



# FREQUENCY AND TIME ERROR MONITORING – 2<sup>ND</sup> 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 April to June 2014.

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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 Standards<sup>1</sup> for the Mainland and Tasmania region. This document reports on the frequency and time error performance observed during April, May and June 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*<sup>2</sup> 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.

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

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

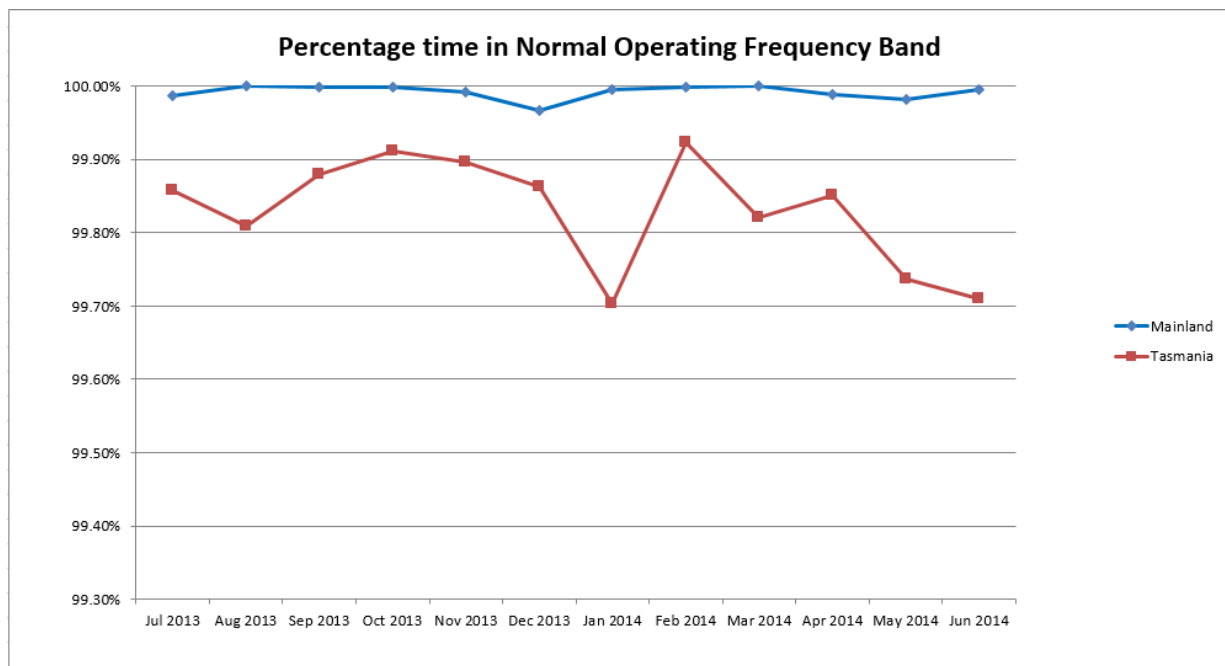
## 2. OPERATION WITHIN THE NORMAL OPERATING FREQUENCY BAND

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	Number of Events	
		Mainland	Tasmania
Load Event	LOW	0	43
	HIGH	0	103
Generation Event	LOW	1	3
	HIGH	0	2
Network Event	LOW	0	0
	HIGH	0	4
Separation Event	LOW	0	0
	HIGH	0	0
Multiple Contingency Event	LOW	2	2
	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	Number of Events	
		Mainland	Tasmania
Normal event/No contingency or load event	LOW	0	3
	HIGH	0	3 <sup>3</sup>

<sup>3</sup> One normal event in Tasmania on 14/05/2014 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 five 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.

