

# FREQUENCY AND TIME ERROR MONITORING – 3RD QUARTER 2013

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DOCUMENT REF: SP&C\_01

VERSION: 1

DATE: 10 October 2013

FINAL

## Version Release History

VERSION	DATE	BY	CHANGES
1.0	10/10/2013	Peter McEnery	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
6.2.1	High frequency event: 1704 hrs 9/7/2013 .....	8
6.2.2	High frequency event: 1217 hrs 15/8/2013 .....	9
6.2.3	High frequency event: 1252 hrs 15/8/2013 .....	10
7	Accumulated time error .....	12

## 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 July 2013, August 2013 and September 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 site<sup>1</sup>.

The “Power System Frequency and Time Deviation Monitoring Report – Reference Guide<sup>2</sup>” 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

The Mainland frequency was within the Normal Operating Frequency Band (49.85 Hz – 50.15 Hz) more than 99% of the time, as required by the Frequency Operating Standards.

The Tasmanian frequency was within the Normal Operating Frequency Band (49.85 Hz – 50.15 Hz) more than 99% of the time, as required by the Frequency Operating Standards.

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.

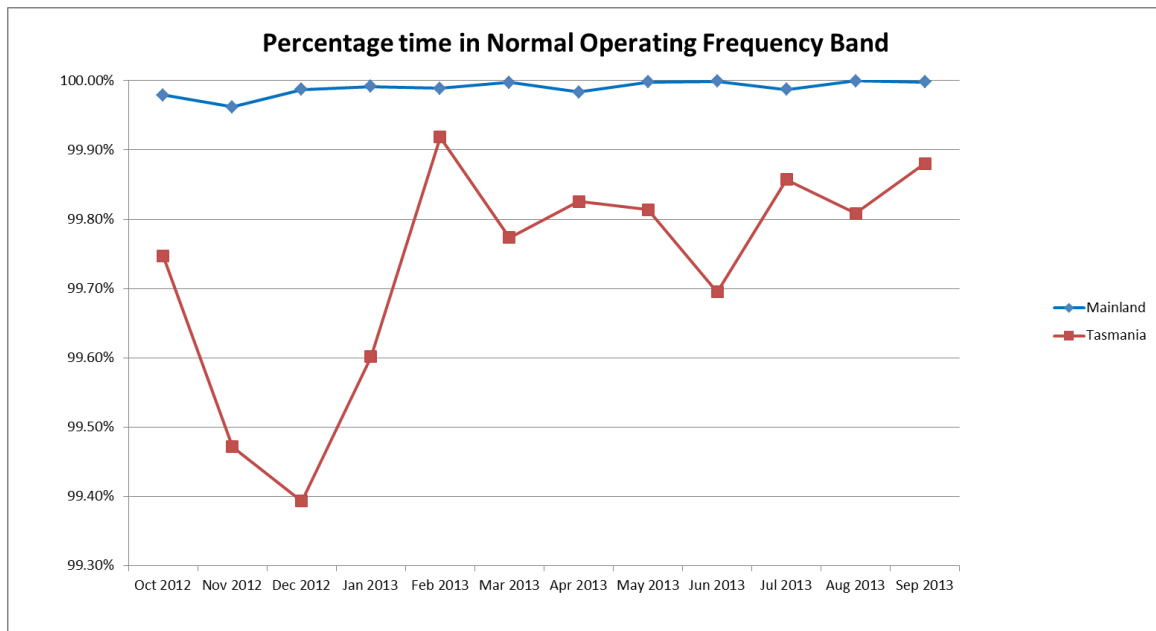
The percentage time of operation in the Normal Operating Frequency Band over the last 12 months is shown in Figure 1.

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<sup>1</sup> 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>

<sup>2</sup> 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 with frequency excursions outside the Normal Operating Frequency Excursion Band.

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

Three Tasmania events in Table 1 did not return to the Normal Operating Frequency Band within the times in the Frequency Operating Standards. These events are discussed in Section 6.

## 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	0
	HIGH	0	3
Load Event	LOW	0	23
	HIGH	0	60
Generation Event	LOW	0	8
	HIGH	0	4
Network Event	LOW	0	0
	HIGH	0	1
Separation Event	LOW	0	0
	HIGH	0	0
Multiple Contingency Event	LOW	0	2
	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 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.

### 6.2 Events in the Tasmania region

There was no low frequency events recorded in the Tasmania region that did not meet the Tasmania Frequency Operating Standard.

