



FREQUENCY AND TIME ERROR MONITORING – 3RD QUARTER 2014

FOR THE NATIONAL ELECTRICITY MARKET

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IMPORTANT NOTICE

Purpose

AEMO has prepared this document to provide information about the frequency and time error performance in the National Electricity Market Mainland and Tasmania regions for the period July to September 2014 inclusive.

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1. INTRODUCTION

AEMO must use reasonable endeavours to maintain power system frequency and time error within the limits specified by the Reliability Panel in the Frequency Operating Standards¹ for the Mainland and Tasmania region. This document reports on the frequency and time error performance observed during July, August and September 2014 in all regions of the National Electricity Market (NEM). Queensland, New South Wales, Victoria and South Australia are referred to as the Mainland region throughout the report.

The *Power System Frequency and Time Deviation Monitoring Report – Reference Guide*² outlines the calculation procedure used by AEMO to produce the quarterly Frequency and Time Error Monitoring report.

The analysis of the delivery of Slow Raise, Slow Lower, Delayed Raise and Delayed Lower Frequency Controlled Ancillary Services (FCAS) presented in this report are based on 4-second 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 and Fast Lower ancillary services 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.

¹ <http://aemc.gov.au/Australia-s-Energy-Market/Market-Legislation/Electricity-Guidelines-and-Standards>

² <http://aemo.com.au/Electricity/Resources/Reports-and-Documents/Frequency-and-Time-Error-Monitoring>

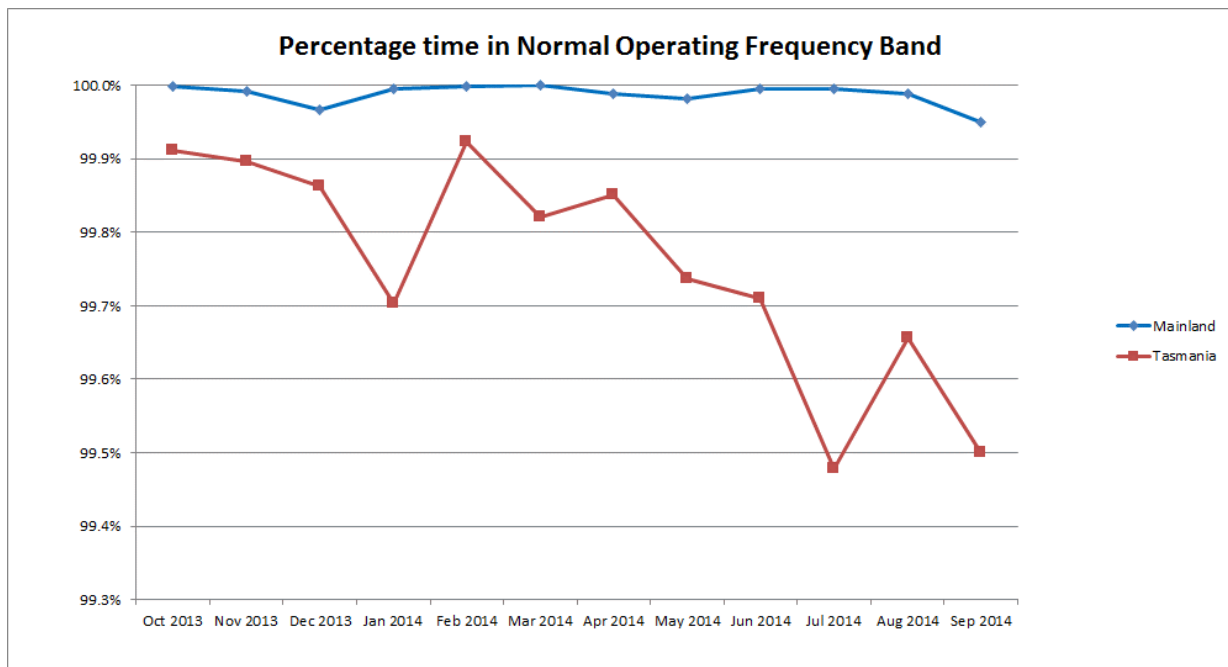
2. OPERATION WITHIN THE NORMAL OPERATING FREQUENCY BAND

The Mainland and Tasmanian frequency remained within the Normal Operating Frequency Band (49.85 Hz – 50.15 Hz) more than 99% of the time over this reporting period, as required by the Frequency Operating Standards.

