FREQUENCY AND TIME ERROR MONITORING – 2ND QUARTER 2017

FOR THE NATIONAL ELECTRICITY MARKET

Published: **MARCH 2018**

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 April to June 2017 inclusive.

Disclaimer

This document or the information in it may be subsequently updated or amended. This document does not constitute legal or business advice, and should not be relied on as a substitute for obtaining detailed advice about the National Electricity Law, the National Electricity Rules, or any other applicable laws, procedures or policies. AEMO has made every effort to ensure the quality of the information in this document but cannot guarantee its accuracy or completeness.

Accordingly, to the maximum extent permitted by law, AEMO and its officers, employees and consultants involved in the preparation of this document:

- make no representation or warranty, express or implied, as to the currency, accuracy, reliability or completeness of the information in this document; and
- are not liable (whether by reason of negligence or otherwise) for any statements or representations in this document, or any omissions from it, or for any use of, or reliance on, the information in it.

CONTENTS

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 April, May and June 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 July 2016 to June 2017, as required by the FOS.

Tasmanian frequencies exceeded the NOFB for more than 1% of the time over ten of the twelve 30-day periods from July 2016 to June 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.

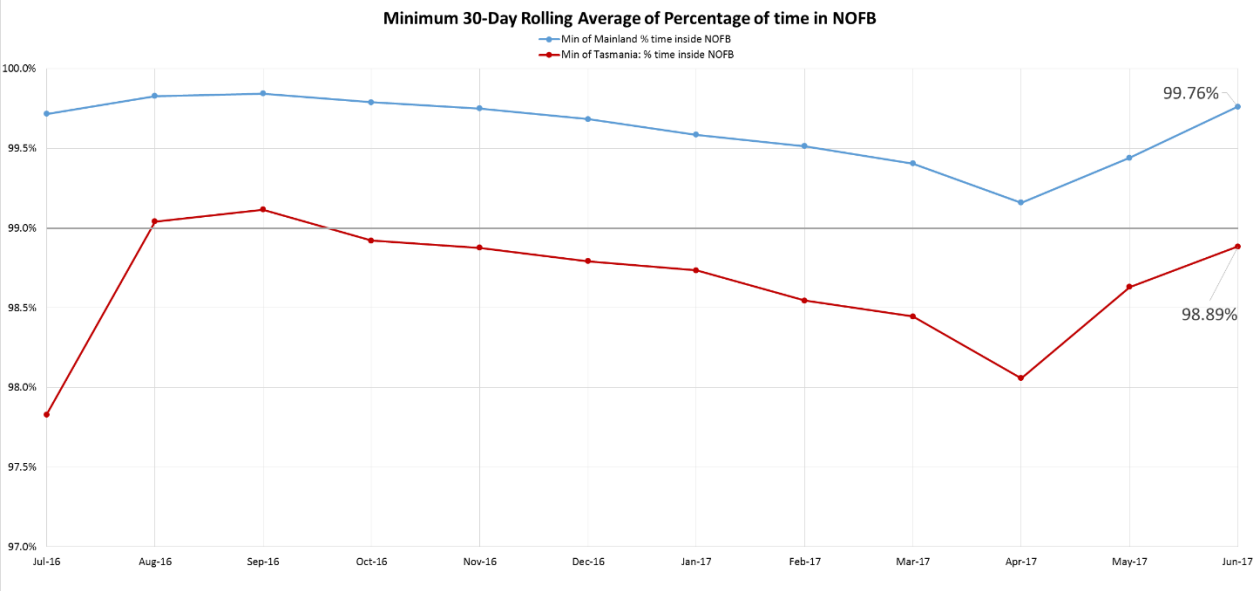

Figure 1 Minimum 30-Day rolling average of percentage of time mainland and Tasmania frequencies remained within NOFB from July 2016 to June 2017

[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	0	0
	HIGH	0	0
	BOTH	0	0
Load Event	LOW	27	72
	HIGH	11	253
	BOTH	1	305
Generation Event	LOW	17	29
	HIGH	0	13
	BOTH	2	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

[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	3
	HIGH	0	0
	BOTH	0	1
Load Event	LOW	0	4
	HIGH	1	0
	BOTH	0	2
Generation Event	LOW	13	7
	HIGH	0	0
	BOTH	3	1
Network Event	LOW	1	3
	HIGH	0	1
	BOTH	0	2
Separation Event	LOW	0	0
	HIGH	0	0
	BOTH	0	0
Multiple Contingency Event	LOW	0	1
	HIGH	0	5
	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

Thirteen 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	1	50.18	336
Generation Events	9	49.64 50.15	344 408
Frequency outside the NOFEB for reason other than a contingency event or a load event	3	49.79 50.17	352 564

4.2 Tasmanian Events

Forty-seven 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	11	49.18 50.57	344 400
Generation Events	1	50.20	352
Frequency outside the NOFEB for reason other than a contingency event or a load event	35	49.13 50.44	132 80

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)	3.37	3.12	10.84
Lowest negative time error (seconds)	-4.06	-4.25	-8.84