There were three high frequency events recorded in the Tasmania region that did not meet the Tasmania Frequency Operating Standard. These events are 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 FREQUENCY BAND (49.85 HZ - 50.15 HZ)(SECONDS)
1704 hrs 9/7/2013	No contingency causing the event could be identified.	50.28	84
1213 hrs 15/8/2013	No contingency causing the event could be identified.	50.46	720
1252 hrs 15/8/2013	No contingency causing the event could be identified.	50.34	288

#### 6.2.1 High frequency event: 1704 hrs 9/7/2013

No contingency could be identified as the cause of the event in Tasmania at 1704 hrs 9/7/2013. Hydro Tasmania investigated the oscillation in frequency from 1704 hrs to 1709 hrs. Hydro Tasmania found that the Automatic Generation Control (AGC) system for its generating units had been set to an inappropriate mode. This AGC mode dispatched Hydro Tasmania generating units assigned to FCAS Regulation duty to also assist in controlling time error in Tasmania, which is not normally instructed by AEMO. This caused these generating units to deviate from AEMO AGC targets and consequently the Tasmania frequency to oscillate. At 1708 hrs the appropriate Hydro Tasmania AGC mode was restored.

Basslink assisted in controlling the Tasmania frequency during the event.

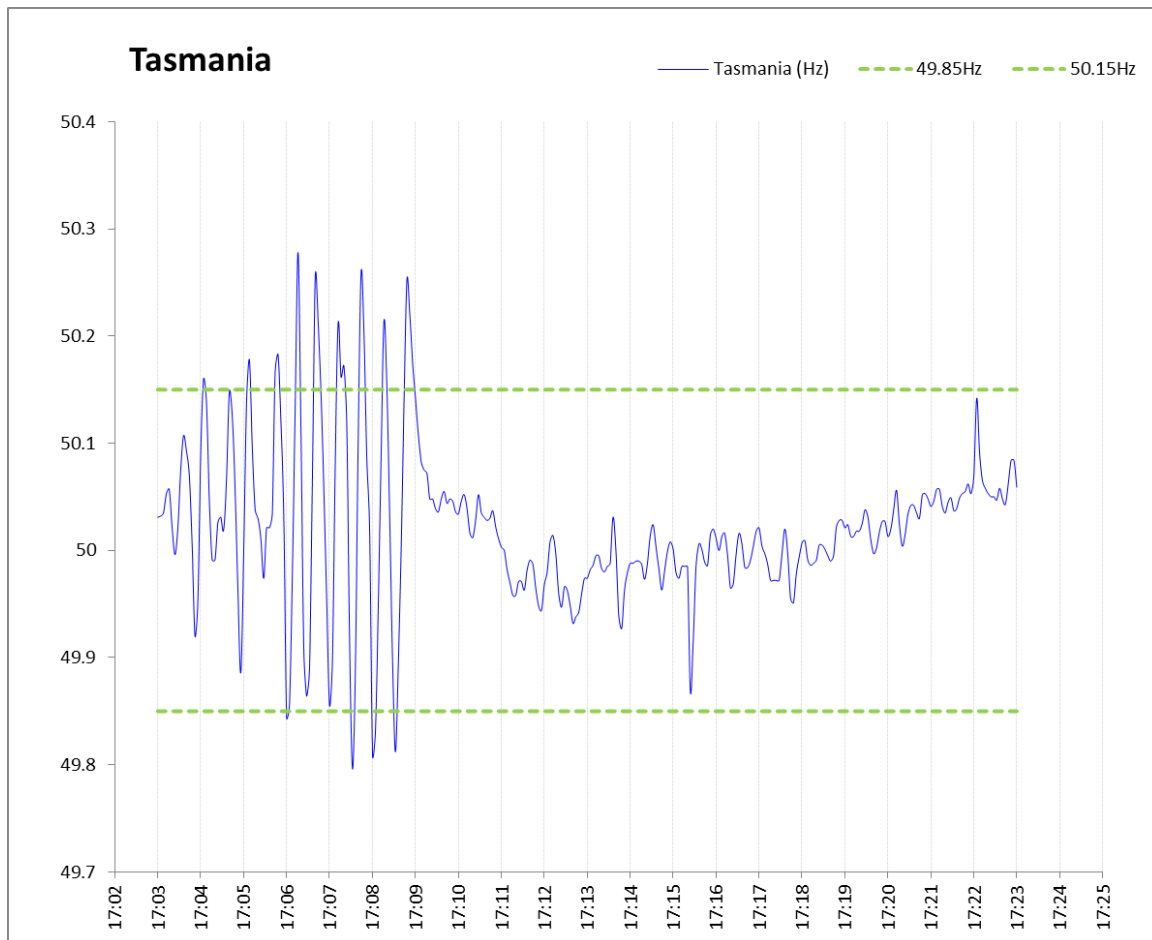
FCAS performance during this event could not be verified:

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



This event is shown in Figure 2.