All Mainland and Tasmania events within the Normal Operating Frequency Excursion Band (49.75 Hz – 50.25 Hz) returned to the Normal Operating Frequency Band within the time limits specified in the Frequency Operating Standards.

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

Figure 1 Percentage time within the Normal Operating Frequency Band



3. EVENTS OUTSIDE THE NORMAL OPERATING FREQUENCY EXCURSION BAND

Table 1 and Table 2 summarise the events in the Mainland and Tasmania regions with frequency excursions outside the Normal Operating Frequency Excursion Band.

All Mainland and Tasmania events in Table 1 complied with the Frequency Operating Standards by returning to the Normal Operating Frequency Band within the specified times. Events in Table 2 didn't comply with the Frequency Operating Standards. These events are discussed further in Section 4.

Table 1 Events in the Mainland and Tasmania regions with frequency excursions outside the Normal Operating Frequency Excursion Band but complied with the Frequency Operating Standards

Event	Low/High Frequency Event ³	Number of Events	
		Mainland	Tasmania
Load Event	LOW	1	233
	HIGH	0	268
Generation Event	LOW	2	3
	HIGH	0	1
Network Event	LOW	0	1
	HIGH	0	0
Separation Event	LOW	0	0
	HIGH	0	0
Multiple Contingency Event	LOW	0	0
	HIGH	0	0

Table 2 Events in the Mainland and Tasmania regions that didn't comply with the Frequency Operating Standards

Event	Low/High Frequency Event ⁴	Number of Events	
		Mainland	Tasmania
Normal event/No contingency or load event	LOW	0	8
	HIGH	0	2

³ Of the Tasmanian Load events 122 are both low and high frequency events (outside the Normal Operating Frequency Excursion Band), while 111 are only low frequency events and 146 are only high frequency events. No other events listed in Table 1 are both low and high frequency events.
⁴ No Tasmanian event in Table 2 resulted in both a high and low frequency excursion outside the Normal Operating Frequency Excursion Band.

4. EVENTS THAT DID NOT COMPLY WITH THE FREQUENCY OPERATING STANDARDS

This section analyses events identified as not complying with the Frequency Operating Standards.

4.1 Events in the Mainland region

There were no frequency events recorded in the Mainland region that did not comply with the Mainland Frequency Operating Standard during this reporting period.

4.2 Events in the Tasmania region

There were ten frequency events recorded in the Tasmania region that did not comply with the Tasmania Frequency Operating Standard during this reporting period. These events are listed in Table 3.

