

POWER SYSTEM FREQUENCY AND TIME ERROR MONITORING

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1 Disclaimer

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2 Introduction

AEMO must use reasonable endeavours to maintain the power system frequency and time error within the limits specified in the Frequency Operating Standards determined for the Mainland and the Tasmania Region by the Reliability Panel. This document reports on the frequency and time error performance observed during September 2012 in all regions of the NEM. Queensland, New South Wales, Victoria and South Australia are referred to as the Mainland regions throughout the report.

The Frequency Operating Standards for the Mainland regions and the Tasmania region are available on the AEMC web site¹.

The “Power System Frequency and Time Deviation Monitoring Report – Reference Guide²” outlines the calculation processes used by AEMO in the preparation of the monthly Power System Frequency and Time Deviation Monitoring reports.

The analysis of the delivery of Slow Raise service, Slow Lower service, Delayed Raise service and Delayed Lower service presented in this report are based on 4-second sampled data. Unless otherwise noted, frequency data for Mainland regions is sourced from 4-second measurements in New South Wales and frequency data for Tasmania region is sourced from 4-second measurements in Tasmania. The analysis of Fast Raise service and Fast Lower service delivered is based on high-speed (50 millisecond samples or lower) data from Market Participants and is only presented in this report for events where the appropriate data is available.

3 Operation within the Normal Operating Frequency Band

During September 2012 the Mainland frequency was within the Normal Operating Frequency Band (49.85 Hz – 50.15 Hz) 99.96% of the time.

During September 2012 the Tasmanian frequency was within the Normal Operating Frequency Band 99.89% of the time.

All frequency excursions within the Normal Operating Frequency Excursion Band returned to the Normal Operating Frequency Band within the times in the Frequency Operating Standards.

4 Operation outside the Normal Operating Frequency Excursion Band

Table 1 summarises events in the Mainland and Tasmanian regions for the month September 2012 with frequency excursions outside the Normal Operating Frequency Excursion Band.

One Mainland event in Table 1 did not meet the Mainland Frequency Operating Standard. This event is discussed in Section 6.

One Tasmania event in Table 1 did not meet the Tasmania Frequency Operating Standard. This event is discussed in Section 6. The number of Tasmania load events was particularly low in September 2012. This was due to the absence of Basslink switching events, as Basslink exported power to the Mainland for the entirety of September 2012.

¹ The Frequency Operating Standards for the Mainland and Tasmania regions are available from <http://www.aemc.gov.au/Panels-and-Committees/Reliability-Panel/Guidelines-and-standards.html>

² The Power System Frequency and Time Deviation Monitoring Report – Reference Guide is available from <http://www.aemo.com.au/Electricity/Market-and-Power-Systems/NEM-Reports/Power-System-Performance-Monitoring>

5 Events outside Normal Operating Frequency Excursion Band

Table 1: Events in the Mainland and Tasmanian regions with frequency excursions outside the Normal Operating Frequency Excursion Band.

EVENT	LOW/HIGH FREQUENCY EVENT	NUMBER OF EVENTS	
		MAINLAND	TASMANIA
No contingency or load event/Normal event	LOW	0	1
	HIGH	0	0
Load Event	LOW	0	4
	HIGH	0	11
Generation Event	LOW	2	8
	HIGH	0	2
Network Event	LOW	0	0
	HIGH	0	0
Separation Event	LOW	0	0
	HIGH	0	0
Multiple Contingency Event	LOW	0	0
	HIGH	0	0

6 Events that did not meet the Frequency Operating Standards

In this section, details are provided of those events identified as not meeting the Frequency Operating Standard applicable to each event.

6.1 Low frequency events in Mainland regions

There was one low frequency event recorded in the Mainland Region that did not meet the Mainland Frequency Operating Standard during September 2012. This event is listed in Table 2.

Table 2: Low frequency events in the Mainland region during which frequency exceeded the Mainland Frequency Operating Standards.