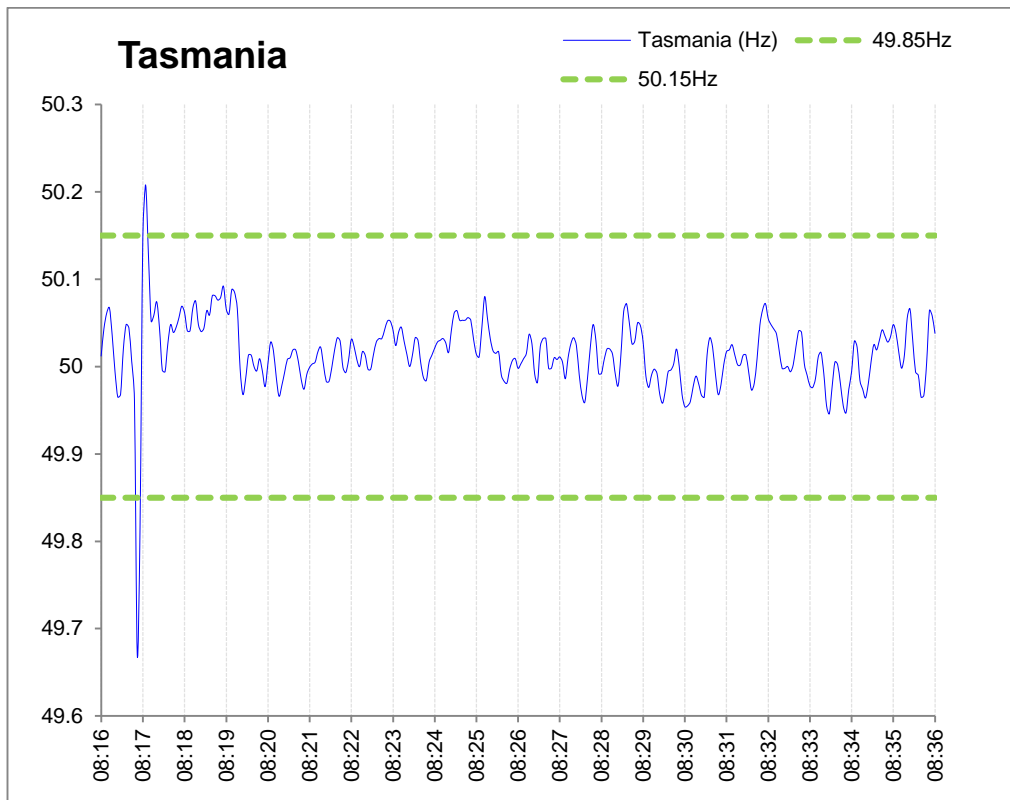
**Table 3 Frequency events in the Tasmania region that did not comply with the Frequency Operating Standards**

Date	Event	Min/Max Frequency (Hz)	Time outside Normal Operating Frequency Band (48.15 Hz – 50.15 Hz) (sec)
0816 hrs 15/04/2014	No contingency causing the event could be identified	49.67	12
1303 hrs 13/05/2014	No contingency causing the event could be identified	50.28	36
1001 hrs 14/05/2014	No contingency causing the event could be identified	49.73 50.25	132
1707 hrs 14/05/2014	No contingency causing the event could be identified	49.69	280
0927 hrs 26/06/2014	No contingency causing the event could be identified	50.26	96

#### 4.2.1 Low frequency event: 0816 hrs 15/04/2014

- No contingency could be identified as the cause of this event
- The frequency excursion reached a minimum of 49.67 Hz during the event, remaining outside the Normal Operating Frequency Band for 12 seconds. This event is shown in Figure 2
- Gordon Power Station rapidly decreased its output by 12 MW, not following its dispatch target, which contributed to the low frequency excursion
- Basslink reduced export to the mainland by 12 MW to return the frequency to the Normal Operating Frequency Band
- The performance of Fast Raise services was not evaluated as high speed measurements are not available
- The frequency excursion was not of sufficient duration to evaluate the performance of Slow Raise or Delayed Raise Frequency Controlled Ancillary Services (FCAS)

