FREQUENCY AND TIME ERROR MONITORING – 3RD QUARTER 2017

FOR THE NATIONAL ELECTRICITY MARKET

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

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 2017 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 Standards (FOS)[1] for the mainland and Tasmanian regions. This document reports on the frequency and time error performance observed during July, August and September 2017 in all regions of the National Electricity Market (NEM). Queensland, New South Wales, Victoria and South Australia are referred to as the 'mainland' 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 the mainland is sourced from 4-second measurements in New South Wales and frequency data for Tasmania is sourced from 4-second measurements in Tasmania.

1 http://aemc.gov.au/Australia-s-Energy-Market/Market-Legislation/Electricity-Guidelines-and-Standards
2 http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/Ancillary-services/Frequency-and-time-error-monitoring

2. OPERATION WITHIN THE NORMAL OPERATING FREQUENCY BAND

Mainland frequencies did not exceed the Normal Operating Frequency Band (NOFB)[3] for more than 1% of the time over any 30-day period from October 2016 to September 2017, as required by the FOS.

Tasmanian frequencies exceeded the NOFB for more than 1% of the time over all 30-day periods from October 2016 to September 2017, and consequently did not meet the FOS.

The minimum daily value in the last 30 days of the rolling average percentage of time that the frequency was inside the NOFB have been used to create Figure 1.

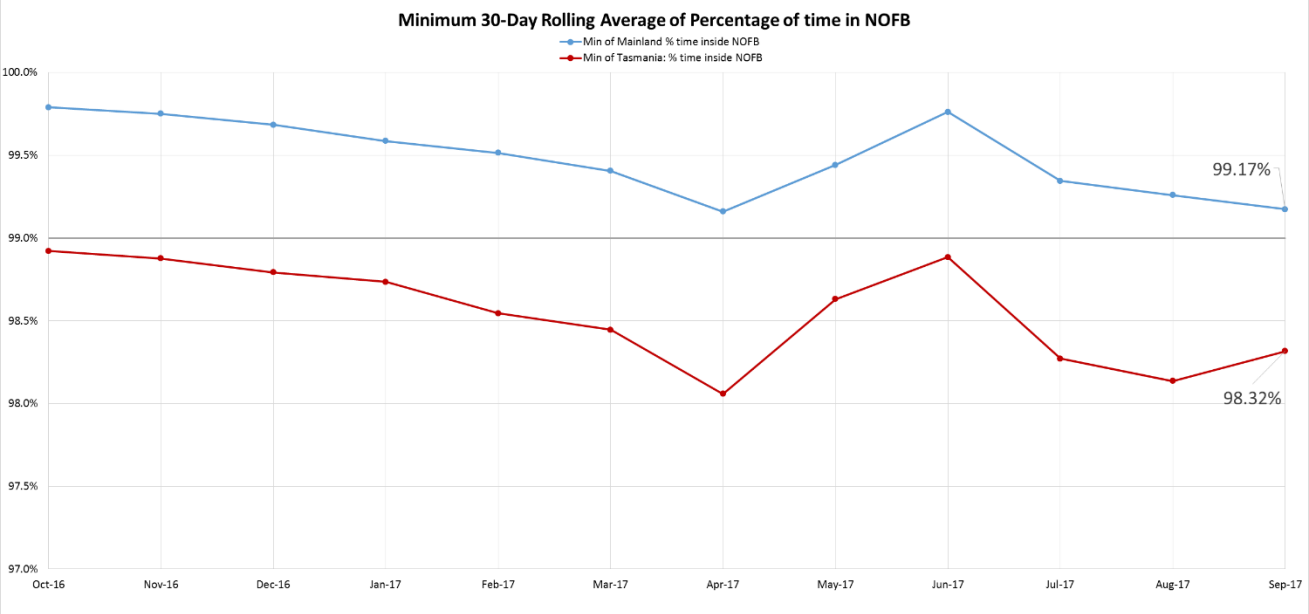

Figure 1 Minimum 30-Day rolling average of percentage of time mainland and Tasmania frequencies remained within NOFB from October 2016 to September 2017

[3] Frequency range of 49.85 Hz – 50.15 Hz

3. EVENTS OUTSIDE THE NORMAL OPERATING FREQUENCY EXCURSION BAND

Table 1 and Table 2 summarise the events in the mainland and Tasmania with frequency excursions outside the Normal Operating Frequency Excursion Band (NOFEB) [4].

