

POWER SYSTEM FREQUENCY AND TIME ERROR MONITORING

March 2013

PREPARED BY: System Performance and Commercial

DOCUMENT REF: SP&C_01

VERSION: 2

DATE: 6 May 2013

FINAL

Version Release History

VERSION	DATE	BY	CHANGES
2.0	28/05/2013	Peter McEniery	Re-classification of three load events as multiple contingency events.
1.0	18/04/2013	Peter McEniery	Initial release

Contents

1	Disclaimer	4
2	Introduction	5
3	Operation within the Normal Operating Frequency Band.....	5
4	Operation outside the Normal Operating Frequency Excursion Band.....	6
5	Events outside Normal Operating Frequency Excursion Band.....	7
6	Events that did not meet the Frequency Operating Standards.....	8
6.1	Events in Mainland regions	8
6.2	Events in the Tasmania region	8
7	Accumulated time error	9

1 Disclaimer

This document is made available to you on the following basis:

- a) **Purpose** - This report has been prepared by the Australian Energy Market Operator Limited (**AEMO**) for the sole purpose of complying with clause 4.18.15 of the National Electricity Rules in the context of events where power system frequency was outside the limits specified in the power system security and reliability standards.
- b) **No Reliance or warranty** – This report contains data provided by third parties and might contain conclusions or forecasts and the like that rely on that data. This data is included “as is” and might not be free from errors or omissions. While AEMO has used due care and skill, AEMO does not warrant or represent that the data, conclusions, forecasts or other information in this report are accurate, reliable, complete or current or that they are suitable for particular purposes. You should verify and check the accuracy, completeness, reliability and suitability of this report for any use to which you intend to put it, and seek independent expert advice before using it, or any information contained in it.
- c) **Limitation of liability** - To the extent permitted by law, AEMO and its advisers, consultants and other contributors to this report (or their respective associated companies, businesses, partners, directors, officers or employees) shall not be liable for any errors, omissions, defects or misrepresentations in the information contained in this report, or for any loss or damage suffered by persons who use or rely on such information (including by reason of negligence, negligent misstatement or otherwise). If any law prohibits the exclusion of such liability, AEMO’s liability is limited, at AEMO’s option, to the re-supply of the information, provided that this limitation is permitted by law and is fair and reasonable.

© 2013 - All rights reserved.

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 March 2013 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 sampling or less) 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 March 2013 the Mainland frequency was within the Normal Operating Frequency Band (49.85 Hz – 50.15 Hz) 100% of the time.

During March 2013 the Tasmanian frequency was within the Normal Operating Frequency Band (49.85 Hz – 50.15 Hz) 99.77% of the time.