**Figure 2 Low Frequency event that occurred in Tasmania at 0816 hrs on 15/04/2014**

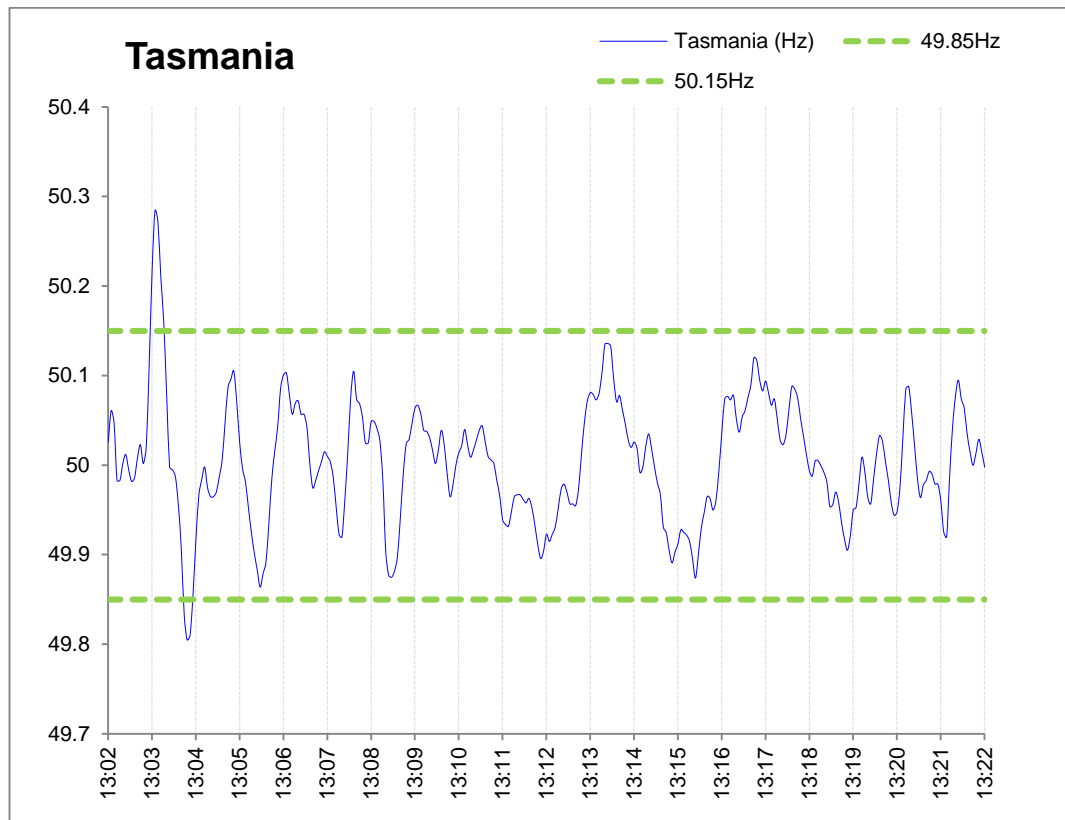


#### 4.2.2 High frequency event: 1303 hrs 13/05/2014

- No contingency could be identified as the cause of this event
- The Tasmania frequency reached a maximum of 50.28 Hz during the event, remaining outside the Normal Operating Frequency Band for 36 seconds. This event is shown in Figure 3
- Gordon Power Station increased its output 30 MW over its dispatch target which contributed to the high frequency excursion
- Basslink was out of service for maintenance during the event and was therefore unable to assist in controlling the Tasmania frequency
- The performance of Fast Lower services was not evaluated as high speed measurements are not available
- The frequency excursion was not of sufficient duration to evaluate the performance of Slow Lower or Delayed Lower FCAS



