
Ancillary Service Report 2012
prepared under clause 3.11.11 of
the Market Rules by System
Management – 12 June 2012



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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.

One of the core functions undertaken by Western Power is the management of the electricity transmission and distribution networks. 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 SWIS in a secure and reliable manner.

Clause 2.2 of the *Wholesale Electricity Market Amending Rules (September 2006)* (**Market Rules**) confers this responsibility upon the segregated (“ringfenced”) business unit of Western Power known as System Management. Amongst these responsibilities, the functions of System Management include the need to:

- operate the SWIS in a secure and reliable manner; and
- provide regular reports to the IMO and other market participants.

Included in the requirement to report is the Ancillary Service Report which is described in clause 3.11.11 of the Market Rules.

1.2 Ancillary Service Report

System Management has prepared this report pursuant to its obligations under clause 3.11.11 of the Market Rules, for the two year period 1 July 2011 to 30 June 2013. The Ancillary Service Report comprises of three parts to meet each of these requirements:

- (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)
- (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 (Chapter 3)
- (c) the Ancillary Service Requirements for the coming year and the Ancillary Services plan to meet those requirements (Chapter 4)

2 Quantities of Ancillary Services in the Preceding Year (2011/12)

2.1 Load Following and Spinning Reserve

The average combination of Load Following and Spinning Reserve supplied for the period 1 May 2011 to 30 April 2012 inclusive was 272 MW during Peak intervals and 247 MW during Off-Peak intervals.

The amount of spinning reserve supplied generally exceeded the requirement that the sum of the load following and spinning reserve be greater than 70% of the maximum output of any generator. More spinning reserve than the minimum requirement will often be provided especially at night when units are left running on minimum output. The average is weighted above minimum requirements because generators are committed/decommitted to the system in increments of capacity to ensure spinning reserve does not fall below the minimum requirement.

The adequacy of the load following service can be determined by analysing the distribution of the system frequency. The historic performance is given in Table 1 below.

Table 1 – Historic Frequency Performance

Month	Time Within 49.80-50.20Hz	Time Within 49.85-50.15Hz (NEM)	Average Hz	Standard Deviation Hz
May-11	99.95%	99.81%	50.00	0.025
Jun-11	99.96%	99.89%	50.00	0.024
Jul-11	99.95%	99.73%	50.00	0.028
Aug-11	99.97%	99.84%	50.00	0.028
Sep-11	99.95%	99.74%	50.00	0.031
Oct-11	99.93%	99.76%	50.00	0.027
Nov-11	99.91%	99.79%	50.00	0.027
Dec-11	99.95%	99.82%	50.00	0.026
Jan-12	99.98%	99.86%	50.00	0.025
Feb-12	99.93%	99.81%	50.00	0.027
Mar-12	99.96%	99.92%	50.00	0.024
Apr-12	99.99%	99.98%	50.00	0.021

The Market Rules require that the load following service should be sufficient to cover the operating and ancillary service standards which in summary require system frequency to be maintained between 49.80Hz and 50.20Hz for 99.9% for each month.

This is discussed further in section 4.1.2

Table 1 shows that for each month the frequency standard is maintained with the frequency distribution being 99.910% or better which meets the load following service requirement

For information performance against the NEM requirement (49.85Hz and 50.15Hz for 99% of the time) is also shown. Against the NEM frequency band the frequency standard would be met for each month.

2.2 Load Rejection

Load rejection reserve service is calculated for dispatch purposes, with quantities of this service being dynamic and not currently recorded for historic analysis. The requirement for this year was 120MW and no overfrequency events above 51Hz were recorded.

2.3 Dispatch Support

Dispatch Support Services were procured from Verve Energy for Power System Security.

The quantities of Dispatch Support for the period 1 May 2011 to 30 April 2012 inclusive as well as the quantities from the previous year is given in Table 2.

