Management must submit the Ancillary Service Requirements to AEMO for approval. AEMO must audit System Management's determination of the Ancillary Service Requirements and may require System Management to re-determine the Ancillary Service Requirements, in which case this clause 3.11.6 applies to any recalculated requirements.*
>
> *3.11.12. AEMO must audit System Management's determination of the Ancillary Services plan submitted to AEMO under clause 3.11.11. AEMO may require System Management to amend the Ancillary Services plan and resubmit it to AEMO, in which case this clause 3.11.12 applies to any amended plan.*

[1] In November 2015, the market operator function and associated Market Rule obligations were transferred from the Independent Market Operator to AEMO.

1.3 Terminology

A word or phrase defined in the *Electricity Industry Act 2004*, or in the Regulations or Market Rules made under that Act, has the same meaning when used in this report.

1.4 Reporting period

This report covers the quantity and cost for the 2015/16 period (sections 2 and 3 of this report), together with the requirements and plan for the 2016/17 period (section 4 of this report).

1.5 Publication

The current and previous Ancillary Service Reports and Approvals documents may be found on the AEMO website at: http://wa.aemo.com.au/home/electricity/market-information/system-management-reports.

2 Quantities of Ancillary Services in the Preceding Year (2015/16)

2.1 Load Following Service

2.1.1 Quantity

Over the reporting period the typical LFAS Requirement was +/-72MW. The quantity actually used in real time may be greater or less than this LFAS Requirement.

The average LFAS raise enabled during the period 1 May 2015 to 30 April 2016 was 105 MW (107 MW for 2014/15). The average LFAS lower enabled during the same period was also 105 MW (107 MW for 2014/15).

These values are based on the historical dispatch of Synergy and NEWGEN_KWINANA_CCG1 generators over the period referred to above.

The average LFAS quantities enabled were more than the typical LFAS Requirement of +/-72MW applicable to the above periods. This is because generators enabled for LFAS are typically brought on line in 'block' increments, normally in the order of 30-40MW per LFAS Facility (i.e. being the range of control between their minimum and maximum outputs), rather than the minimum amounts needed to meet the LFAS Requirement (which may require increments of less than 10MW).

The LFAS raise enabled during the year is shown in Figure 1.