DATE	EVENT	MIN FREQUENCY (HZ)	TIME OUTSIDE NORMAL OPERATING BAND (49.85 HZ - 50.15 HZ)(SECONDS)
26/09/2012 15:26:00	Generation event	49.74	452

6.1.1 Event: 26/09/2012 15:26:00

The event was caused by the trip of the Kogan Creek generating unit from 731 MW. Figure 1 shows that the Mainland frequency was outside the Normal Operating Frequency Band for 452 seconds. This exceeded the Mainland Frequency Operating Standard of recovery within 300 seconds. The Mainland frequency fell to a minimum of 49.74 Hz during this event.

A comparison of the amount of Enabled Slow Raise and Delayed Raise FCAS, and the amounts delivered is shown in Figure 2. The frequency excursion was not sufficient to trigger a response from five switched controllers to deliver Delayed Raise FCAS services during this event. The shortfall in Delayed Raise FCAS services impeded the recovery to the Normal Operating Frequency Band. The amount of Fast Raise services delivered was not calculated as high speed data was not requested for this event.

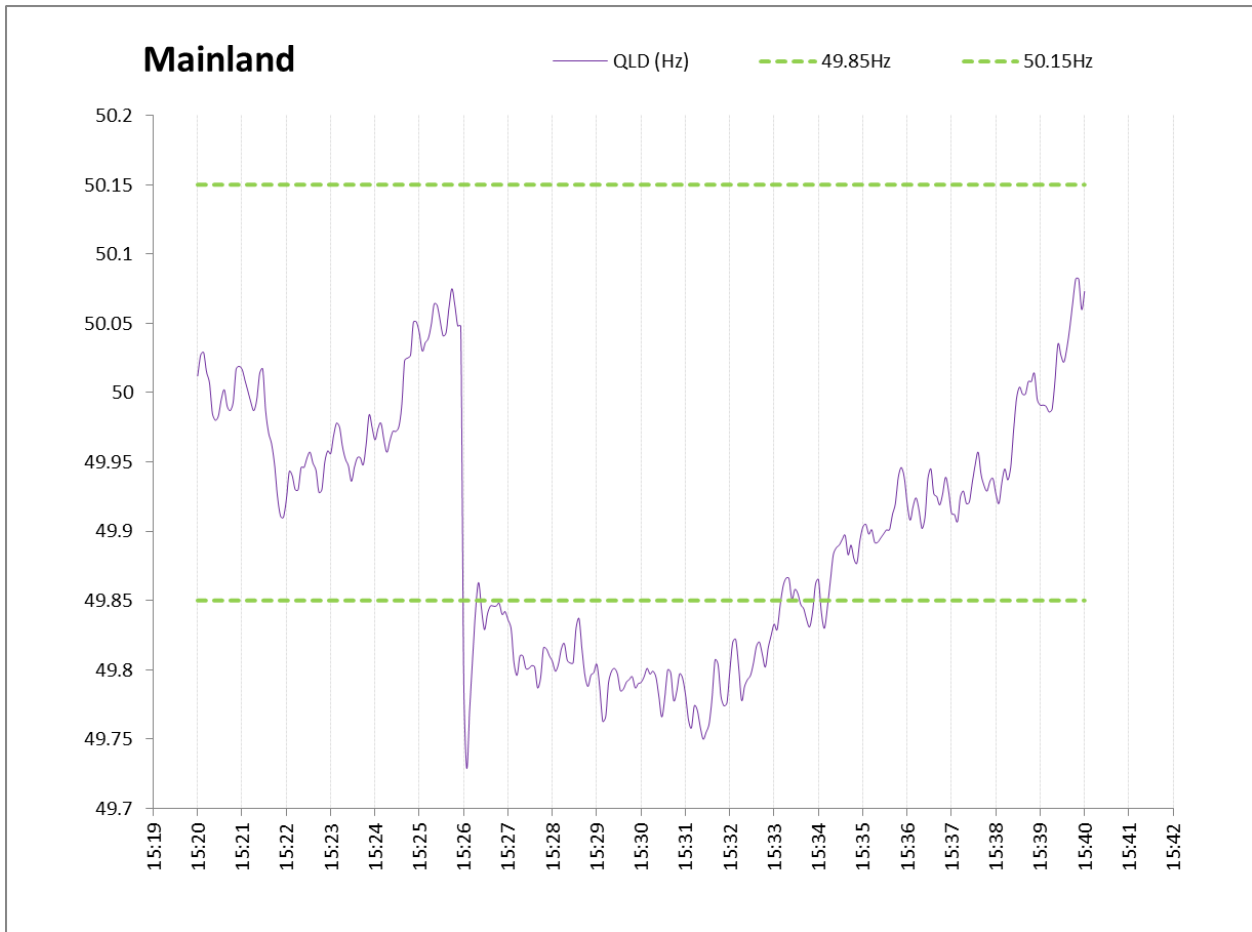


Figure 1: Low frequency generation event in Mainland that occurred 26/09/2012 15:26:00

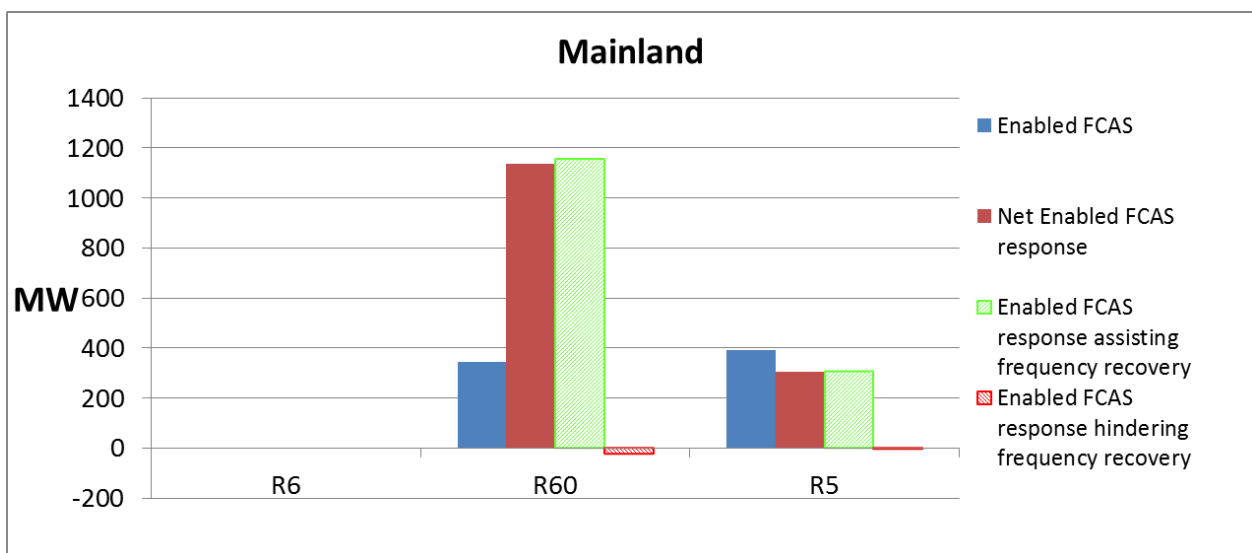


Figure 2: FCAS response to generation event in Mainland that occurred 26/09/2012 15:26:00.

6.2 High frequency events in Mainland regions

There were no high frequency events in the Mainland regions not meeting the Mainland Frequency Operating Standard during September 2012.

6.3 Low frequency events in Tasmania.

There was one low frequency event recorded in the Tasmania Region that did not meet the Tasmania Frequency Operating Standard during September 2012. This event is listed in Table 3.

Table 3: Low frequency events in the Tasmania region during which frequency exceeded the Tasmania Frequency Operating Standards.