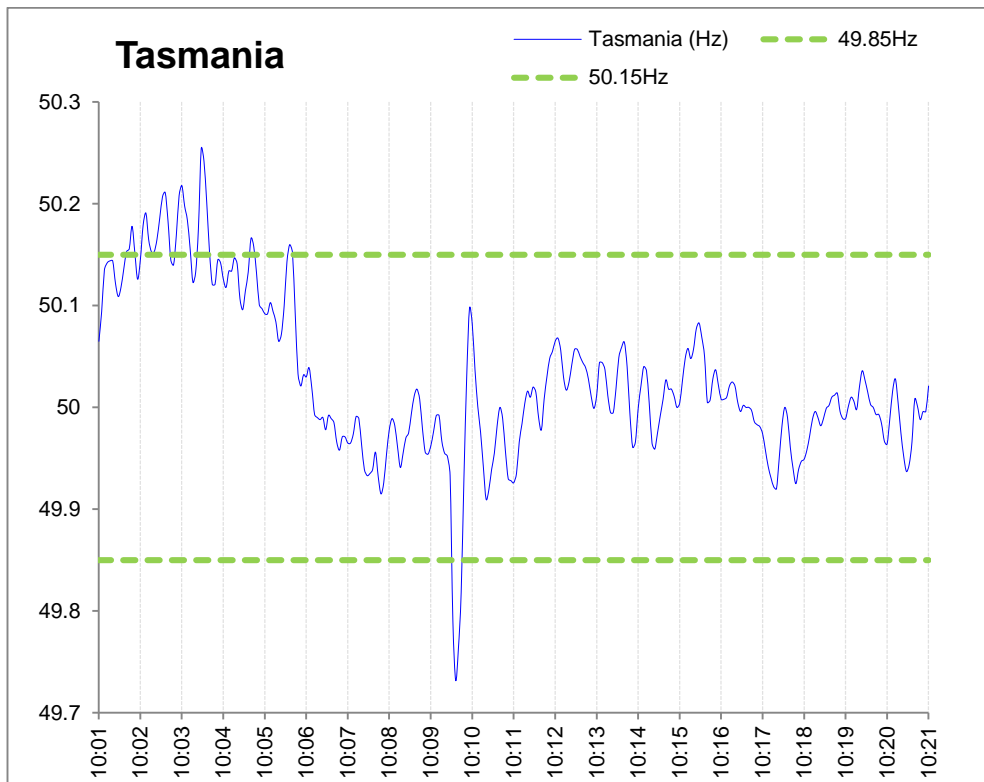
**Figure 3 High frequency event that occurred in Tasmania at 1303 hrs on 13/05/2014**



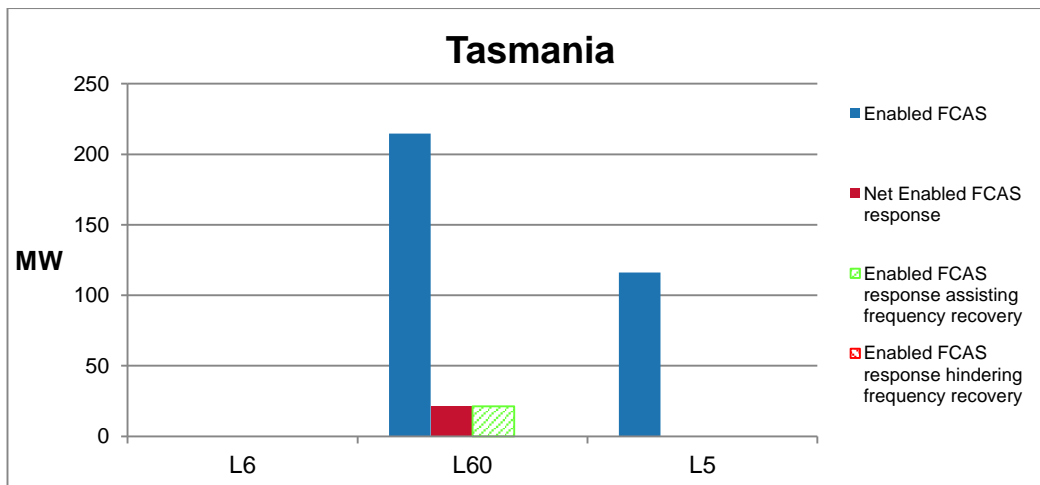
#### 4.2.3 High and Low frequency event: 1001 hrs 14/05/2014