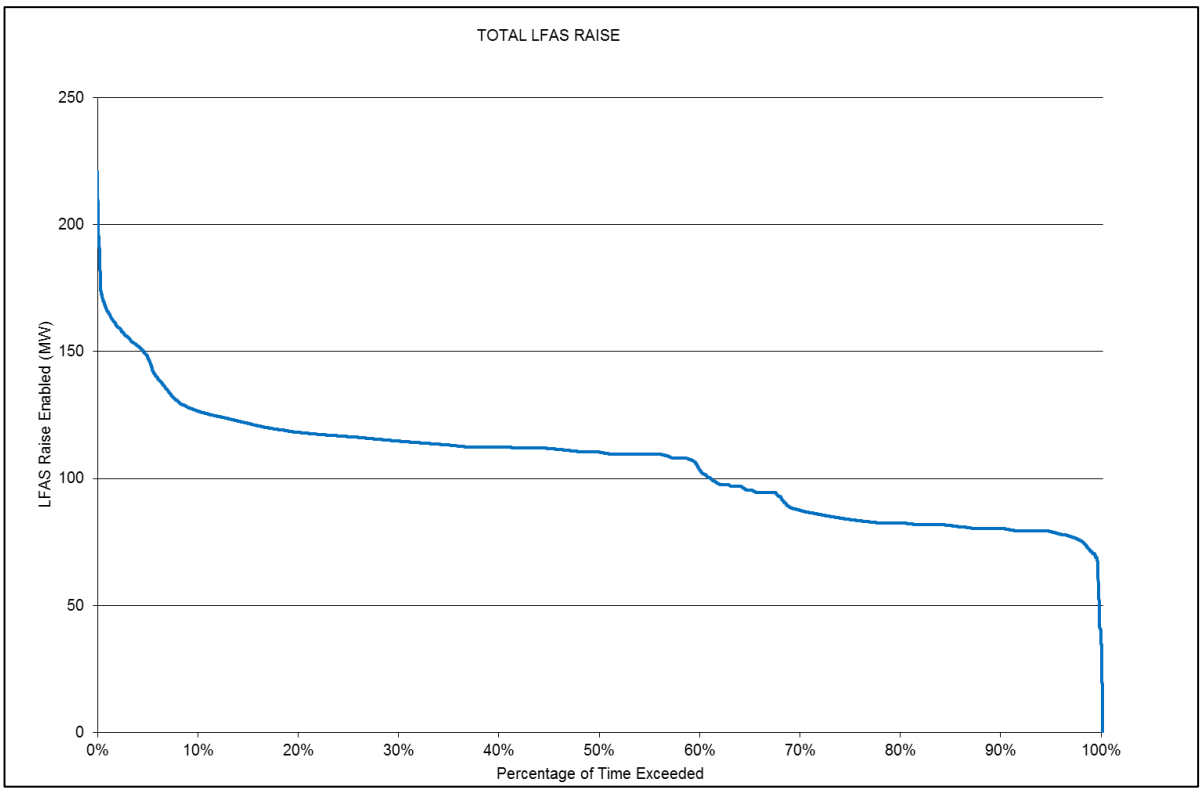

Figure 1- Historic LFAS raise 2015/16 enablement

The LFAS lower enabled during the year is shown in Figure 2

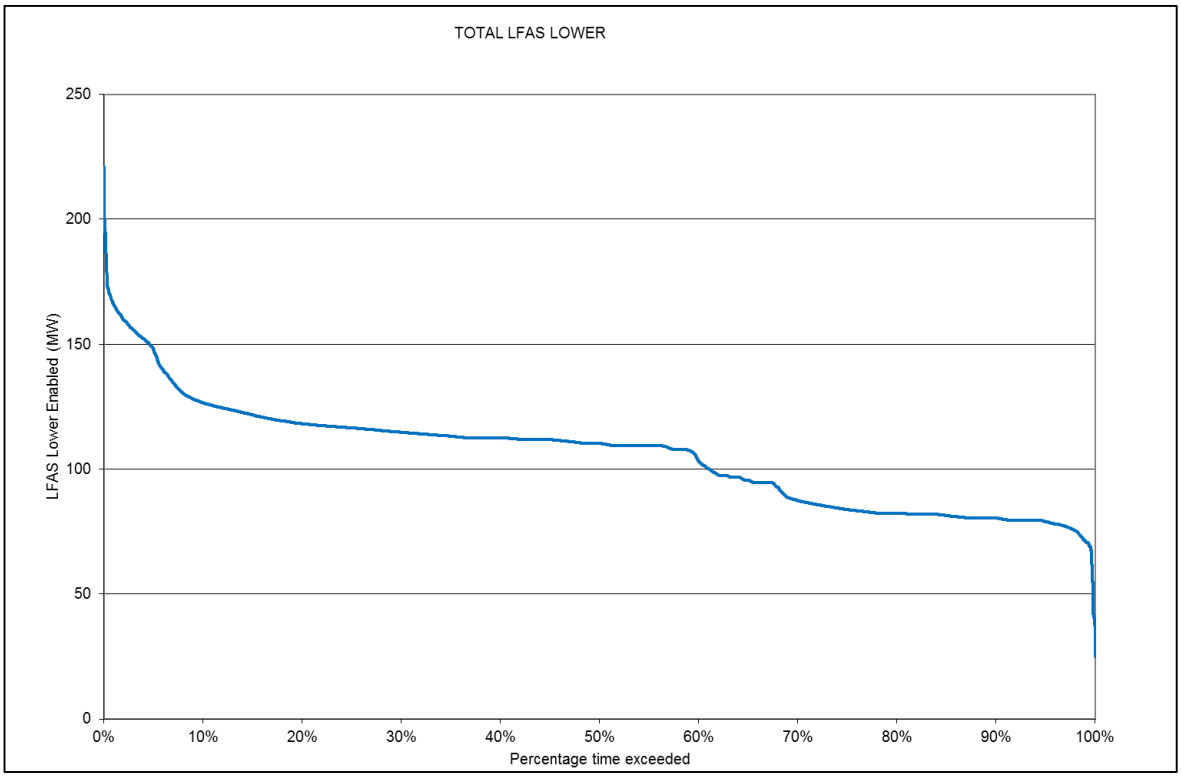

Figure 3- Historic LFAS lower 2015/16 enablement

The enablement quantities were in excess of the LFAS Requirement for more than 95% of the time. As mentioned earlier, this is primarily due to generators enabled for LFAS being brought on line in 'block' increments, rather than the minimum amounts needed to meet the LFAS Requirement. Enablement can fall below the LFAS Requirement for short periods due to Facility failures or communication failures between East Perth Control Centre and the Facility.

2.1.2 Adequacy of Quantities Enabled

Clause 3.11.11(a) of the Market Rules requires the Ancillary Services report to set out the adequacy of quantities provided in the preceding year. In the context of LFAS, adequacy is determined by assessing whether the approved Ancillary Service Requirement for LFAS was met.

In terms of a quantity, the 2015 Ancillary Service report approved, at that time, by the Independent Market Operator (IMO) specified that the general LFAS Requirement for the 2015/16 year was +/- 72MW.

To assess the adequacy of LFAS, System Management examined the distribution of the system frequency over the preceding year to determine if the quantity applied (+/-72MW) was sufficient. The historic performance is given in Table 1 below.

Table 1 – Historic Frequency Performance

Month	Time within		Average Hz	Standard Deviation Hz
	49.8-50.2 Hz	49.975-50.025 Hz		
May-15	100.00%	88.63%	50.00	0.018
Jun-15	99.99%	87.88%	50.00	0.016
Jul-15	100.00%	87.46%	50.00	0.017
Aug-15	100.00%	87.73%	50.00	0.016
Sep-15	99.99%	88.07%	50.00	0.019
Oct-15	100.00%	87.57%	50.00	0.018
Nov-15	100.00%	86.93%	50.00	0.017
Dec-15	99.98%	88.08%	50.00	0.017
Jan-16	99.99%	86.58%	50.00	0.018
Feb-16	99.98%	88.27%	50.00	0.017
Mar-16	100.00%	88.55%	50.00	0.016
Apr-16	100.00%	89.90%	50.00	0.015

Note the frequency data is based on one minute averages with periods outside the Normal Operating State frequency range (50+/-0.32Hz) excluded.

Table 1 shows that for each month the frequency requirement was achieved with the frequency distribution being at least 99.9%.

This confirms that the enabled LFAS quantities referred to in section 2.1.1 were adequate to meet the last approved requirement. While the quantities enabled were greater than the typical requirement of +/- 72MW, this is a direct result of the enablement in 'block' increments issue.

System Management acknowledges that the scope of this assessment does not consider whether there is opportunity to reduce the requirement (either as a whole or periodically). Further discussion of this is contained in section 4.2.3 of this report.