DATE	EVENT	MIN FREQUENCY (HZ)	TIME OUTSIDE NORMAL OPERATING BAND (49.85 HZ - 50.15 HZ)(SECONDS)
04/09/2012 15:27:24	No Condition causing the event was identified.	49.74	8

6.3.1 Event: 0409/2012 15:26:00

No contingency could be identified as the cause of the event on 04 September 2012 in Tasmania. The Gordon generating unit reduced its output from 83 MW to 45 MW, which contributed to the frequency excursion. Figure 1 shows that the Tasmania frequency was outside the Normal Operating Frequency Band for 8 seconds. The Tasmania frequency fell to a minimum of 49.74 Hz during this event.

The duration of the event was not sufficient to verify the performance of the Slow Raise and Delay Raise services. The amount of Fast Raise services delivered was not calculated as high speed data was not requested for this event.

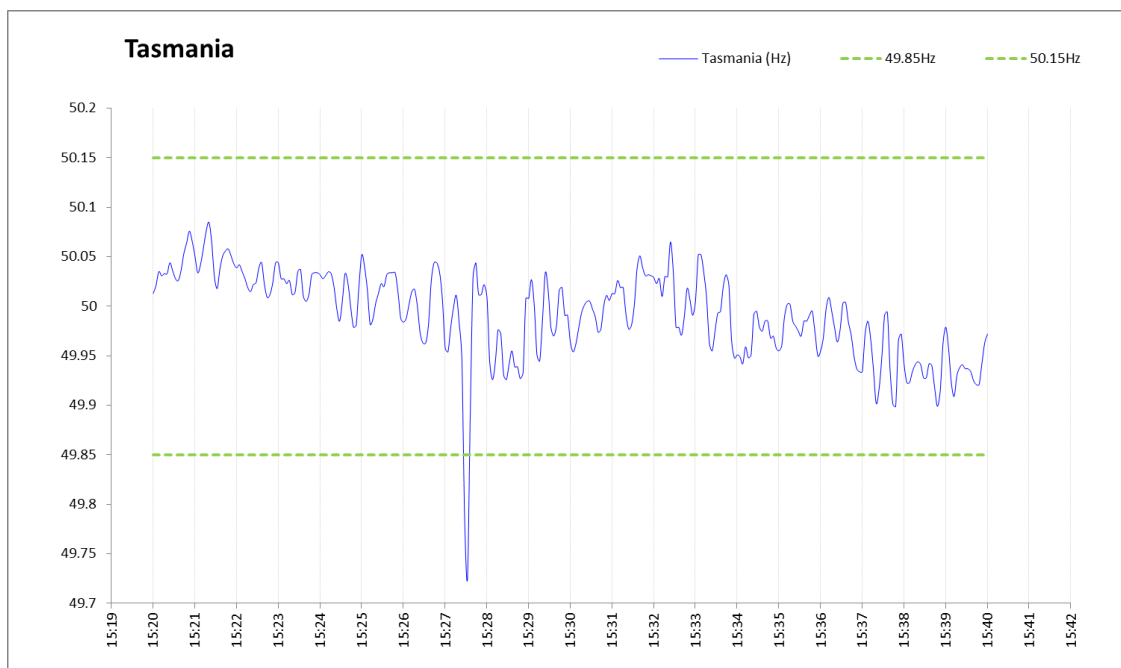


Figure 3: Low frequency event in Tasmania that occurred 04/09/2012 15:27:00

6.4 High frequency events in Tasmania

There were no high frequency events in Tasmania region during September 2012 that did not meet the Tasmania Frequency Operating Standard.

7 Accumulated time error

The Frequency Operating Standards require that the accumulated time error be maintained within the range ± 5 seconds in Mainland regions and ± 15 seconds in Tasmania. Constraints used to control Mainland accumulated time error, by varying the amount of Regulation FCAS enabled, are based upon measurements taken in Queensland and New South Wales. The range of accumulated time error recorded for measurements in Queensland, New South Wales and Tasmania are provided in Table 4. The time error requirements in the Frequency Operating Standards were met in September 2012.

Table 4: Accumulated time error measurements in September 2012.

VALUE	QLD	NSW	TAS
Highest positive time error (seconds)	4.52	4.72	6.17
Lowest negative time error (seconds)	-3.50	-3.39	-9.99