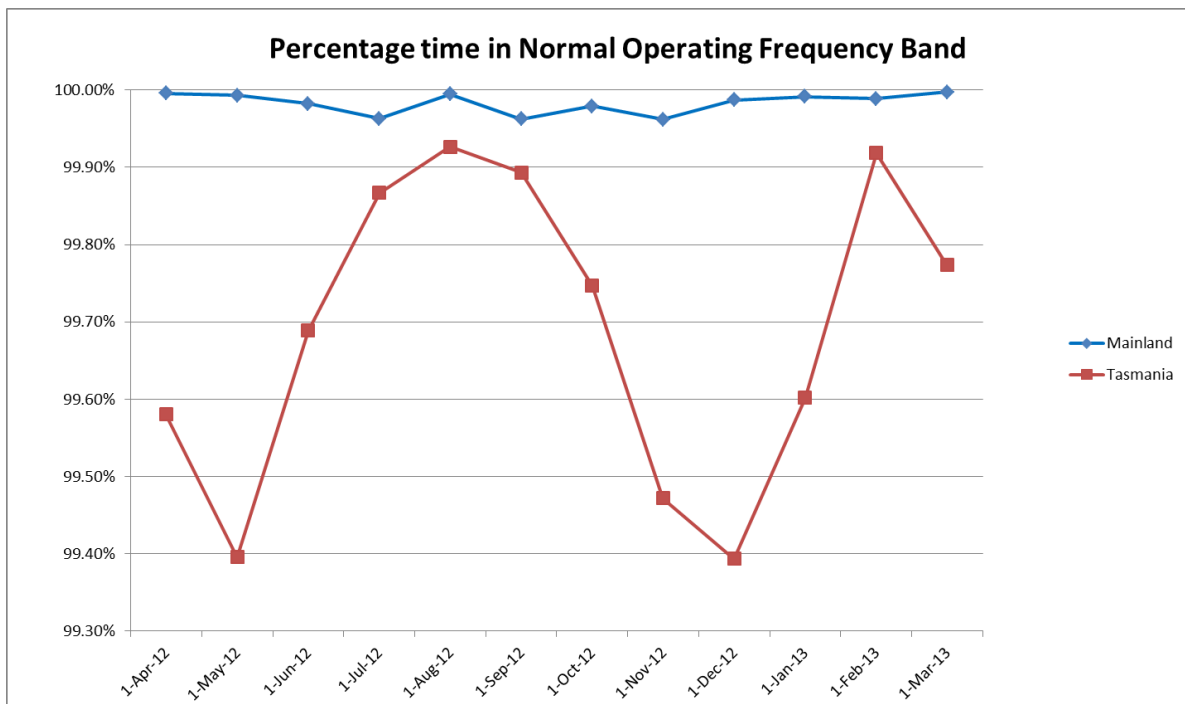
All frequency excursions within the Normal Operating Frequency Excursion Band (49.75 Hz – 50.25 Hz) returned to the Normal Operating Frequency Band within the times in the Frequency Operating Standards.

The percentage time of operation in the Normal Operating Frequency Band over the last 12 months is shown in Figure 1.

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://aemo.com.au/Electricity/Resources/Reports-and-Documents/Frequency-and-Time-Error-Monitoring>

Figure 1: Percentage time in Normal Operating Frequency Band, last 12 months



4 Operation outside the Normal Operating Frequency Excursion Band

Table 1 summarises events in the Mainland and Tasmanian regions for the month March 2013 with frequency excursions outside the Normal Operating Frequency Excursion Band.

All Mainland events in Table 1 returned to the Normal Operating Frequency Excursion Band within the times in the Mainland Frequency Operating Standard.

All Tasmania events in Table 1 returned to the Normal Operating Frequency Excursion Band within the times in the Tasmania Frequency Operating Standard.

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	40
	HIGH	0	41
Generation Event	LOW	0	0
	HIGH	0	0
Network Event	LOW	0	0
	HIGH	0	0
Separation Event	LOW	0	0
	HIGH	0	0
Multiple Contingency Event	LOW	0	1
	HIGH	0	3

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 Events in Mainland regions

There were no low or high frequency events recorded in the Mainland region that did not meet the Mainland Frequency Operating Standard during March 2013.

6.2 Events in the Tasmania region

There was one frequency event recorded in the Tasmania Region that did not meet the Tasmania Frequency Operating Standard during March 2013. This event is listed in Table 2.

Table 2: Frequency events in the Tasmania region during which frequency exceeded the Tasmania Frequency Operating Standard.