2.2 Spinning Reserve Service

2.2.1 Quantity of Spinning Reserve Service

The average Spinning Reserve Service (SRS) enabled for the period 1 May 2015 to 30 April 2016 inclusive was:

- 306 MW (inclusive of LFAS raise) during Peak Trading Intervals (with the maximum quantity during Peak Trading Intervals being 622MW and the minimum quantity during Peak Trading Intervals being 74MW); and
- 281 MW (inclusive of LFAS raise) during Off-Peak Trading Intervals (with the maximum quantity during Off-Peak Trading Intervals being 576MW and the minimum quantity during Off-Peak Trading Intervals being 83MW).

SRS enabled during the year is shown in Figure 3.

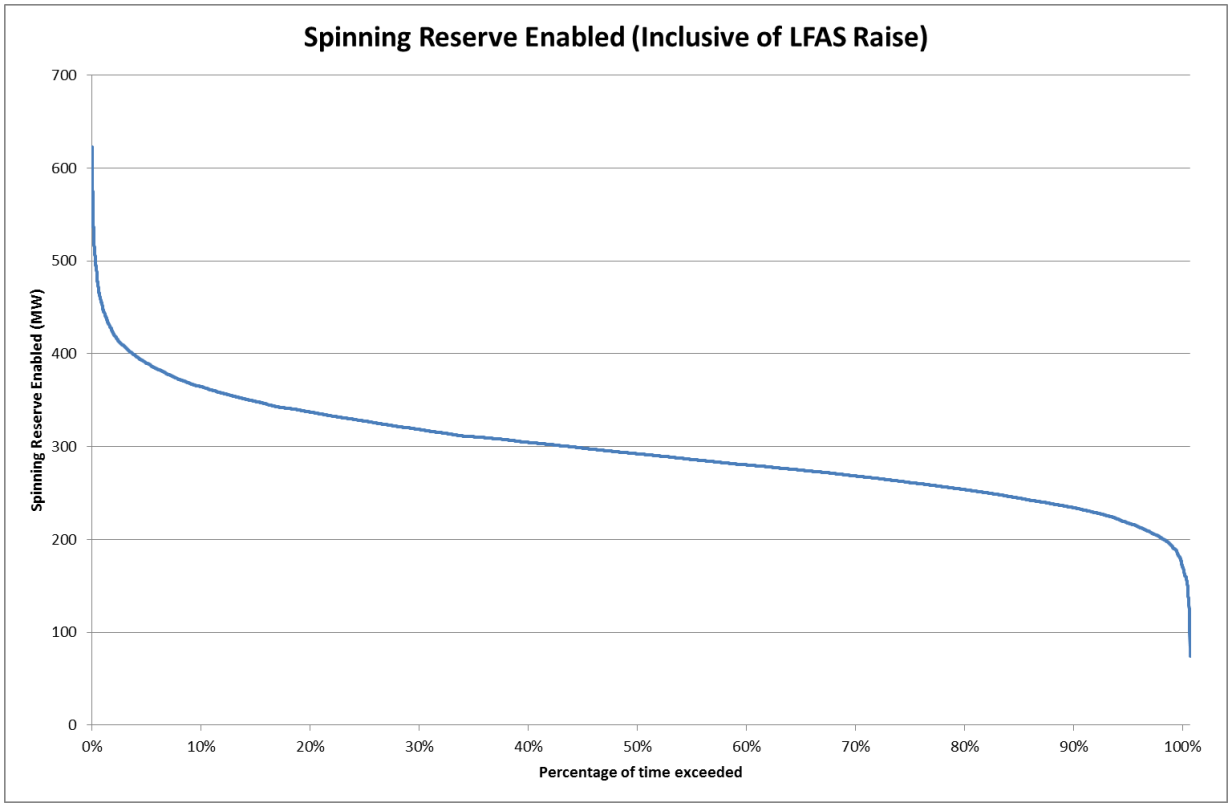

Figure 3 - Historic Spinning Reserve 2015/16 enabled

2.2.2 Adequacy of Quantities enabled

Clause 3.11.11(a) requires the Ancillary Services report to set out the adequacy of quantities provided in the preceding year. In the context of SRS, adequacy is determined by assessing whether the Ancillary Service Requirement for SRS was met. The 2015 Ancillary Service report approved, at that time, by the IMO specified the Ancillary Services Requirement for SRS as:

The greater of:

- 240MW for a generator event, being 70% of Collie Power Station which has a maximum output of 340MW; or
- For the largest network event, when Bluewaters Terminal is supplied by either the MU-BLW 91 or BLW-SHO 91 line, 301MW. A forced outage of this line would result in the loss of about 430MW if both Bluewaters generators were dispatched at their full output whilst one of these transmission lines was undergoing a planned outage. This sets the SRS demand for such a network event to be 0.7 multiplied by 430MW which is 301MW. Normally however, co-ordinated network and generator planned outages make this a rare event.

As seen in section 2.2.1, the average amount of SRS enabled was above the minimum SRS Ancillary Service Requirement of 240MW.

It should be noted that in the case of a generator event, more SRS than the minimum requirement will often be enabled because generators are committed/decommitted to the system that brings on line or removes large increments of spinning reserve, rather than in increments that meet the minimum requirement.

2.3 Load Rejection Reserve Service

2.3.1 Quantity of Load Rejection Reserve Service

The average Load Rejection Reserve Service (LRRS) during the period 1 May 2015 to 30 April 2016 inclusive was 293 MW during Peak Trading Intervals and 167 MW during Off-Peak Trading Intervals.