For all mainland and Tasmania events in Table 1, frequency returned to the NOFB within the times specified in the FOS. For the events in Table 2, it did not. These events are discussed further in Section 4.

Table 1 Mainland and Tasmania: Frequency excursions outside the NOFEB and returned in FOS timeframes

Event	Low/High/Both Frequency Event	Number of Events	
		Mainland	Tasmania
No contingency or load event	LOW	1	9
	HIGH	1	3
	BOTH	0	8
Load Event	LOW	0	40
	HIGH	0	112
	BOTH	0	231
Generation Event	LOW	1	5
	HIGH	0	0
	BOTH	1	7
Network Event	LOW	0	0
	HIGH	0	1
	BOTH	0	1
Separation Event	LOW	0	0
	HIGH	0	0
	BOTH	0	0
Multiple Contingency Event	LOW	0	0

[4] Frequency range of 49.75 Hz – 50.25 Hz

Event	Low/High/Both Frequency Event	Number of Events	
		Mainland	Tasmania
	HIGH	0	0
	BOTH	0	0

Table 2 Mainland and Tasmania: Frequency excursions outside the NOFEB not returned in FOS timeframes

Event	Low/High/Both Frequency Event	Number of Events	
		Mainland	Tasmania
No contingency or load event	LOW	0	0
	HIGH	0	0
	BOTH	0	0
Load Event	LOW	0	0
	HIGH	0	0
	BOTH	0	12
Generation Event	LOW	2	1
	HIGH	0	0
	BOTH	0	1
Network Event	LOW	0	0
	HIGH	0	0
	BOTH	0	0
Separation Event	LOW	0	0
	HIGH	0	0
	BOTH	0	0
Multiple Contingency Event	LOW	0	0
	HIGH	0	0
	BOTH	0	0

4. EVENTS OUTSIDE THE FREQUENCY OPERATING STANDARDS

This section analyses the events identified as not meeting the standards in the FOS.

4.1 Mainland Events

Fourteen frequency events were recorded in the mainland that did not meet the FOS during this reporting period. This occurred due to the event duration, where the time outside the NOFB was greater than 300 seconds, or where the frequency was outside than NOFEB for a reason other than a contingency event or a load event. These events are listed in Table 3.

Table 3 Mainland frequency events outside the FOS

Event	Number of Events	Min/Max Mainland Frequency (Hz)	Min/Max Duration outside NOFB - 49.85 – 50.15 Hz (sec)
Load Events	6	49.79 50.20	404 324
Generation Events	6	49.67	416
Frequency outside the NOFEB for reason other than a contingency event or a load event	2	49.84 53.00	16 8

4.2 Tasmanian Events

Forty-nine frequency events were recorded in Tasmania that did not meet the FOS during this reporting period. These events are listed in Table 4.

Table 4 Tasmania frequency events outside the FOS

Event	Number of Events	Min/Max Tasmanian Frequency (Hz)	Min/Max Duration outside NOFB - 49.15 – 50.15 Hz (sec)
Load Events	14	48.98 50.65	480 348
Generation Events	6	49.10 50.46	316 360
Frequency outside the NOFEB for reason other than a contingency event or a load event	29	49.29 50.41	28 92

5. ACCUMULATED TIME ERROR

The FOS specify that the accumulated time error should be maintained within the range ± 5 seconds in the mainland and ± 15 seconds in Tasmania. Constraint equations used to control mainland accumulated time error by varying the amount of Regulation FCAS enabled, are based on 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 5.

Table 5 Maximum and Minimum time error measurements for Queensland, New South Wales and Tasmania

Value	Queensland	New South Wales	Tasmania
Highest positive time error (seconds)	5.30	5.26	9.95
Lowest negative time error (seconds)	-5.16	-5.12	-8.96

The highest positive time error in Queensland and New South Wales is due to load run-off on the 24th July 2017. The amount of lower regulation in mainland was adjusted.

The lowest negative time error in Queensland and New South Wales appeared to be related to high wind conditions in South Australia on the 29th July 2017 with wind farms feathering down their output.