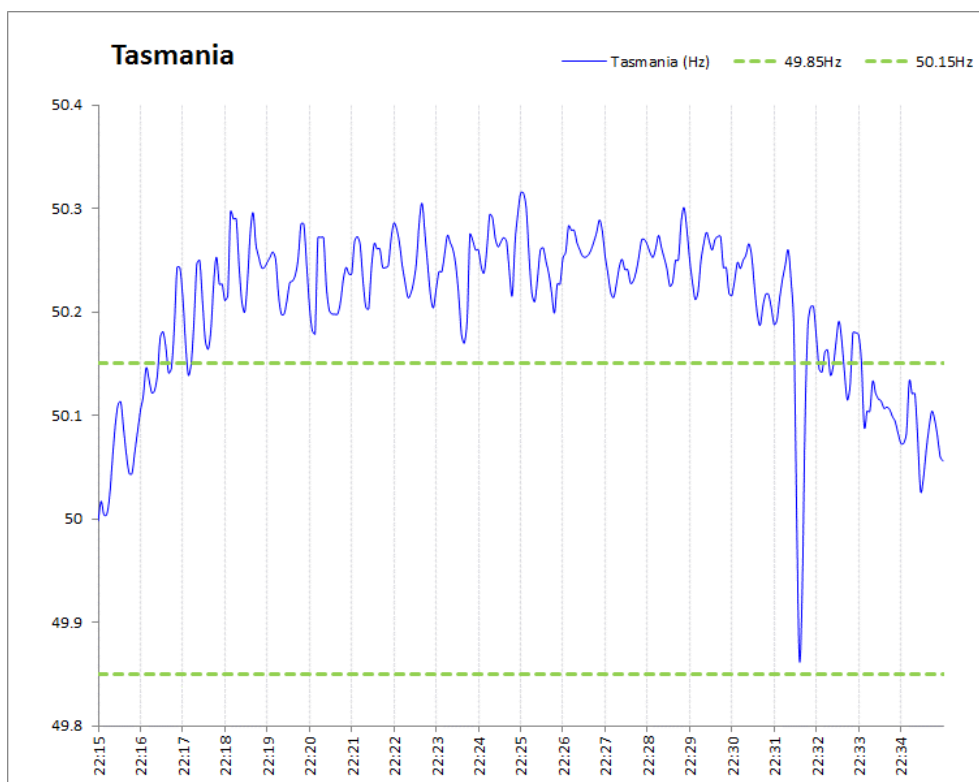
Table 3 Frequency events in the Tasmania region that did not comply with the Frequency Operating Standards

Date	Event	Min/Max Frequency (Hz)	Time outside Normal Operating Frequency Band (49.15 Hz – 50.15 Hz) (sec)
2216 hrs 01/07/2014	One participant not following targets contributed to the event.	50.31	940
1926 hrs 11/07/2014	One participant not following targets contributed to the event.	50.47	1,056
0403 hrs 24/07/2014	One generator reduced output 23MW contributing to the event but no contingency could be identified.	49.59	172
0516 hrs 26/07/2014	Rapidly increasing load contributed to the event but no contingency could be identified.	49.70	48
1222 hrs 27/07/2014	Rapidly increasing load contributed to the event but no contingency could be identified.	49.71	20
0156 hrs 24/08/2014	One generator reduced output 20MW contributing to the event but no contingency could be identified.	49.33	84
2331 hrs 27/08/2014	One generator reduced output 20MW contributing to the event but no contingency could be identified.	49.74	32
0229 hrs 17/09/2014	One generator reduced output 11MW contributing to the event but no contingency could be identified.	49.71	20
0239 hrs 17/09/2014	Load increased output 17MW contributing to the event but no contingency could be identified.	49.56	24
0824 hrs 28/09/2014	No cause could be determined.	49.74	80

4.2.1 High frequency event: 2216 hrs 1/07/2014

- No contingency could be identified as the cause of this event.
- The frequency excursion reached a maximum of 50.31 Hz at 2225 hrs, remaining outside the Normal Operating Frequency Band for 940 seconds. This event is shown in Figure 2.
- Prior to this event Basslink had been out of service. After returning to service at 2203 hrs Basslink was unable to follow targets, causing the Tasmania frequency to move outside the frequency standard. Basslink was declared non-conforming by -101MW.
- Basslink was restored to correct operation at 2337 hrs.
- The performance of Fast Lower services was not evaluated as high speed measurements are not available.
- Review of the performance of Slow Lower and Delayed Lower Frequency Controlled Ancillary Services (FCAS) found no services were enabled in Tasmania.

