
**Ancillary Service Report 2011
prepared under clause 3.11.11 of
the Market Rules by System
Management - 27 June 2011**



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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 are 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 2010 to 30 June 2012. The Ancillary Service Report comprises of three parts:

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

The following sections will address each of these requirements.

2 Quantities of Ancillary Services in the Preceding Year (2010/11)

2.1 Load Following and Spinning Reserve

The average combination of Load Following and Spinning Reserve supplied for the period 1 April 2010 to 31 March 2011 inclusive was 274 MW during Peak intervals and 245 MW during Off-Peak intervals.

The amount of spinning reserve supplied generally exceeded the requirement that requires the sum of the load following and spinning reserve to be at 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-10	99.98%	99.92%	50.00	0.024
Jun-10	99.97%	99.76%	50.00	0.029
Jul-10	99.91%	99.81%	50.00	0.031
Aug-10	99.97%	99.83%	50.00	0.028
Sep-10	99.93%	99.58%	50.00	0.029
Oct-10	99.95%	99.90%	50.00	0.026
Nov-10	99.94%	99.79%	50.00	0.027
Dec-10	100.00%	99.89%	50.00	0.025
Jan-11	99.96%	99.85%	50.00	0.027
Feb-11	99.91%	99.66%	50.00	0.032
Mar-11	99.97%	99.76%	50.00	0.028
Apr-11	99.97%	99.90%	50.00	0.025

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 following gives the quantities of Dispatch Support for the period 1 May 2010 to 30 April 2011 inclusive as well as the quantities from the previous year.

Dispatch Support Facility	1/5/2010-30/4/2011	1/5/2009-30/4/2010
Mungarra Gas Turbines	59,445 MWh	53,895 MWh
Kalgoorlie Gas Turbines	4,825 MWh	1,534 MWh
Geraldton Gas Turbine	0 MWh	0 MWh

The use of the Kalgoorlie Gas Turbines increased significantly due to a 6 day outage of the Muja-Kalgoorlie 220kV transmission line in April 2011.

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 2010/11. Three Verve Energy Black Start facilities are allocated for this purpose. These facilities are Kwinana GT1, Tiwest Cog1 and Pinjar GT3 & Pinjar GT5. Note Pinjar gas turbines 3&5 are considered one black start facility as they are at the same site.

3 Cost of Ancillary Services in the Preceding Year (2010/11)

Table 2 provides the cost of each ancillary service for the period 1 April 2010 to 31 March 2011 as well as the cost for the previous year. These costs are defined in Market Rule 3.13.1 and are collected by the IMO on behalf of System Management. It should be noted that the cost of load following and spinning reserve is dependent on the Marginal Cost Administered Price (MCAP) during the trading intervals. The MCAP is determined two business days after the relevant trading day.

Table 2 – Cost of Ancillary Services

Ancillary Service	1/4/2010 – 31/3/2011 Total Payment (excluding GST)	1/4/2009 – 31/3/2010 Total Payment (excluding GST)
Load Following	\$ 7,580,815.20 (Capacity)	\$ 6,188,803.20 (Capacity)
	\$ 3,820,803.20 (Availability)	\$ 1,453,073.57 (Availability)
	\$ 11,401,618.40 (Total)	\$ 7,641,876.77 (Total)
Spinning Reserve	\$ 20,673,652.47	\$ 10,424,519.71
Load Rejection	\$ 0.00	\$ 0.00
Dispatch Support	\$ 5,046,139.65	\$ 5,274,074.25
System Restart	\$ 256,765.51	\$ 249,996.00
TOTAL	\$ 37,378,176.03	\$ 23,590,466.73

Note - the Spinning Reserve cost shown in the table for 2010/11 (\$20,673,652.47) does not include any adjustments to address the MW/MWh Ancillary Service Cost issue identified by the IMO and communicated to Market Participants on 8 April 2011. The adjustment processing is still in progress, but re-processing for six of the affected months has resulted in a net reduction of \$564,082.05.

Generally the cost of Ancillary Services were in line with the previous year. However, the Load Following Availability and Spinning Reserve components almost doubled. This resulted from a change to the Margin Peak and Margin Off-Peak parameters starting 1 July 2010. The details of this change can be found at the ERA website at:

http://www.erawa.com.au/2/272/42/determination_of_the_imo_and_system_management_al
l.pm

4 Ancillary Service Requirements and Plan for Coming Year (2011/12)

4.1 Ancillary Service Requirements for Coming Year 2011/12

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 the 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.