The distribution of LRRS provided during this period is shown in Figure 4 below.

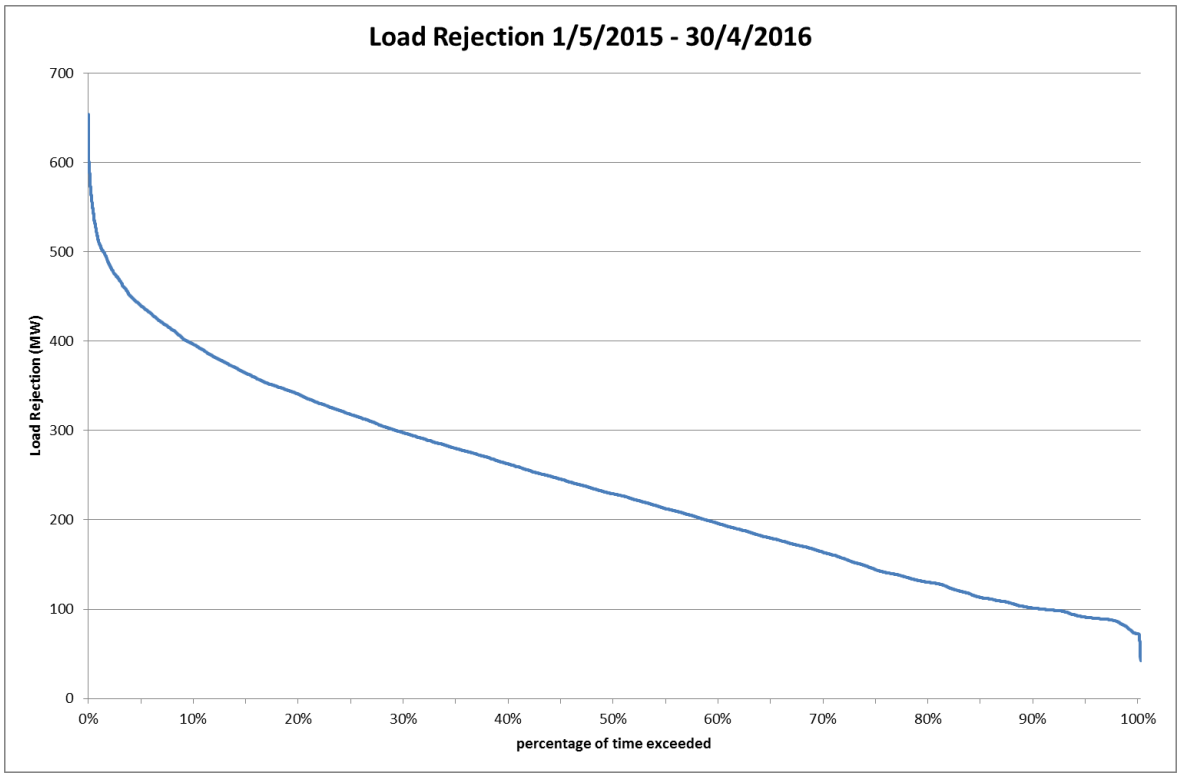

Figure 4 - Historic 2015/16 Load Rejection Provision

2.3.2 Adequacy of Quantities provided

Clause 3.11.11(a) requires the Ancillary Services report to set out the adequacy of quantities provided in the preceding year. In the context of LRRS, adequacy is determined by assessing whether the approved Ancillary Service Requirement for LRRS was met.

In terms of a quantity, the 2015 Ancillary Service report approved by, at that time, the IMO specified a requirement of 120MW to meet the standard that after a Single Contingency Event, frequency is to be maintained below 51 Hz. No over-frequency events above 51 Hz were recorded during 2015/16.

2.4 Dispatch Support Service

Synergy is contracted to provide Dispatch Support Services (DSS) under an existing Ancillary Service Contract. The quantities of DSS provided under the Ancillary Service Contract for the periods 1 May 2015 to 30 April 2016 as well as comparative information for the period 1 May 2014 to 30 April 2015, is given in Table 2.

Table 2 – Historic DSS Provision

Dispatch Support Facility	1/5/2015-30/4/2016	1/5/2014-30/4/2015
Mungarra Gas Turbines	17,122 MWh	61,351 MWh
Kalgoorlie Gas Turbines	1,437 MWh	1,404 MWh
Geraldton Gas Turbine	0 MWh	0 MWh

Note the Geraldton Gas Turbine was withdrawn from this contract in October 2015 as a result of the Facility's de-registration.

Additionally the Mungarra DSS requirements dropped materially after the first three months when the Neerabup to Three Springs 330kV transmission line was completed in August 2015. Only 20% of the annual quantity reported above for this location was used after that time.

2.5 System Restart Service

System Management has existing Ancillary Service Contracts for System Restart Services as set out in Table 3 below.

Table 3 – Contracts for System Restart Services

Market Participant	Facility/ies	Contract Expiry	Sub-Network Area
Synergy	KWINANA_GT1	30 June 2016	South Metro
Synergy	PINJAR_GT3 & PINJAR_GT5	30 June 2016	North Metro
Perth Energy	PERTHENERGY_KWINANA_GT1	30 June 2016	South Metro

No System Restart Services were used in 2015/16.

3 Cost of Ancillary Services in the Preceding Year (2015/16)

The cost of each Ancillary Service as calculated and collected by AEMO for each of the following periods is set out in Table 4[2]:

- 1 April 2013 to 31 March 2014
- 1 April 2014 to 31 March 2015
- 1 April 2015 to 31 March 2016

Each of the cost items reported in Table 4 are defined in the Rule references provided.