Table 2 –Historic Dispatch Support Service Provision

Dispatch Support Facility	1/5/2011-30/4/2012	1/5/2010-30/4/2011
Mungarra Gas Turbines	46,790 MWh	59,445 MWh
Kalgoorlie Gas Turbines	299 MWh	4,825 MWh
Geraldton Gas Turbine	0 MWh	0 MWh

The use of the Kalgoorlie Gas Turbines reduced significantly as there was a 6 day outage of the Muja-Kalgoorlie 220kV transmission line in the previous year.

Mungarra Gas Turbines consist of Mungarra GT1, Mungarra GT2 and Mungarra GT3. These have a total sent out capacity of 112.6MW.

Kalgoorlie Gas Turbines consist of West Kalgoorlie GT2 and West Kalgoorlie GT3 which have a total capacity of 62.8MW.

Geraldton Gas Turbine has a capacity of 20.8MW.

2.4 System Restart

No System Restart Services were used in 2011/12. Two Verve Energy and one Perth Energy Black Start facilities are allocated for this purpose. These facilities are Kwinana GT1, PerthEnergy Kwinana GT1 and Pinjar GT3 & Pinjar GT5. Note Pinjar GT3 & Pinjar GT5 are considered one black start facility as they are at the same site.

3 Cost of Ancillary Services in the Preceding Year (2011/12)

The cost of each ancillary service for the period 1 April 2011 to 31 March 2012 as well as the cost for the previous year is given in Table 3. These costs are defined in Market Rule 3.13.1 and are calculated and collected by the IMO on behalf of System Management.

It should be noted that the cost of load following, spinning reserve and dispatch support for each trading interval is dependent on the Marginal Cost Administered Price (MCAP) during the trading intervals.

Table 3 – Cost of Ancillary Services

Ancillary Service	1/4/2011 – 31/3/2012 Total Payment (excluding GST)	1/4/2010 – 31/3/2011 Total Payment (excluding GST)
Load Following	\$ 10,388,823.40 (Capacity)	\$ 7,580,815.20 (Capacity)
	\$ 5,176,946.61 (Availability)	\$ 3,820,803.20 (Availability)
	\$ 15,565,770.01 (Total)	\$ 11,401,618.40 (Total)
Spinning Reserve	\$ 19,944,645.90	\$ 20,673,652.47
Load Rejection	\$ 0.00	\$ 0.00
Dispatch Support	\$ 8,137,848.95	\$ 5,046,139.65
System Restart	\$ 451,210.41	\$ 256,765.51
TOTAL	\$ 44,099,475.26	\$ 37,378,176.03

The cost of ancillary services has generally risen compared to the previous year due to price rises as quantities have remained constant or decreased.

System Restart prices have risen markedly to the introduction of tender based contracts rather than the administered prices.

4 Ancillary Service Requirements and Plan for Coming Year (2012/13)

4.1 Ancillary Service Requirements for Coming Year 2012/13

4.1.1 Overview

Under Market Rule 3.11.1 the Ancillary Service Requirements must be determined by System Management in accordance with the:

- SWIS Operating Standards (as defined in Market Rule 3.1) and
- Ancillary Service Standards (as defined in Market Rule 3.10.)

The SWIS Operating Standards for system frequency are given by the Technical Rules Table 2.1. Frequency Operating Standards for the South West Interconnected Network This is given in Appendix 1 for reference.

The requirements for each of the ancillary services have been developed to meet this requirement for the upcoming year, having regard to the requirements of the Power System Operation Procedure: Ancillary Services.

Except as otherwise noted in this section, the ancillary service requirements are not:

- location specific;
- variable for different SWIS load levels or other scenarios;
- variable by the type of day and time of day; or
- variable across the year.

4.1.2 Load Following

The SWIS Operating Standard is specified in the Technical Rules as “Table 2.1 Frequency Operating Standards for the South West Interconnected Network”. The “Normal Range” requirement is that system frequency shall be maintained at above 49.80 Hz and below 50.20 Hz for 99% of the time.

The Ancillary Service Standard is specified in Market Rule 3.10.1(a):-

“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.”

In order to be in accordance with both these standards System Management has determined that the Load Following Ancillary Service Requirement should be sufficient to maintain the system frequency between 49.80Hz and 50.20Hz for 99.9% for each month.

