

FREQUENCY MONITORING – THREE YEAR HISTORICAL TRENDS

FOR THE NATIONAL ELECTRICITY MARKET

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CHAPTER 1. INTRODUCTION

AEMO is responsible under the National Electricity Rules (NER) for ensuring that the power system is operated in a safe, secure and reliable manner. As part of this obligation, AEMO is required to maintain power system frequency and time error to within the limits specified in the frequency operating standards determined for mainland National Electricity Market (NEM) regions and Tasmania by the Reliability Panel¹.

This report provides an overview of power system frequency performance from October 2013 to October 2016.

To detail the performance of power system frequency management and emerging trends, AEMO will start publishing frequency reports quarterly in 2017.

In 2017, AEMO will review and consult on the Market Ancillary Services Specification (MASS)². The MASS details the technical requirements for the provision of Frequency Control Ancillary Services (FCAS), which is a market ancillary service. FCAS is central to AEMO's management of power system frequency, which is essential for operating the system safely, securely and reliably. The power system frequency data presented in this report will be used by AEMO to assess some aspects of FCAS performance.

¹ <http://aemc.gov.au/Australias-Energy-Market/Market-Legislation/Electricity-Guidelines-and-Standards?publisher=2&type=2>

² <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/Ancillary-services/Market-ancillary-services-specifications-and-FCAS-verification>



CHAPTER 2. FREQUENCY PERFORMANCE

Mainland and Tasmanian frequencies were within the Normal Operating Frequency Band (NOFB)³ more than 99% of the time over any 30-day period from October 2013 to October 2016, as required by the Frequency Operating Standards⁴, except for the following two periods:

- December 2015 to June 2016 – the Basslink Interconnector was out of service from 20 December 2015 to 13 June 2016. Initially, fast Frequency Control Ancillary Service (FCAS) was provided by hydro generators. Then, on 29 December 2015, fast FCAS was not sourced from the market⁵, but was provided by a generator tripping scheme and a temporary adaptive under-frequency load shedding scheme. The use of these schemes, as well as loss of frequency support from the mainland, led to the power system frequency remaining in the NOFB for less than 99% of the time in a 30 day period between January 2016 and July 2016.
- October 2016 – the reason for the power system frequency remaining in the NOFB for less than 99% of the time in a 30 day period in Tasmania is still under investigation.

The minimum 30-day rolling average percentage of time that the mainland and Tasmania frequencies remained inside the NOFB is shown in Figure 2-1.

Figure 2-2 shows the number of frequency excursions in mainland regions with the following details:

- Excursions outside NOFB (49.85 Hz to 50.15 Hz)
- Excursions outside the normal operating frequency excursion band (49.75 Hz to 50.25 Hz)
- Excursions outside the generation and load event tolerance bands (49.5 Hz to 50.5 Hz)
- Excursions outside the operational frequency tolerance band (49.0 Hz to 51.0 Hz)
- Excursions outside the extreme frequency excursion tolerance limits (47.0 Hz to 52.0 Hz)

Figure 2-3 shows the number of frequency excursions in Tasmania with the following details:

- Excursions outside the NOFB (49.85 Hz to 50.15 Hz)
- Excursions outside the normal operating frequency excursion band (49.75 Hz to 50.25 Hz)
- Excursions outside the generation and load event tolerance bands (48.0 Hz to 52.0 Hz)
- Excursions outside the operational frequency tolerance band (48.0 Hz to 52.0 Hz)
- Excursions outside the extreme frequency excursion tolerance limits (47.0 Hz to 55.0 Hz)

Figure 2-4: For mainland regions – This shows excursions outside the NOFB (49.85 Hz to 50.15 Hz) for more than 5-minutes

Figure 2-5: For Tasmania – This shows excursions outside the NOFB (49.85 Hz to 50.15 Hz) for more than 5-minutes

³ Frequency range of 49.85 Hz – 50.15 Hz

⁴ AEMO uses a rolling average to assess if the requirement for power system frequency to remain in the NOFB for 99% of the time in a 30 day period.