Figure 2: High frequency event that occurred in Tasmania 1704 hrs 9 July 2013



### 6.2.2 High frequency event: 1217 hrs 15/8/2013

No contingency could be identified as the cause of the event in Tasmania at 1217 hrs 15 August 2013. Basslink had been out of service from 1140 hrs and constraint set I-BL\_ZERO was invoked. Following advice that Basslink was available to return to service, AEMO revoked constraint set I-BL\_ZERO at 1215 hrs. Basslink did not follow its dispatch target to transmit power from Tasmania to the Mainland, and consequently there was a high frequency excursion outside the Normal Operating Frequency Excursion Band. AEMO received subsequent advice that Basslink was unable to return to service and constraint set I-BL\_ZERO was invoked at 1225 hrs. After constraint set I-BL\_ZERO was invoked the Tasmania frequency returned to the Normal Operating Frequency Band.

The response of Fast Lower services were not verified as high speed data was not requested for this event.

The response of Slow Lower services is shown in Figure 4. The Slow Lower service response appears to have been insubstantial relative to the amount of Slow Lower services enabled.

The frequency excursion during this event was not of sufficient magnitude to trigger switched controllers for the delivery of Delayed Lower services during this event.

This event is shown in Figure 3.

Figure 3: High frequency event that occurred in Tasmania 1217 hrs 15 August 2013.

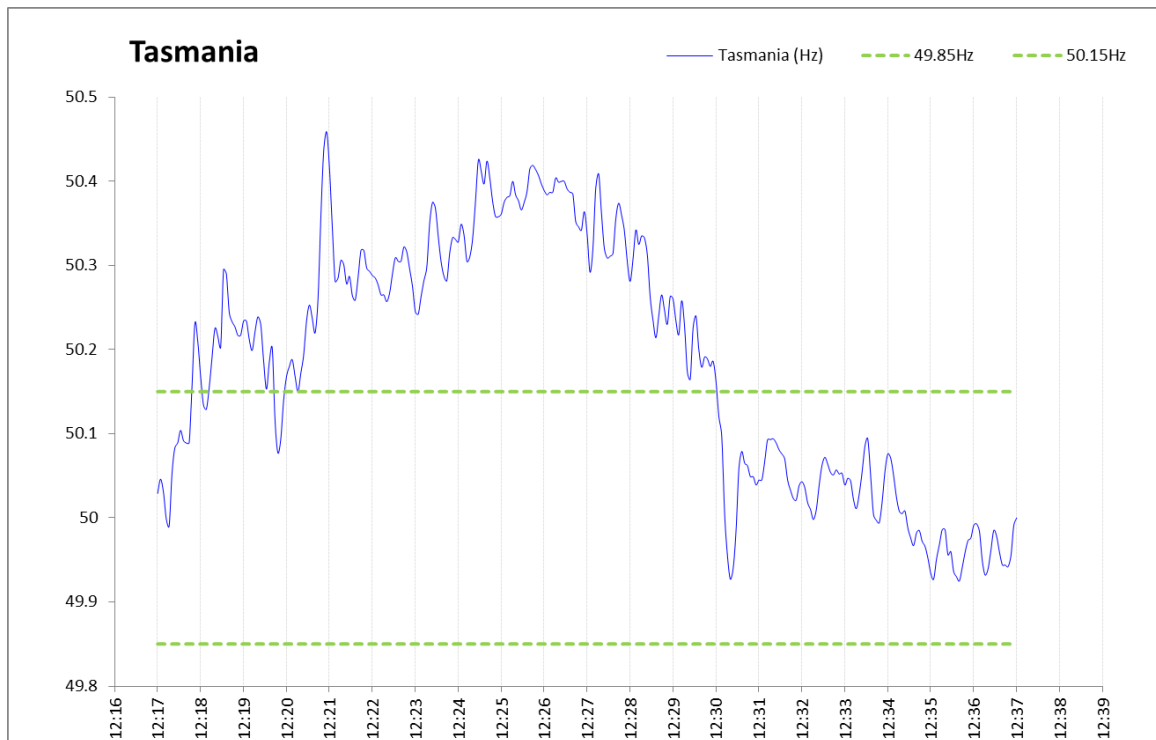
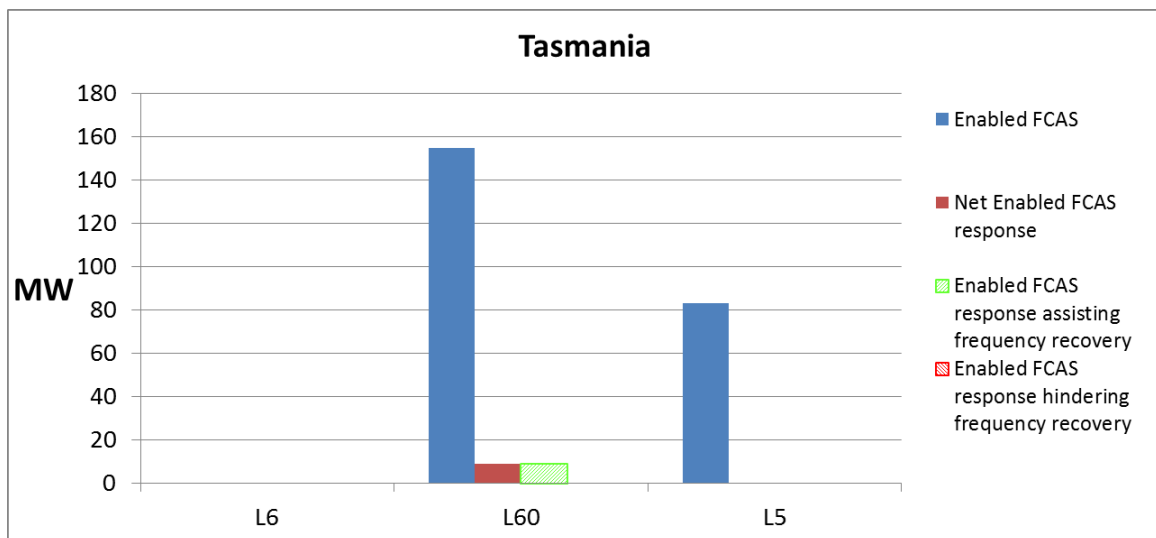