System Management cannot accurately forecast the minute by minute fluctuations of system frequency due to load and intermittent generator variations in the short or long term. As such load following requirements are set on using historical results to raise or lower future requirements.

Analysis of the frequency variations of last year as shown in Table 1 shows that the load following requirement of +/- 90MW was just sufficient as the frequency variation approached 99.9% in only one month.

System Management believes that as the threshold for the load following requirement was only approached during one month following 2011/12 and so the requirement for 2012/13 could be lowered marginally to around +/- 80MW. However a new large windfarm at Mumbida is estimated to be commissioning during August 2012, this will increase again the requirement for load following ancillary services. The size of this increase has not been studied in previous studies. As such an estimate has been made of the impact of Mumbida being to be +/- 90MW.

As such the requirements have been left at their current values being:

Load Following Ancillary Service Raise = 90MW.

Load Following Ancillary Service Lower = 90MW

Temporary changes to the this requirement may be made if the prevailing weather forecasts show times where intermittent generation levels will be low. The LFAS Market allows System Management to adjust these requirements by advising the IMO in advance

It should be noted that the proportion of load following component in the spinning reserve which is discussed below and this service can not be supplied from facilities such as interruptible loads that do not respond to continuous control signals.

4.1.3 Spinning Reserve

The SWIS Operating Standard is specified in the Technical Rules as “Table 2.1 Frequency Operating Standards for the South West Interconnected Network”. The “Single Contingency Event” requirement is that the system frequency shall be maintained not to fall below 48.75 Hz and returned to 49.8 - 50.2 Hz within 15 minutes.

The Ancillary Service standard is specified in Market Rule 3.10.2 -

“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;”

System Management uses the Ancillary Service Standard to set the spinning reserve proportion since to meet the SWIS Operating Standard 100% of the output of the contingency would need to be carried. This imposes a much greater cost to the market customers for a smaller risk of loss of supply.

In order to be in accordance with both these standards System Management has determined that the Spinning Reserve Ancillary Service Requirement is 70% of the largest contingency.

The requirement is determined by the largest contingency being the larger of the largest output of any unit on the system and the largest network event causes loss of generation. This will vary with the dispatch plans of the various participants and network outages. System Management cannot accurately forecast the dispatch of each unit on the system in the short or long term.

For 2012/13 Collie Power Station is the largest unit on the SWIS with a maximum generated output of 340MW. Hence, the maximum spinning reserve level that may be required is 0.7 multiplied by 340MW which is approximately 240MW. 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. Hence the requirement would rise if this should occur.

It is noted that the spinning reserve ancillary service requirement is the spinning reserve level less any Load Following Ancillary Service Raise requirement. Hence the general minimum spinning reserve service required is $240 - 90 = 150\text{MW}$. This can be provided by such facilities as synchronised generation and interruptible loads.

Temporary increases in spinning reserve during commissioning test of large generators are normally made to cover the extra risk to security. In 2012/13 no new large generators are expected to be commissioned and so this is not foreseeable. However requests from existing large generators may be received and System Management would schedule more spinning reserve during these times.

4.1.4 Load Rejection Reserve

The SWIS Operating Standard is specified in the Technical Rules as “Table 2.1 Frequency Operating Standards for the South West Interconnected Network”. The “Single Contingency Event” requirement is that the system frequency shall not rise above 51.0 Hz, returned to less than 50.5 Hz within two minutes and returned to 49.8 - 50.2 Hz within 15 minutes.

The Ancillary Service Standard is specified in Market Rule 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;”

In order to be in accordance with both these standards System Management has determined that the Load Rejection Reserve Ancillary Service Requirement should be 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.

The requirement is determined by the amount of load that is lost during the a network faults. This requirement is set at 120MW, this is unchanged from last year. The network faults, generally a short circuit on a transmission line due to environmental impact causes severe voltage dips which cause customer loads to automatically disconnect.