- No contingency could be identified as the cause of this event
- The Tasmania frequency reached a maximum of 50.25 Hz and a minimum of 49.73 Hz during the event, remaining outside the Normal Operating Frequency Band for 132 seconds. This event is shown in Figure 4
- Poatina Unit 2 increased its output by 80 MW, following its dispatch target, which contributed to the high frequency excursion
- Tasmania demand increased instantaneously by 17 MW which contributed to the low frequency excursion
- Basslink was out of service for maintenance during the event and was therefore unable to assist in controlling the Tasmania frequency
- The performance of Fast Lower and Fast Raise services was not evaluated as high speed measurements are not available
- The performance of Slow Lower services was insufficient to assist the stabilisation and recovery of the Tasmania frequency as shown in Figure 5
- The frequency excursion was not of sufficient duration to evaluate the performance of Delayed Lower or Delayed Raise FCAS

**Figure 4 High/Low frequency event that occurred in Tasmania at 1001 hrs on 14/05/2014**



**Figure 5 FCAS response during high frequency event that occurred in Tasmania at 1001 hrs on 14/05/2014**

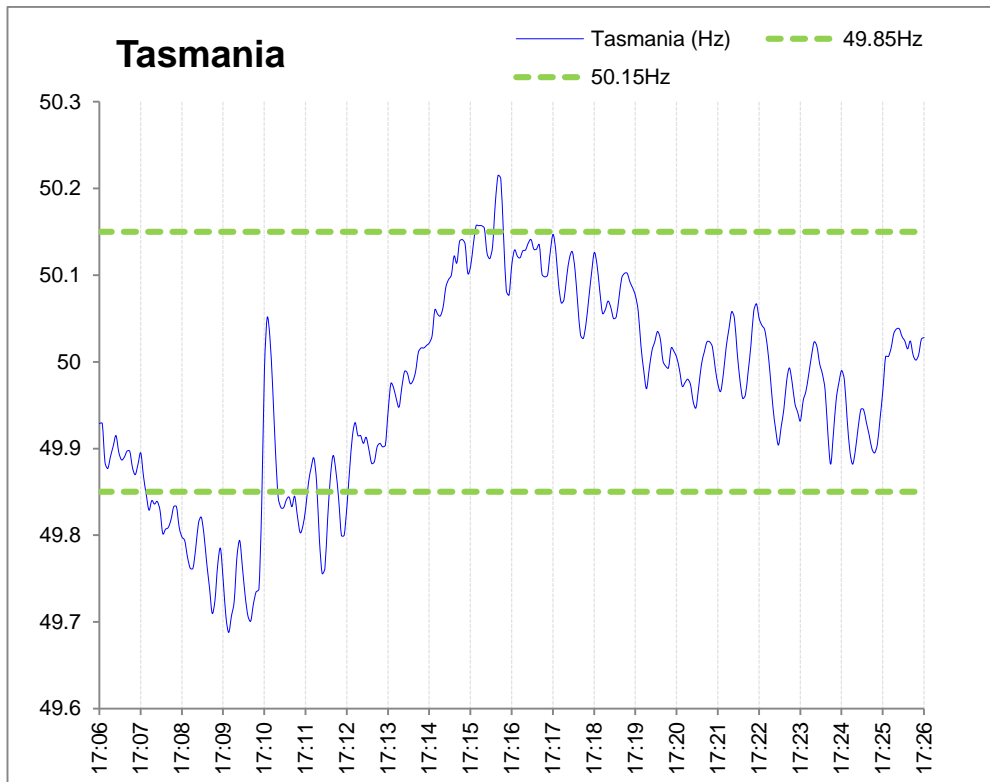