Figure 4: FCAS response during high frequency event that occurred in Tasmania 1217 hrs 15 August 2013.



### 6.2.3 High frequency event: 1252 hrs 15/8/2013

No contingency could be identified as the cause of the event in Tasmania at 1252 hrs 15 August 2013. Basslink had been out of service from 1140 hrs. A similar event had previously occurred at 1217 hrs. Following advice that Basslink was available to return to service, AEMO revoked constraint set I-BL\_ZERO at 1250 hrs. Basslink did not follow its dispatch target to transmit power from Tasmania to the Mainland, and consequently there was a high frequency excursion outside the Normal Operating Frequency Excursion Band. AEMO received subsequent advice that Basslink was unable to return to service and constraint set I-BL\_ZERO was invoked at 1255 hrs.

After constraint set I-BL\_ZERO was invoked the Tasmania frequency returned to the Normal Operating Frequency Band.

The response of Fast Lower services were not verified as high speed data was not requested for this event.

The response of Slow Lower services is shown in Figure 6. The Slow Lower service response appears to have been insubstantial relative to the amount of Slow Lower services enabled.

The frequency excursion was not of sufficient magnitude to trigger switched controllers for the delivery of Delayed Lower services during this event.

This event is shown in Figure 5.

Figure 5: High frequency event that occurred in Tasmania 1252 hrs 15 August 2013.