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 for the normal operating conditions 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 meet 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.

Analysis of the frequency variations of last year as shown in Table 1 shows that the load following requirement of +/- 60MW was appropriate as the frequency variation approached 99.9% in two months.

System Management expects the load following requirement to rise in 2011/12 with the commissioning of Collgar Windfarm as the operation of this facility should increase the frequency variations.

In November 2010 a series of 4 Work Package reports were completed as part of the Renewable Energy Generation Working Group outcomes. These are available at

<http://www.imowa.com.au/REGWG>

Work Package 3 report shows an increase in the load following requirement. The closest scenario is Scenario 2 which as Collgar plus Badgingarra as given in Table 7.3. System Management has estimated with Collgar alone the requirement will be +/-90MW.

The load following requirement for the 2011/12 year has been based on the latest information made available to System Management by the IMO.

The load following requirement is forecast to be

July 2011	+/-60MW
August 2011	+/-70MW
September 2011	+/-70MW
October 2011	+/-80MW
November 2011 and on	+/-90MW

The actual ramp up however may vary from this forecast.

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 for the single contingency conditions is that the system frequency shall be maintained at 48.75 Hz or above.

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 requirement since to meet the SWIS Operating Standard 100% of the output of the largest unit would need to be carried. This imposes a much greater cost to the market customers for a smaller risk of loss of supply.

The requirement is determined by the largest output of any unit on the system. This will vary with the dispatch plans of the various participants. System Management cannot accurately forecast the dispatch of each unit on the system in the short or long term.

For 2011/12 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 240MW. It should be noted that the facility with the highest registered capacity is Newgen Neerabup with 342 MW, but this is made up of 2 generating units of 171MW each.

It is noted that the spinning reserve ancillary service requirement is the spinning reserve level less any load following requirement. Hence the minimum spinning reserve service required is $240 - 60 = 180\text{MW}$ initially falling to $240 - 90 = 150\text{MW}$. This can be provided by such facilities as synchronised generation and interruptible loads.

4.1.4 Load Rejection Reserve

The SWIS Operating Standard for the single contingency conditions is that the system frequency shall be maintained at 51.0 Hz or below.

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;”

The requirement is determined by the amount of load that is lost during the majority of network faults. This requirement is set at 120MW, this is unchanged from last year.

It should be noted that at times when the risk of load rejection is low due to the prevailing weather conditions this may be reduced to 90MW which is reduced from last year based on recent experience. 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 forecast to be 80MW.

4.1.5 Dispatch Support

Dispatch support services are forecast to be required for 2011/12. 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 2011/12.

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. 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.

There is a requirement that the black start generators should not be at the same location to mitigate the risk of common failure at the same power station and capable of energising discrete 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.

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

http://www.westernpower.com.au/mainContent/workingWithPower/systemManagement/System_Restart_Services.html.

4.2 Ancillary Service Plan for Coming Year 2011/12

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.

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.

4.2.2 Load Following

The load following requirements will be met with the additional commitment of Verve Energy generation in the absence of procurement from a Non-Verve provider.

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

The requirement given in section 4.1.1 above (i.e. +/-90MW) can be met by operating fast acting generators, such as open cycle gas turbines, whose total operating range (in MW) is equal to that required. The requirement can also be met by operating slower acting generators, such as steam turbines, however their total operating range (in MW) may need to be greater than required. For example a +/-30MW load following service may be provided by slow acting generators whose total operating range is +/-60MW.

Verve Energy will continue to be the sole provider of this service, at this time.

It should be noted that future Load Following Services are the subject of the Market Evolution Program (MEP) being undertaken by the IMO. Further details are available at

<http://www.imowa.com.au/mep-overview>

4.2.3 Spinning Reserve

For 2011/12, 52MW of spinning reserve will be provided by interruptible load supplied by two market participants. This will reduce to reduce to 42MW in October 2011 as the contract to supply 10MW from one supplier will expire.

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. This however will get harder to manage as overnight load supplied by Verve Energy is reduced.

4.2.5 Dispatch Support

Dispatch support services are forecast to be required for 2011/12. 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 Marginal Cost Administered Price. Load increases in the Geraldton Area however is expected to require this service to be activated more often.

4.2.6 System Restart

In 2011/12 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 \$491,000. This is higher than the previous level which was based on a transitional arrangement at market start.