⁵ This was to improve the operational efficiency of hydro generators due to the Basslink outage and drought like conditions

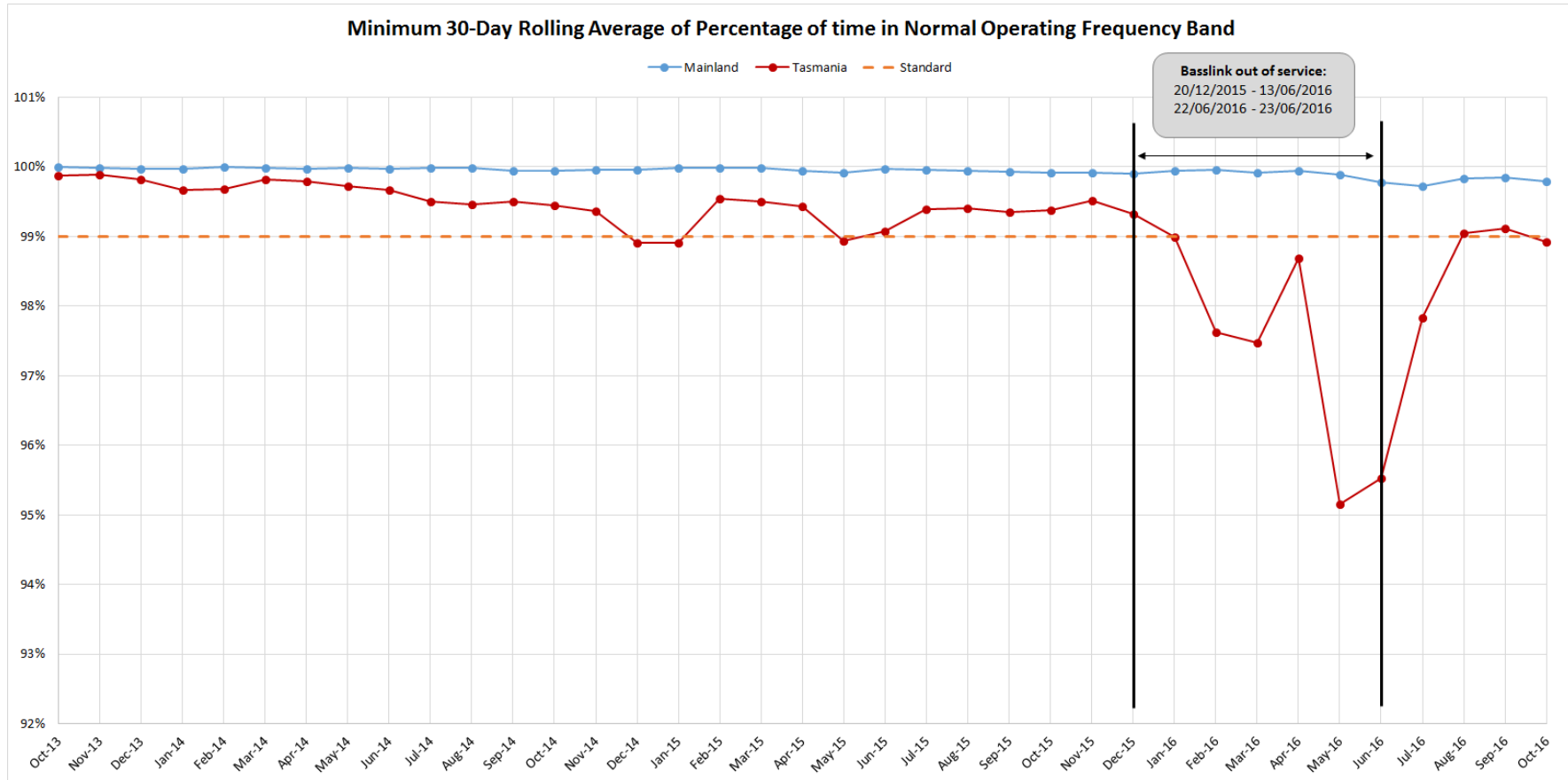


Figure 2-1 Minimum 30-Day rolling average of percentage of time Mainland and Tasmania frequencies remained within NOFB