Table 4 – Cost of Ancillary Services

ANCILLARY SERVICE	WEM Rule	1/4/2015 – 31/3/2016	1/4/2014 – 31/3/2015	1/4/2013 – 31/3/2014
LOAD FOLLOWING Capacity Total	9.9.2(q)	$8,733,763.27	$10,807,114.83	$13,001,881.41
Availability				
Availability raise	9.9.2(a)	$12,052,038.44	$13,055,049.98	$16,718,720.02
Availability lower	9.9.2(b)	$18,973,393.48	$21,169,117.79	$23,679,099.50
Availability Total	9.9.2 (d)	$31,025,431.92	$34,224,167.78	$40,397,819.52
Load Following Total		$39,759,195.19	$45,031,282.61	$53,399,700.93
SPINNING RESERVE	9.9.2 (f)	$14,610,361.38	$9,224,548.99	$13,662,858.93
LOAD REJECTION	9.9.4 (a)			
SYSTEM RESTART	9.9.4 (a)	$485,245.52	$516,659.25	$488,139.14
DISPATCH SUPPORT	9.9.4 (a)	$2,097,812.39	$5,428,607.41	$4,745,982.05
RESIDUAL COST_LRD COST (Component of Synergy AS Provider Payment)	9.9.1	$44,989.94	$673.89	$17,278.73
TOTAL		**$56,997,604.42**	**$60,201,772.14**	**$72,313,959.77**

The quantities of Ancillary Services in 2015/16 have remained at around the same levels compared to the previous year, other than for the DSS Ancillary Service which decreased materially due to the completion of the Neerabup to Three Springs 330kV transmission line in August 2015 as referred to earlier in section 2.4.

The total cost of Ancillary Services over the current reporting period has reduced by $3.2 million. While there were increases in Spinning Reserve costs (correlating to the ERA

[2] The information in Table 4 is provided by AEMO. During preparation of this report AEMO advised that as a result of a review performed by the ERA and AEMO, amendments have been made to previous years' costs (hence preceding 2 years have been included in Table 4). This review highlighted some errors in transcription of the LFAS costs for 2014/15 (previously reported as LFAS raise of $23.7 million and LFAS lower of $16.7 million) and System Restart Costs for 2013/14 (previously reported as $.505 million) and in differing interpretations for quantifying Spinning Reserve Payments for 2013/14 and 2014/15 (previously reported as $18 million in 2013/14 and $12.3 million in 2014/15). The review also highlighted a requirement to include the residual Cost_LRD amount to account for the total that was settled and paid to contracted providers. Residual COST_LRD is defined in WEM Rule 9.9.1 and is a cost paid by Market Customers as a component of Synergy AS Provider Payment (p,m) calculation. The residual cost is paid to Synergy by Market Customers based on the difference between Cost_LRD(m) less the total monthly contract costs for Load Rejection Reserve Service, System Restart Service and Dispatch Support Service.

approved ancillary service parameters[3]), there were decreases in LFAS costs (appearing to be a direct result of the LFAS Market), with the major contributor to the overall reduction being a material decrease in DSS costs as referred to earlier.

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

4 Ancillary Service Requirements and Ancillary Services Plan for Coming Year (2016/17)

4.1 Overview

Clause 3.11.11 of the Market Rules requires this report to include:

> *(c) the Ancillary Service Requirements for the coming year and the Ancillary Services plan to meet those requirements.*

The remainder of this chapter sets out for each type of Ancillary Service:

- The relevant standard/s applicable to that type of Ancillary Service and how System Management applies the standard/s
- The Ancillary Service Requirements for the 2016/17 year for that type of Ancillary Service, noting that previous advice from the IMO was that it interpreted the term 'Requirement' to mean the quantity/ies needed to achieve the standard/s
- The Ancillary Services plan for the Ancillary Service, being the method of procurement of the Ancillary Service type (whether by way of an Ancillary Service Contract, through an established market or other mechanisms provided for in the Market Rules) and any related future plans concerning the service.

4.2 Load Following Service

4.2.1 LFAS Standards

Market Rule 3.10.1(a) sets the LFAS Ancillary Service Standard as:

> "*a level which is sufficient to:*
>
> *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 1 minute average readings around a thirty minute rolling average."*

Market Rule 3.1.1 defines the applicable SWIS Operating Standard as:

> *"The frequency and time error standards for a Network in the SWIS are as defined in the Technical Rules that apply to that Network."*

The Technical Rules frequency standards are given in "Table 2.1 Frequency Operating Standards for the South West Interconnected Network" of those rules. This is given in Appendix 1 for reference.

For LFAS the applicable component is the "Normal Range" requirement being that system frequency shall be maintained at above 49.80 Hz and below 50.20 Hz for 99% of the time.

4.2.2 Application of the Standards

In an effort to comply with both standards set out in section 4.2.1, System Management targets a combined standard such that:

> System frequency is to be maintained between 49.80Hz and 50.20Hz for at least 99.9% of the time for each month.

The above combined standard remains unchanged from prior approved reports.

4.2.3 LFAS Requirement

The last approved Ancillary Services report set a general LFAS Ancillary Services Requirement equivalent to the operating range of two High Efficiency Gas Turbines (HEGT) at Kwinana (i.e. the range of control between their minimum and maximum outputs). In quantity terms this is +/-72MW. This level was set based on observations that this was sufficient to maintain the combined frequency standard of 99.9%.

System Management has continued to observe that running two large HEGT Facilities is sufficient to ensure the necessary frequency standard of 99.9% is maintained (see Table 1 for Historic Frequency Performance).