It should be noted that at times when the risk of load rejection is lower due to the prevailing weather conditions this may be reduced to 90MW. This results from the risk of a network fault causing a load rejection is being significantly reduced at times of low lightning activity.

In addition this will cover disconnection of load at Boddington after a network fault which is 80MW and the disconnection of the load at Boddington which is 120MW due to a plant fault.

The amount of load rejection reserve in future years may increase if certain network events, such as the forced outage of a transmission line, will cause disconnection of larger amounts of loads. Or larger loads are connected to the system.

4.1.5 Dispatch Support

Dispatch Support Services are forecast to be required for 2012/13. This will continue to be supplied for network support from Verve Energy facilities at Mungarra, West Kalgoorlie and Geraldton.

System Management does not at this time anticipate entering into further arrangements for dispatch support during 2012/13.

4.1.6 System Restart

System Management has determined 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 unforced outage amongst the service providers.

In addition System Management has determined that if possible the black start generators should not be at the same location to mitigate the risk of common failure at the same power station or sub-networks. The requirement for system restart is based on having restart capability in each of 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.

The details of these requirements are given on the System Management Webpage at:

http://www.westernpower.com.au/retailersgenerators/systemManagement/System_Restart_Services.html.

4.2 Ancillary Service Plan for Coming Year 2012/13

4.2.1 Development and Procurement

System Management may procure ancillary service from participants other than Verve Energy in circumstances where it believes Verve Energy cannot provide sufficient services or another party can provide a less expensive alternative. To assist with procurement of Load Following Ancillary Service at least cost, System Management is increasingly looking to the WEM Market to provide options.

4.2.2 Load Following

The load following requirements will be met by certified providers in the Load Following Ancillary Service Market that is being implemented by the IMO under rule change RC_2011_10. In the absence of any provision under the LFAS Market arrangements the requirement will be met with the additional commitment of Verve Energy generation.

There is expected to be sufficient Verve Energy plant to meet this requirement even with the largest load following provider unit (a frame 9 gas turbine) out of service.

Details of the Load Following Ancillary Service market can be found at the IMO's website.

4.2.3 Spinning Reserve

For 2012/13, 42MW of spinning reserve will be provided by interruptible load supplied by a market participant.

The remaining spinning reserve will be supplied by synchronising additional Verve Energy generators. There is expected to be sufficient Verve Energy plant to meet this requirement even with the largest spinning reserve provider unit (a large open cycle gas turbine) out of service.

4.2.4 Load Rejection

The Load Rejection requirement will be provided by the ability to turn down or off a Verve Energy generating unit(s). There is expected to be enough turn down even at times of minimum Verve Energy generation.

4.2.5 Dispatch Support

Dispatch support services are forecast to be required for 2012/13. At this stage System Management anticipates continuing to obtain these services from Verve Energy facilities at Mungarra, West Kalgoorlie and Geraldton.

The cost of this service is not easily predictable as the cost is dependent on the future value of the Balancing Price. Load increases in the Geraldton Area however is expected to require this service to be activated more often.

4.2.6 System Restart

System Management procures 3 system restart services to cover one planned and one unforced outage on the service providers. In addition System Management attempts to procure the service in different parts of the SWIS to reduce the risk of network failures preventing restart of the system. These three parts are North Metropolitan, South Metropolitan and South Country (Collie/Bunbury).

System Management has obtained 3 System Restart Services as a result of a public tender process or by direct negotiation if there was insufficient response to the tender.

System Management is still assessing the feasibility of options for System Restart in the South Country region. There are no existing or proposed black start facilities in this subregion so sites are being studied as where new facilities could be installed.

In 2012/13 the service will be provided by Verve Energy gas turbines located at Kwinana and Pinjar. In addition it will be provided by Western Energy gas turbines located at Donaldson Rd.

The cost of this service is expected be \$41,583/month, equivalent to \$498,996/year.

Appendix 1

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

TECHNICAL RULES FOR THE SOUTH WEST INTERCONNECTED NETWORK

SECTION 2 – TRANSMISSION AND DISTRIBUTION SYSTEM PERFORMANCE AND PLANNING CRITERIA

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.