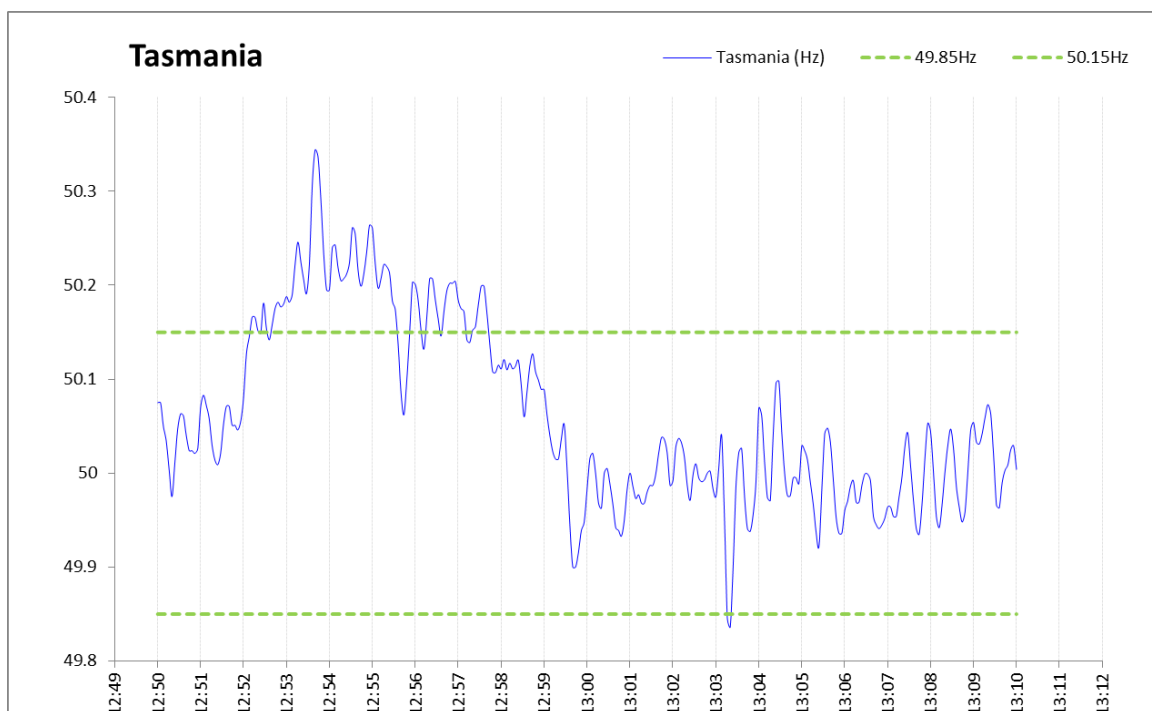
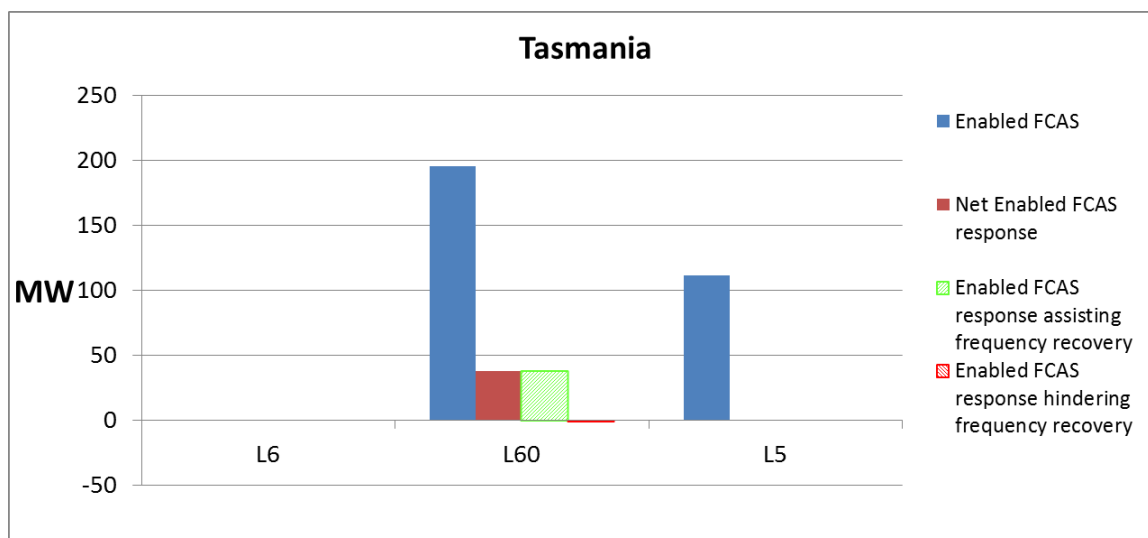


Figure 6: FCAS response during high frequency event that occurred in Tasmania 1252 hrs 15 August 2013.



AEMO will further review the FCAS delivery for these two events and will provide a report by the end of December 2013.

### 7 Accumulated time error

The Frequency 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 3.

Table 3: Maximum and minimum time error measurements, Queensland, New South Wales and Tasmania

VALUE	QLD	NSW	TAS
Highest positive time error (seconds)	2.35	2.66	8.42
Lowest negative time error (seconds)	-3.05	-2.48	-14.90