**4.2.4 Low frequency event: 1707 hrs 14/05/2014**

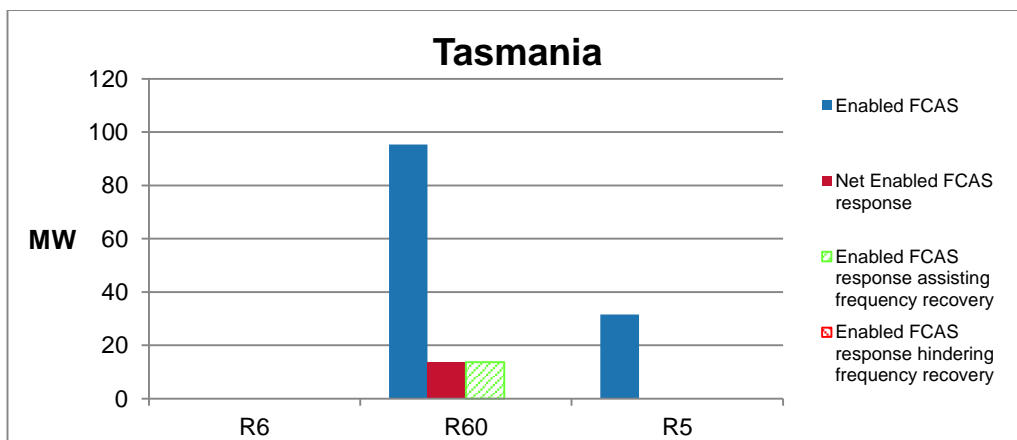
- No contingency could be identified as the cause of this event
- The Tasmania frequency reached a minimum of 49.69 Hz during the event, remaining outside the Normal Operating Frequency Band for 280 seconds. This event is shown in Figure 6
- Tungatinah Power Station remained 60 MW under its dispatch target which contributed to the low frequency excursion

- Gordon Power Station increased its output, in response to Raise Regulation FCAS, to return the frequency to the Normal Operating Frequency Band
- Basslink was out of service for maintenance during the event and was therefore unable to assist in controlling the Tasmania frequency
- The performance of Fast Raise services was not evaluated as high speed measurements are not available
- The performance of Slow Raise services was insufficient to assist the stabilisation and recovery of the Tasmania frequency as shown in Figure 7
- The frequency excursion was not of sufficient duration to evaluate the performance of Delayed Raise FCAS

**Figure 6 Low frequency event that occurred in Tasmania at 1707 hrs on 14/05/2014**



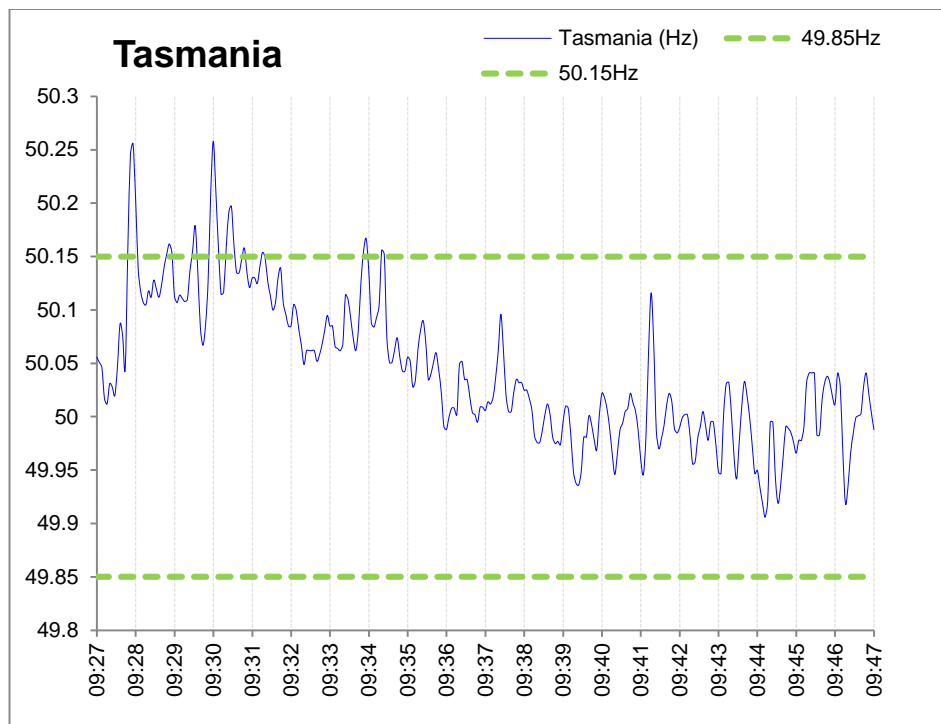
**Figure 7 FCAS response during low frequency event that occurred in Tasmania at 1707 hrs on 14/05/2014**