The achievement of the historical frequency performance is primarily related to the responsiveness of the LFAS enabled units. The LFAS enabled HEGT Facilities are characteristically very fast in their response to correct the frequency and keep it within the required range. However for deeper frequency deviations and more significant load and generation fluctuations, System Management's experience is that the enablement of +/-72MW (i.e. two large HEGT Facilities) is necessary to deal with these latter more significant scenarios.

A key input to determining any reduction in the requirement should be accurate measurements of historical LFAS usage. As noted in other reports and forums[4] these measurements are not currently available. As a result, the LFAS requirements are based on System Management's system operations experience and observations rather than actual measurements. Since the last approved Ancillary Services report, this has equated to a quantity of +/-72MW (i.e. two large HEGT Facilities) and has not changed.

While not necessarily conclusive, System Management also notes that analysis undertaken by EY during the 2014 Ancillary Services Standards and Requirements study in relation to the causes of LFAS indicated that a requirement greater than +/-72MW is necessary at times to maintain the frequency within the combined standard of 99.9%. System Management notes that EY qualified their work to the effect that the result of their analysis '*is not the same as the overall LFAS needed'*[5] but System Management still

[4] Refer to page 5 of LFAS Investigation report presentation to MAC in December 2014 (http://wa.aemo.com.au/docs/default-source/Governance/Market-Advisory-Committee/4-lfas-update-for-december-2014-mac-v2-kr.pdf?sfvrsn=0) and pages 42 and 61 of the `2014 Ancillary Services Study Final Report by consultant EY (http://wa.aemo.com.au/home/imo/consultations/2014-ancillary-service-standards-and-requirements-study)

[5] Refer to section 9.1 of the EY Final Report on the 2014 Ancillary Service Standards and Requirements Study: http://wa.aemo.com.au/home/imo/consultations/2014-ancillary-service-standards-and-requirements-study

considers the results relevant as an indicator (rather than a conclusive measurement) when considering any potential reduction in the current level.

In the circumstances, System Management considers that it is prudent to be technically conservative and maintain the +/-72MW until such time as there is opportunity through the Electricity Market Review (EMR) to rationalise the provision of Ancillary Services. Therefore the general LFAS Ancillary Services Requirement for the 2016/17 period is proposed to remain at +/-72MW.

Outside of the general requirement for +/-72MW, the maximum demand for LFAS services occurs when commissioning generators need to perform ramp up/down tests.

This is not envisaged to be more than 250MW up or down (depending on the test). For example during the ramp of a gas turbine from minimum load to maximum load of 160MW, a normal LFAS Level of up to 90MW would equate to a total LFAS demand of 250MW.

Note further information on the temporary increases in LFAS Levels may be found in the Commissioning and Testing Power System Operation Procedure[6].

In addition the general level can be relaxed in accordance with Market Rule 3.10.5:

The level of Load Following Service, Spinning Reserve Service and Load Rejection Reserve Service may be reduced:

(a) following relevant contingencies; or

(b) where System Management cannot meet the standard without shedding load, providing that System Management considers that reducing the level is not inconsistent with maintaining Power System Security."

4.2.4 LFAS Plan

4.2.4.1 LFAS Market

The Market Rules have established an LFAS Market which currently consists of two competing providers. System Management sources LFAS through the LFAS Market in accordance with the Market Rules, noting that the provision of these services through the market to date has been adequate to meet the requirements.

Market Participants interested in participating in the LFAS Market should refer to the Ancillary Services Power System Operation Procedure for the Facility requirements[7].

Over the past few years there has been an underlying concern on the cost of LFAS and System Management and previously the IMO jointly worked on this issue. For further information regarding this matter refer to sections 4.2.3 and 4.2.4.2 of the 2015 Ancillary Services Report[8].

The EMR which is currently underway contains proposals that will impact the LFAS quantity requirements, such as the Energy Market Operations and Processes workstream. This work

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6 http://wa.aemo.com.au/docs/default-source/rules/system-management---power-system-operation-procedures/ppcl0025-commissioning-and-testing-psop---clean.pdf?sfvrsn=0

7 http://wa.aemo.com.au/docs/default-source/rules/system-management---power-system-operation-procedures/ancillary_services_psop_july_2012.pdf?sfvrsn=2

8 http://wa.aemo.com.au/docs/default-source/System-Management-Reports/final-2015-ancillary-services-report-for-imo-website.pdf?sfvrsn=0

proposes to examine the co-optimisation of energy and ancillary services, shorter dispatch cycles, reduced gate closure times and other relevant market operation and design matters[9]. System Management considers that these changes to market design and operation will have the most significant impact on the LFAS quantity requirements and, together with the transfer of System Management to AEMO, provides the best opportunity to address the issues surrounding the cost of LFAS.

4.3 Spinning Reserve Service

4.3.1 SRS Relevant Standards

Market Rule 3.10.2 sets the SRS Ancillary Service Standard as:

> *"…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;"*

Market Rule 3.1.1 defines the applicable SWIS Operating Standard as:

> *"The frequency and time error standards for a Network in the SWIS are as defined in the Technical Rules that apply to that Network."*

The Technical Rules frequency standards are given in "Table 2.1 Frequency Operating Standards for the South West Interconnected Network" of those rules. This is given in Appendix 1 for reference.

For SRS the relevant condition in Table 2.1 of the Technical Rules is the "Single Contingency Event" requirement being that, in the event system frequency does fall below the lower boundary of the Normal Range (49.8Hz), it shall be maintained so as not to fall below 48.75 Hz, and that it must return to 49.8 - 50.2 Hz within 15 minutes.