Mainland - Number of Frequency Band Exceedances 3 year historical trend

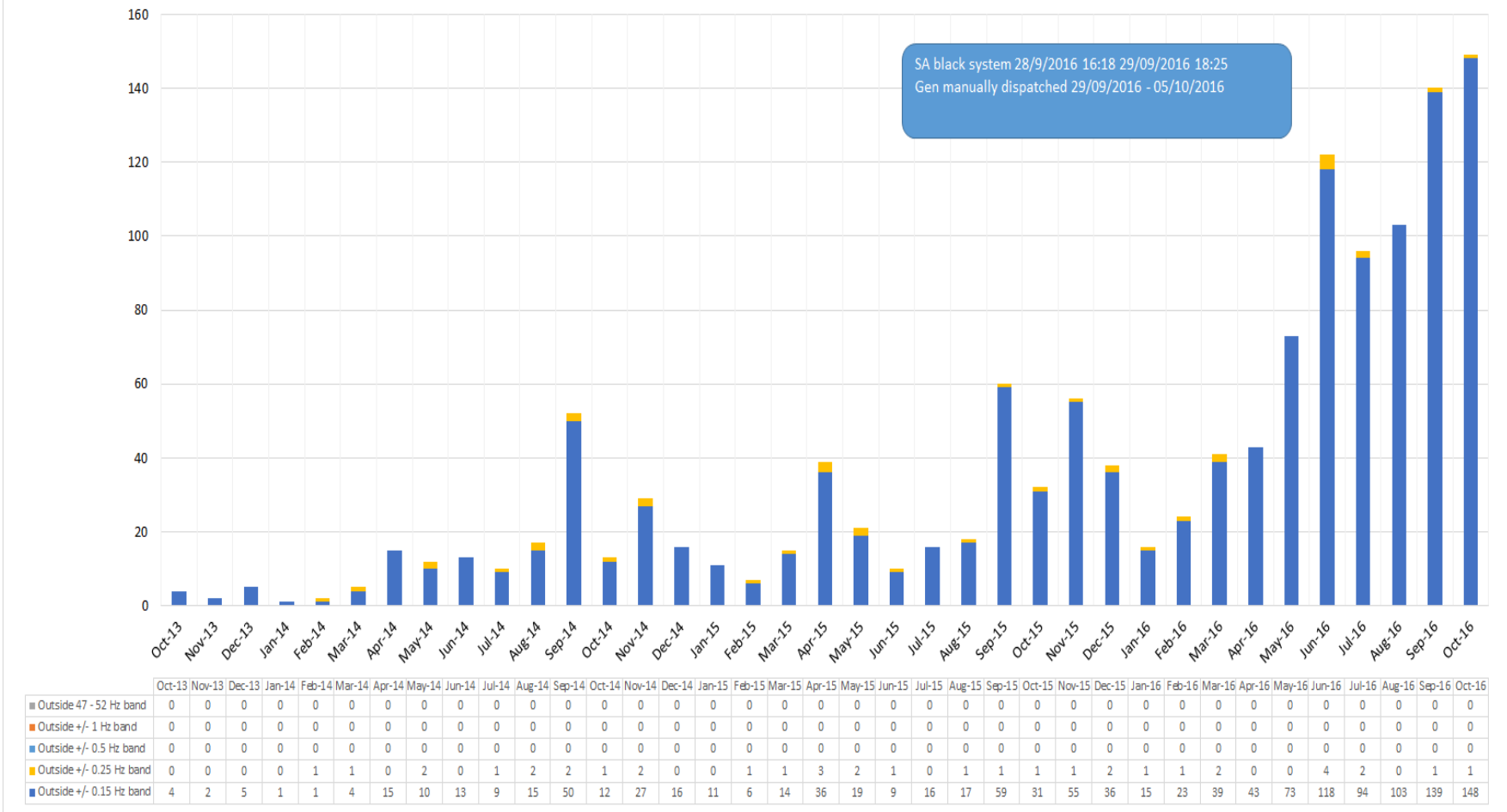


Figure 2-2 Mainland – Number of frequency band exceedances

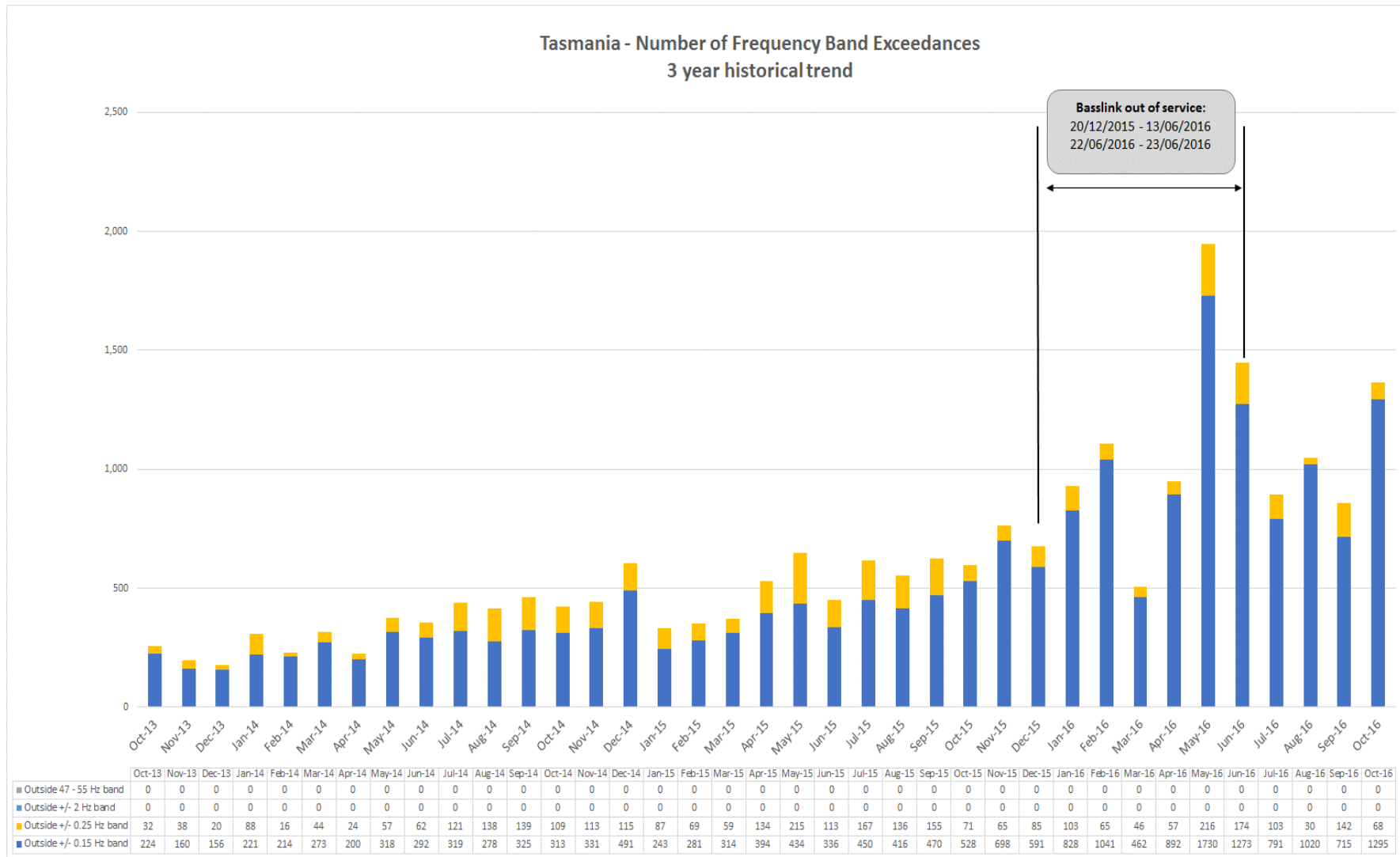


Figure 2-3 Tasmania – Number of frequency band exceedances