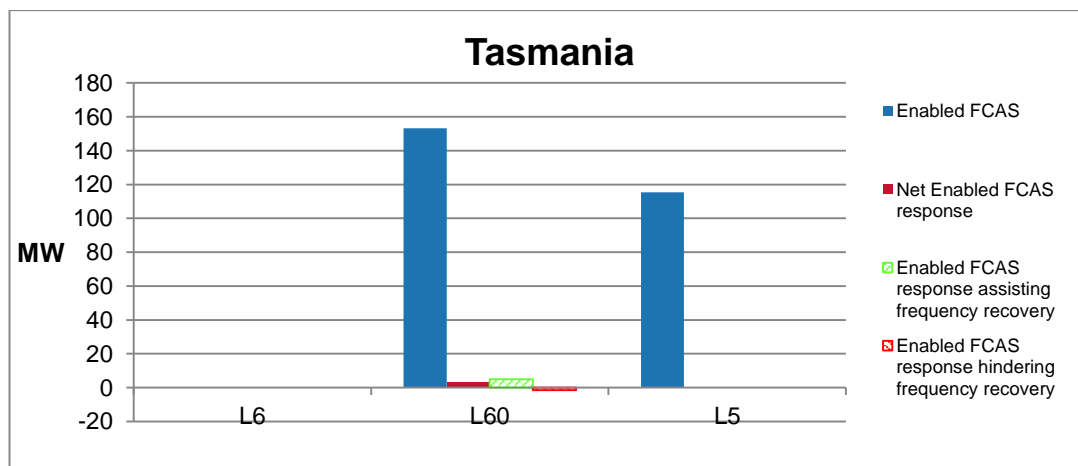
### 4.2.5 High frequency event: 0927 hrs 26/06/2014

- No contingency could be identified as the cause of this event
- The Tasmania frequency reached a maximum of 50.26 Hz during the event, remaining outside the Normal Operating Frequency Band for 96 seconds. This event is shown in Figure 8
- The performance of Fast Lower services was not evaluated as high speed measurements are not available
- The performance of Slow Lower services was insufficient to assist the stabilisation and recovery of the Tasmania frequency as shown in Figure 9
- The frequency excursion was not of sufficient duration to evaluate the performance of Delayed Lower FCAS

**Figure 8 High frequency event that occurred in Tasmania at 0927 hrs on 26/06/2014**



**Figure 9 FCAS response during high frequency event that occurred in Tasmania at 0927 hrs on 26/06/2014**





## 5. ACCUMULATED TIME ERROR

The Frequency and Operating Standards require that the accumulated time error be maintained within the range  $\pm 5$  seconds in Mainland regions and  $\pm 15$  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)	2.43	2.56	12.73
Lowest negative time error (seconds)	-4.47	-4.19	-13.77