4.3.2 Application of the Standards

The SWIS Operating Standard implies that 100% of the quantity of the Single Contingency Event is to be enabled. That is to ensure that the frequency does not fall below 48.75 Hz after the loss of a 340MW generator, 340MW of spinning reserve is generally required to be dispatched.

To use the requirement set by the SWIS Operating Standard would impose a much greater cost to the market to reduce the risk of loss of supply compared to applying the Ancillary Service Standard which requires only 70% of the output of a generator related contingency to

[9] Refer to: http://www.finance.wa.gov.au/cms/Public_Utilities_Office/Electricity_Market_Review/Wholesale_Electricity_Market_Improvements.aspx

be enabled. As the occurrence of a “Single Contingency Event” in the context of the SWIS Operating Standard is very rare, the application of this standard for SRS appears to not be economically justified.

Applying the Ancillary Service Standard limits the “Single Contingency Event” to only the largest generator. This however would increase the risk to Power System Security when the largest network event has a larger impact than the largest generator event.

System Management therefore applies a combination of the standards as follows:

> The SRS requirement for 2016/17 is a level equal to at least 70% of the quantity of the largest contingency.

The above combined standard remains unchanged from previous years approved requirements.

4.3.3 SRS Requirement

System Management understands that no new large generation or network configurations are proposed that would change the “Single Contingency Event” from the approved 2013 Ancillary Services report. The circumstances applying the combined standard referred to in section 4.3.2 sets the following SRS Ancillary Services Requirement for 2015/16:

The greater of:

- The largest generation event is the loss of Collie Power Station as the largest unit on the SWIS with a maximum generated output of 340MW. This normally sets the spinning reserve demand and so, the maximum spinning reserve level that is normally required is anticipated to be 0.7 multiplied by 340MW which is approximately 240MW; or

- The largest network event is the loss of a transmission line when a power station is only being supplied by a single line. The largest instance of this is when Bluewaters Terminal is supplied by either the MU-BLW 91 or BLW-SHO 91 line. A forced outage of this line would result in the loss of about 430MW if both Bluewaters generators were dispatched at their full output whilst one of these transmission lines was undergoing a planned outage. This would set the spinning reserve demand for such a network event to be 0.7 multiplied by 430MW which is 301MW. Normally however co-ordinated network and generator planned outages make this a rare event.

The above will vary with the dispatch and commissioning plans of the various Market Participants and network outages.

Note further information on the temporary increases in SRS dispatch levels may be found in the Commissioning and Testing Power System Operating Procedure[10].

In addition, the general level can be relaxed in accordance with Market Rule 3.10.2:

“(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

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10 http://wa.aemo.com.au/docs/default-source/rules/system-management---power-system-operation-procedures/ppcl0025-commissioning-and-testing-psop---clean.pdf?sfvrsn=0

(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."

4.3.4 SRS Plan

The Market Rules provide that the Synergy Portfolio is the default provider of SRS and Synergy's Portfolio of approximately 3,000MW of Scheduled Generators is adequate in itself to provide the SRS Ancillary Services Requirement.

The Market Rules provide that System Management may contract with alternate providers where this provides a less expensive alternative than Synergy. In this regard Simcoa has an existing contract for the provision of 42MW of SRS that has been in place since market commencement.

In the 2014/15 year, a competitive process was undertaken to procure SRS services at a discount to the administered price. This process resulted in awarding two short term contracts, each for 13MW, to Simcoa and Bluewaters. Both of these contracts have been renewed for a further term, expiring 30 June 2017.

4.4 Load Rejection Reserve Service

4.4.1 LRRS Relevant Standards

The LRRS Ancillary Service Standard is specified in Market Rule 3.10.4 as:

> *"(a) the level sufficient to keep over-frequency below 51 Hz for all credible load rejection events;"*

Market Rule 3.1.1 defines the applicable SWIS Operating Standard:

> *"The frequency and time error standards for a Network in the SWIS are as defined in the Technical Rules that apply to that Network."*

The Technical Rules frequency standards are given in "Table 2.1 Frequency Operating Standards for the South West Interconnected Network" of those rules. This is given in Appendix 1 for reference.

For LRRS the applicable component is the "Single Contingency Event" requirement being that the system frequency shall be maintained so as not to rise above 51.0 Hz and to return to 50.5 Hz within 2 minutes and return to 49.8 - 50.2 Hz within 15 minutes.

System Management understands that no new network configurations are proposed which would change the "Single Contingency Event" from previous years.

4.4.2 Applications of the Standards

The SWIS Operating Standard, as defined in the Technical Rules, encompasses the Ancillary Service Standard so System Management applies the combination of these standards as follows:

> The LRRS requirement for 2016/17 is, after a Single Contingency Event, a level sufficient to maintain the system frequency below 51.0 Hz, returned to less than 50.5 Hz within two minutes and returned to 49.8 - 50.2 Hz within 15 minutes.

This is the same standard as applied in previous years.

4.4.3 LRRS Requirement

The requirement is determined by the amount of load that is lost during a network fault. The network faults are generally from a short circuit on a transmission line, generally due to environmental impact. These cause severe voltage dips which in turn cause customer loads to automatically disconnect and so increasing the System Frequency.

The requirement is set by examining the load reductions that have historically occurred during a network fault event. Note previously the internal failure of a large load was also considered, however since to date this contingency has not eventuated this event is no longer a contingency to be considered.