Figure 2 High Frequency event that occurred in Tasmania at 2216 hrs on 01/07/2014



4.2.2 High frequency event: 1926 hrs 11/07/2014

- No contingency could be identified as the cause of this event.
- The Tasmania frequency reached a maximum of 50.47 Hz during the event, remaining outside the Normal Operating Frequency Band for 1,056 seconds. This event is shown in Figure 3.
- During this period Basslink was not following targets. Basslink flow cycled, remaining steady for 2-4 minutes, ramping up steadily about 40 MW in 2 minutes, then falling 40 MW in 4 seconds, resulting in a number of frequency spikes. Basslink was declared as non-conforming.
- Basslink was restored to correct operation at 2202 hrs.
- The performance of Fast Lower services was not evaluated as high speed measurements are not available.
- Figure 4 shows the performance of Slow Lower and Delayed Lower FCAS. Of 48.0 MW Slow Lower FCAS enabled 20.3 MW responded, all assisting the frequency response. None of the 58.2 MW Delayed Lower FCAS enabled responded.

Figure 3 High frequency event that occurred in Tasmania at 1926 hrs on 11/07/2014

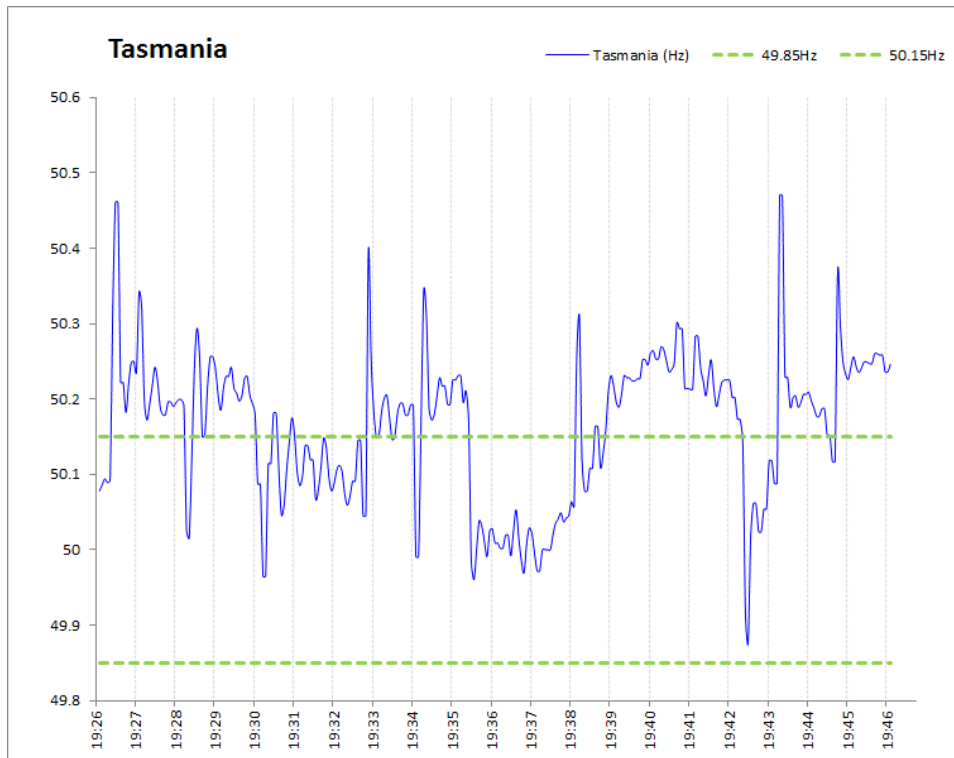
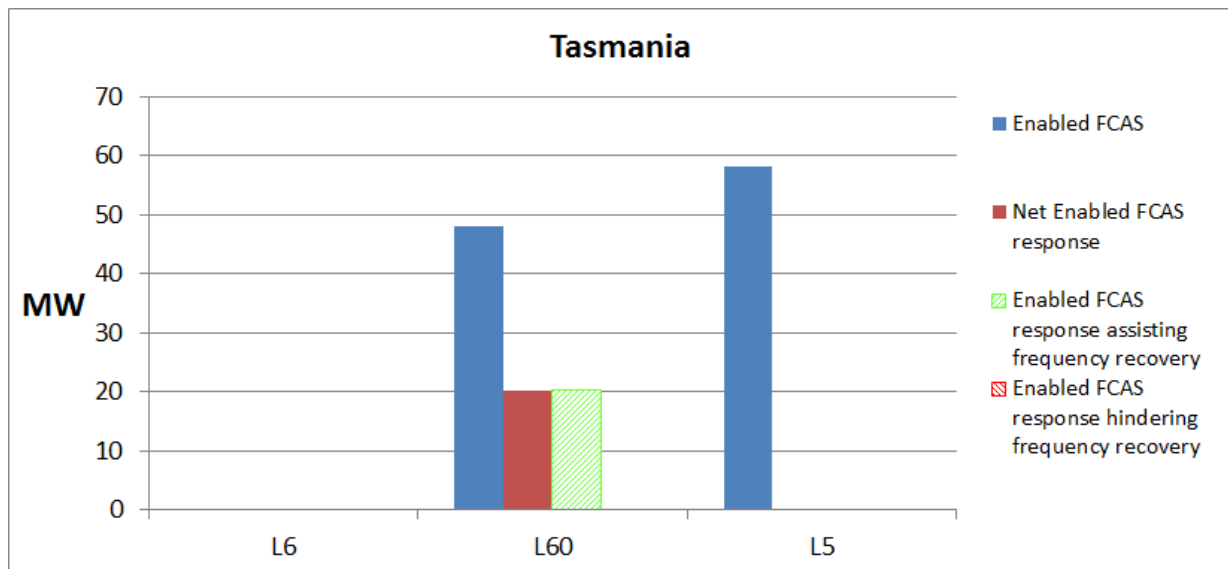