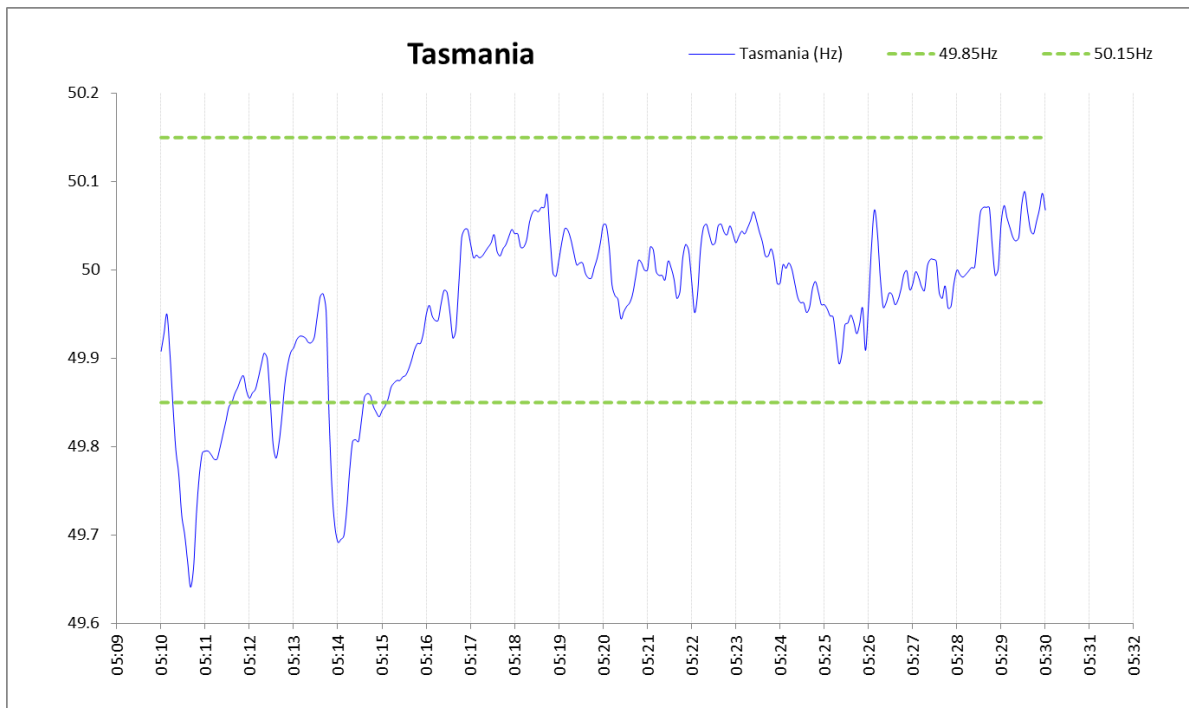
DATE	EVENT	MIN/MAX FREQUENCY (HZ)	TIME OUTSIDE NORMAL OPERATING BAND (49.85 HZ - 50.15 HZ)(SECONDS)
0510 hrs 16/3/2013	No contingency causing the event could be identified.	49.64 Hz	188

No contingency could be identified as the cause of the event in Tasmania on 16 March 2013. Gordon power station was ramping down from 228 MW to 0 MW in a stepped manner from DI ending 0505 hrs to DI ending 0535 hrs. At 0510 hrs Gordon power station had a step reduction from 112 MW to 70 MW. The response of two generating units enabled for Raise Regulation appeared insufficient to maintain the Tasmania frequency in the Normal Operating Frequency Band. Basslink was importing power to Tasmania near its limit at the time of the event. Low power system inertia was likely to have been a contributing factor to this frequency excursion. The frequency disturbance was repeated at 0512 hrs when Gordon power station had a step reduction in output from 60 MW to 30 MW. Tasmania frequency fell to a minimum of 49.64 Hz during this event.

FCAS performance during this event could not be verified:

- a. Fast Raise services were not verified as high speed data was not requested for this event;
- b. The excursion outside the Normal Operating Frequency Band was not long enough to verify the performance of Slow Raise services; and
- c. The excursion outside the Normal Operating Frequency Band was not long enough to verify the performance of Delayed Raise services.

Figure 2: Low frequency event that occurred in Tasmania 0510 hrs 16 March 2013.



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 ranges of accumulated time error recorded for measurements in Queensland, New South Wales and Tasmania are provided in Table 3.

Table 3: Accumulated time error measurements in March 2013.

VALUE	QLD	NSW	TAS
Highest positive time error (seconds)	1.85	2.00	1.33
Lowest negative time error (seconds)	-3.14	-2.97	-7.33