This gives a level of LRRS of 120MW derived from:

- Actual observations of load reductions that have historically occurred during a network fault event; and

- A forecast of the largest network contingency.

In addition the general level can be relaxed in accordance with Market Rule 3.10.4:

"(b) may be relaxed by up to 25% by System Management where it considers that the probability of transmission faults is low."

4.4.4 LRRS Plan

4.4.4.1 LRRS Providers

The Synergy Portfolio is the default provider of LRRS, which is adequate in itself to meet the LRRS Ancillary Services Requirement. In the circumstances System Management is not proposing to procure any additional LRRS.

4.4.4.2 LRRS Future Developments

At this point in time, there are no confirmed requirements for increased LRRS during the 2016/17 period.

4.5 Dispatch Support Service

4.5.1 DSS Relevant Standards

There are no applicable standards expressly for DSS.

4.5.2 DSS Requirement

Requirements for DSS are generally developed on a case by case basis.

There is an existing DSS contract with Synergy recognising that the Portfolio is dispatched outside of its preferred order in the Geraldton and Kalgoorlie areas for transmission outage requirements. As there is no out-of-merit compensation payable for this dispatch the Synergy DSS contract provides compensation for the dispatch, in lieu of any alternative mechanism.

No other requirement for DSS has been identified at this time.

4.5.3 DSS Plan

The need for the existing Synergy DSS contract is not easily predictable as it depends on the long term transmission outage requirements. System Management does not expect a significant increase in the use of this service from the current levels.

Potential load increases in the Kalgoorlie area may require the need to have more support from Kalgoorlie under the existing DSS contract from its historic levels of 200MWh/year. Further Muja-Kalgoorlie transmission line planned outages would result in additional needs in this area under the existing contract.

It should be noted that the Synergy DSS contract is due to expire on 1 July 2018, in line with the prospective Electricity Market Review reforms that would require constrained dispatch and individual facility bidding.

4.6 System Restart

4.6.1 System Restart Relevant Standards

Market Rule 3.10.6 sets the Ancillary Service Standard for System Restart Services:

"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."

There is no applicable SWIS Operating Standard for this service.

4.6.2 System Restart Requirement

System Management requires that there should be at least three generating stations that can start upon black system conditions and can energise the rest of the system. Three services are required to ensure that a service is available to cover one planned and one forced outage amongst the service providers to meet the desired reliability target.

In addition System Management has determined that the black start generators should not be at the same location to mitigate the risk of common failure in the same geographic or electrical area (sub-networks).

Without this diversity the risk of having a generator being unable to start for extended periods is increased due to it being dependant on supply from a remote black start location where the restart path is not subject to network failures. This is particularly the case for generators with long start up times in the South Country should they need to be started from metropolitan black start providers.

That is, if supply to these generators is not restored quickly then they enter a warm or cold state and due to technical limitations this means the Facilities are unable to be restarted for several hours. This scenario will potentially result in a considerable delay to the restoration of supply to customers.

This scenario has arisen previously when adverse weather conditions caused a failure of the 330kV network between Perth and Collie in the morning and was not able to be restored until the weather lifted around midday. System Management consider this scenario credible.

The requirement for System Restart is based on having restart capability in each of the three electrical sub-networks being North Metropolitan, South Metropolitan and South Country.

It should be noted that certain generators with self-start facilities, such as those at Kalgoorlie, cannot restart the rest of the system due to network constraints.

Of further note is that there is no black start capability in the south country currently as previous attempts to procure a service in that area have been unsuccessful. A current tender process is underway with potential prospects for this area.

Further details regarding System Restart requirements are given on the System Management webpage at: http://www.westernpower.com.au/documents/system-management-standard-system_restart_services.pdf

The geographic delineation can be found on the System Management webpage at: http://www.westernpower.com.au/documents/system_restart_electrical_boundaries.pdf

4.6.3 System Restart Plan

As set out in Table 3, the existing three contracts for System Restart Services expire on 30 June 2016. In 2015 System Management commenced a procurement process for System Restart Services as per the process set out in the Ancillary Service Power System Operation Procedure[11]. This process has closed for two of three sub-network areas (North Metropolitan and South Metropolitan) with the outcome being that existing contracts are to be extended for terms up to 5 years.

For the South Country sub-network area, the tender was re-opened earlier this year, after the first tender released in 2015 was unsuccessful. The outcome of this process is expected to be finalised prior to the end of 2016. Should a contract be awarded as a result of this process, it is likely to require a level of works that would not see the service available until 2018.

[11] http://wa.aemo.com.au/docs/default-source/rules/system-management---power-system-operation-procedures/ancillary_services_psop_july_2012.pdf?sfvrsn=2

Appendix 1

Technical Rules Table 2.1 Frequency Operating Standards for the South West Interconnected Network

Table 2.1 *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	
Island[(1)]	49.5 to 50.5 Hz	
Single contingency event	48.75 to 51 Hz	Normal Range: within 15 minutes. For over-*frequency* events: below 50.5 Hz within 2 minutes
Multiple *contingency event*	47.0 to 52.0 Hz	Normal Range within 15 minutes For under-*frequency* events: (a) above 47.5 Hz within 10 seconds (b) above 48.0 Hz within 5 minutes (c) above 48.5 Hz within 15 minutes. (d) For over-*frequency* events: (e) below 51.5 Hz within 1 minute (f) below 51.0 Hz within 2 minutes (g) below 50.5 Hz within 5 minutes

Note:

An island is formed when the *interconnection* between parts of the *interconnected transmission system* is broken, for example if the *interconnection* between the Goldfields region and remainder of the power system is broken.