Figure 4 FCAS response during high frequency event that occurred in Tasmania at 1926 hrs on 11/07/2014



4.2.3 Low frequency event: 0403 hrs 24/07/2014

- No contingency could be identified as the cause of this event.
- The Tasmania frequency reached a minimum of 49.59 Hz during the event, remaining outside the Normal Operating Frequency Band for 172 seconds. This event is shown in **Error! Reference source not found.**
- Gordon reduced output 23 MW, offset by 13 MW Basslink and 3 MW Tas load reductions, contributing to the low frequency excursion.
- The performance of Fast Lower services was not evaluated as high speed measurements are not available.
- Figure 6 shows the performance of Slow Lower and Delayed Lower FCAS. Of 75.8 MW Slow Raise FCAS enabled, net enabled response assisting the frequency response was -9.3 MW, comprising 10.6 MW assisting and 19.9 MW hindering. No Delayed Lower FCAS was enabled.

Figure 5 Low frequency event that occurred in Tasmania at 0403 hrs on 24/07/2014

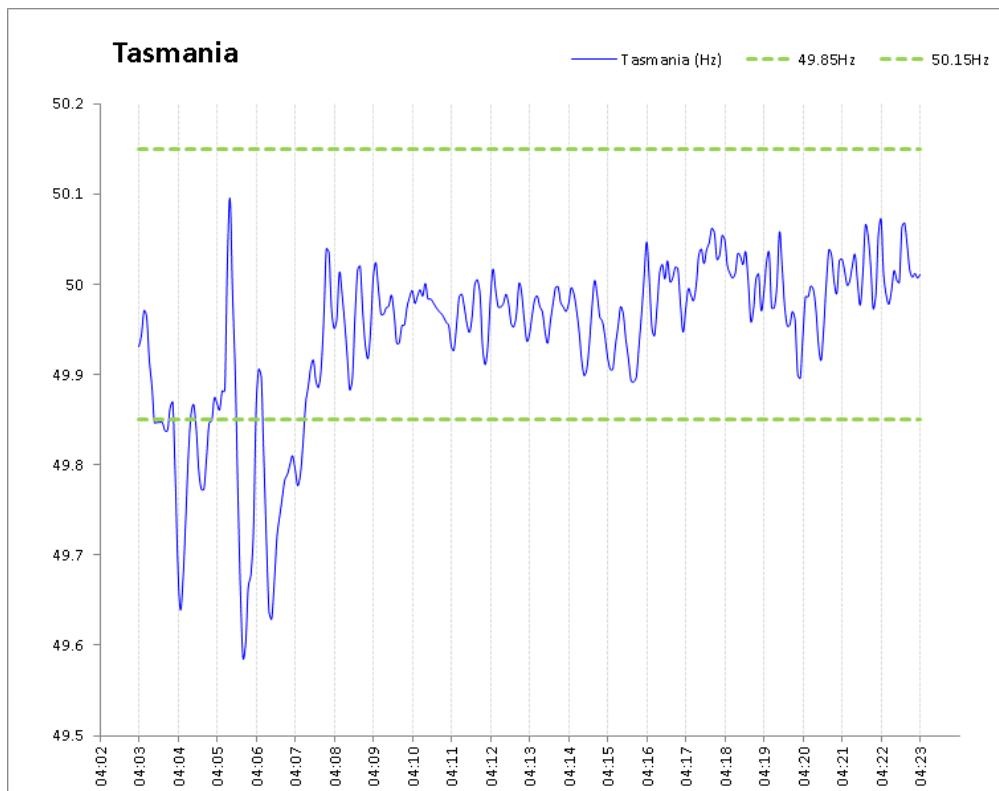
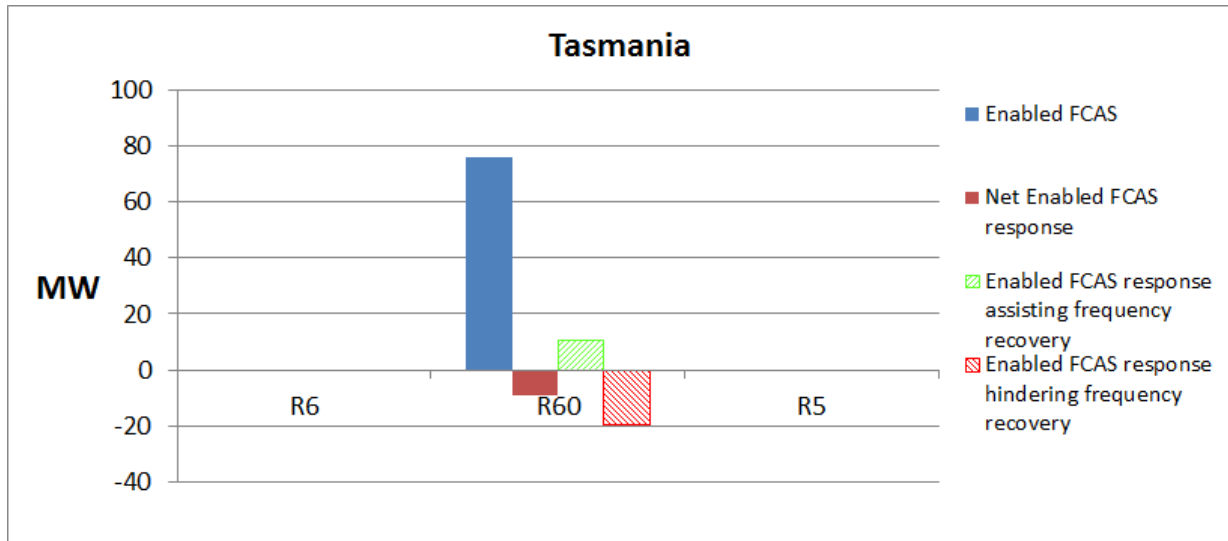


Figure 6 FCAS response during low frequency event that occurred in Tasmania at 0403 hrs on 24/07/2014



4.2.4 Other non-compliant frequency events

Detailed reporting is not provided for the other seven non-compliant frequency events listed in Table 3. These events were less severe than the other three events, with smaller magnitude, and/or shorter duration frequency excursions.



5. ACCUMULATED TIME ERROR

The Frequency and 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 4.

Table 4 Maximum and Minimum time error measurements for Queensland, New South Wales and Tasmania

Value	Queensland	New South Wales	Tasmania
Highest positive time error (seconds)	2.74	2.29	6.33
Lowest negative time error (seconds)	-4.21	-4.04	-6.76