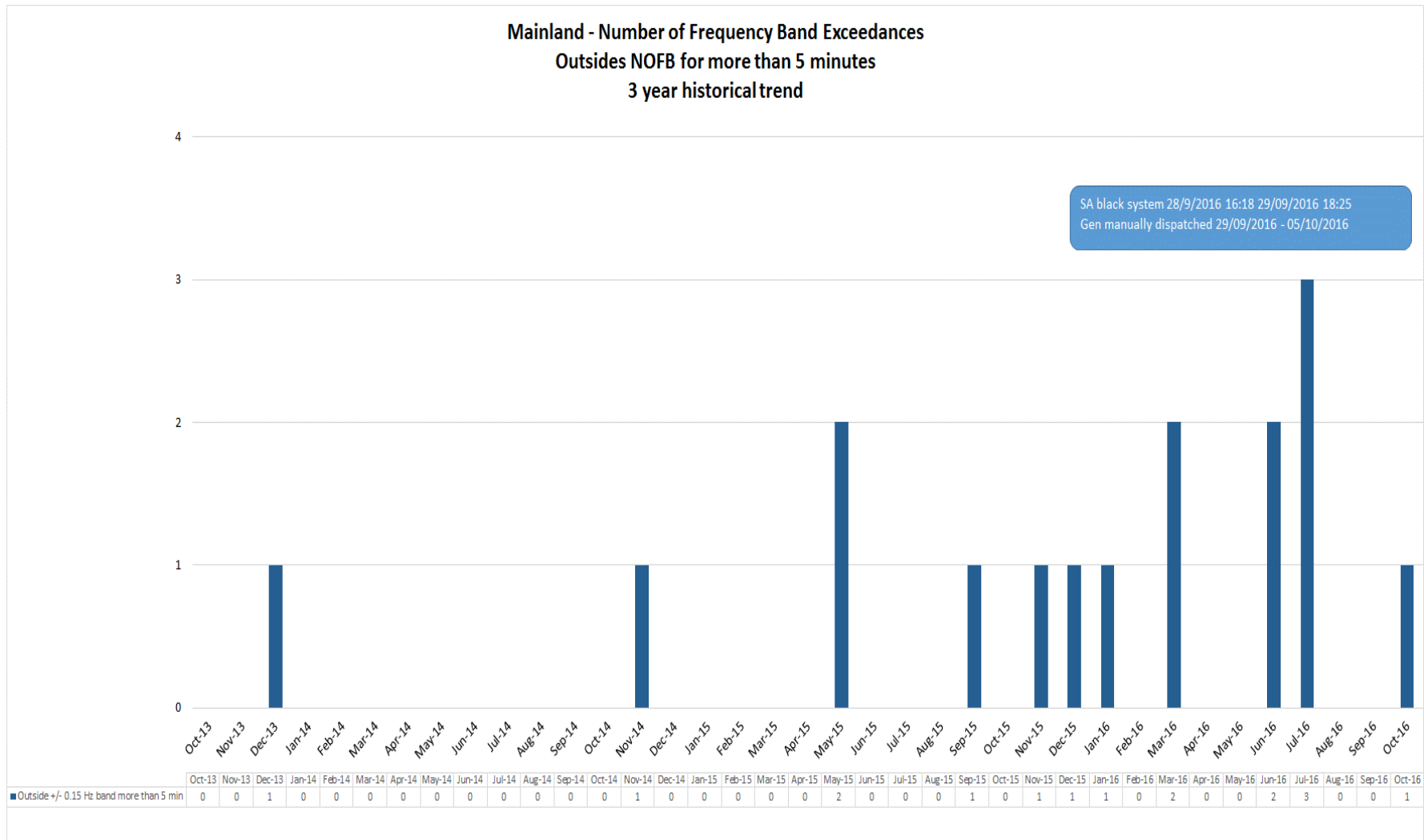


Figure 2-4 Mainland – Number of frequency band exceedances outsides NOFB for more than 5 minutes

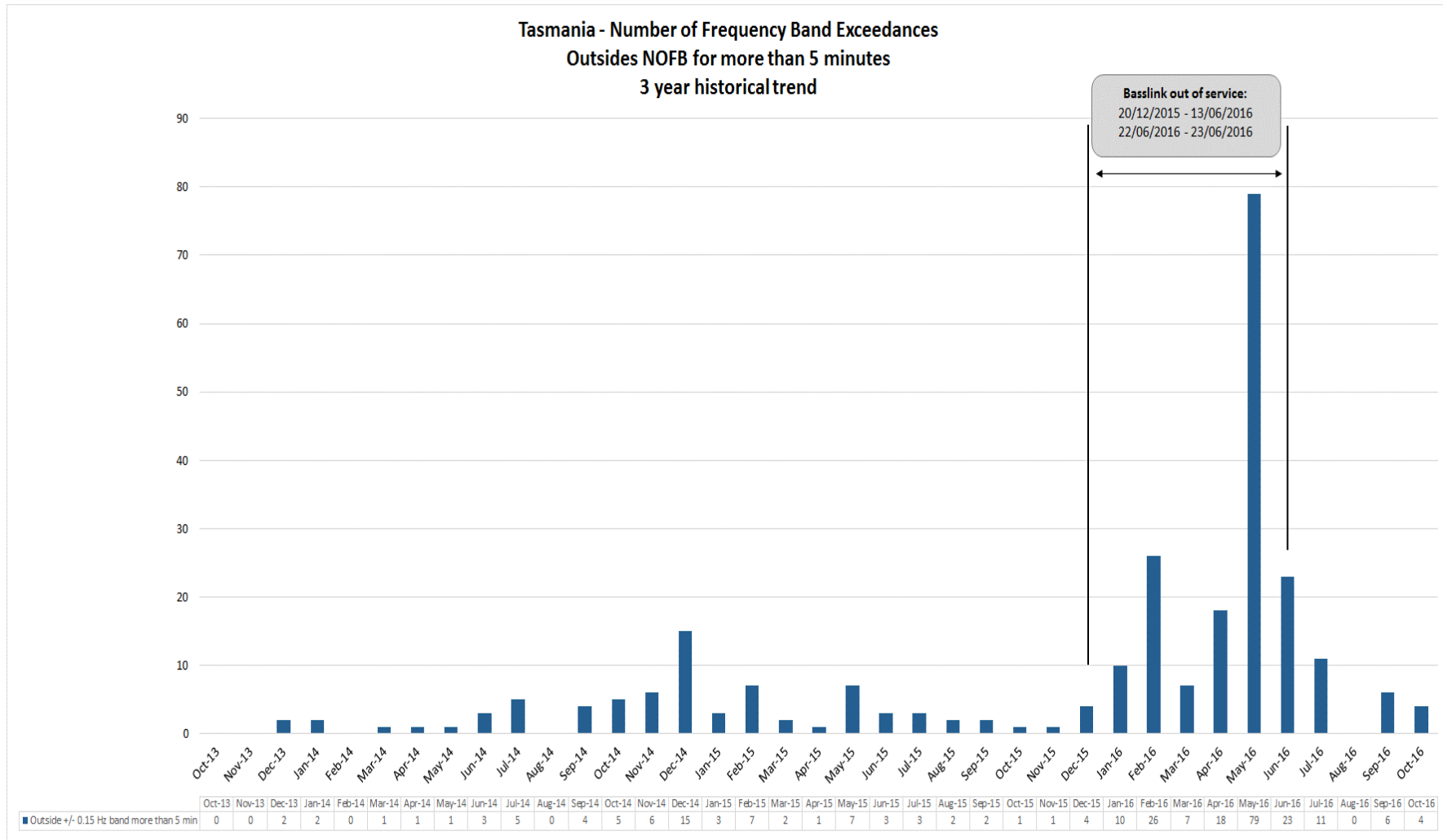


Figure 2-5 Tasmania – Number of frequency band exceedances outsides NOFB for more than 5 minutes