

Power System Operating Incident Report – Trip of John Butters - Farrell 220 kV Transmission Line and Farrell – Rosebery - Queenstown 110 kV Transmission Line on 1 October 2013

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DATE: 29 November 2013

FINAL

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Incident Classifications

Time and date and of incident	0025 hrs Tuesday 1 October
Region of incident	Tasmania
Affected regions	Tasmania
Event type	TG – Loss of transmission elements and generating units
Primary cause	ENVI & LN – Environment and Lightning
Impact	Not Significant
Associated reports	Nil

Abbreviations and Symbols

Abbreviation	Term
AEMO	Australian Energy Market Operator
CB	Circuit Breaker
EMMS	Electricity Market Management System
EMS	Energy Management System
kV	Kilovolt
MW	Megawatt
NER	National Electricity Rules

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1 Introduction

This report reviews a power system operating incident that occurred on 1 October 2013 in the Tasmanian region at Transend's Farrell Substation. AEMO is required to review this incident as it is classified as a non-credible contingency that satisfies the requirements of a reviewable operating incident under the National Electricity Rules¹ (NER).

The purpose of this incident review is to assess power system security over the course of the incident. The NER requires AEMO to assess the adequacy of the provision and response of facilities and services and the appropriateness of actions taken to restore or maintain power system security².

This report is based upon information provided by Transend. Data from AEMO's Energy Management System (EMS) and Electricity Market Management System (EMMS) has also been used in analysing the incident.

All references to time in this report are to National Electricity Market time (Australian Eastern Standard Time).

2 The Incident

On Tuesday 1 October 2013 at 0025 hrs, the Farrell-John Butters 220 kV transmission line and Farrell-Rosebery-Queenstown 110 kV transmission line tripped simultaneously. The trip was caused by a lightning. As a result of this incident, there was a loss of approximately 10 MW of load and a loss of 16 MW of generation at John Butters Power Station.

3 Transend Investigation

Transend³ investigated the incident and found that lightning caused the simultaneous trip of the two transmission lines - Farrell-John Butters 220 kV and Farrell-Rosebery-Queenstown 110 kV. The lightning strike was within the vicinity of shared transmission towers of the tripped lines.

The protection and control schemes operated correctly in tripping the transmission lines by opening the relevant circuit breakers.

4 Pre-Incident State

Prior to the incident there was lightning activity in the West Coast Region of Tasmania. AEMO had reclassified several vulnerable⁴ double circuit transmission lines in the area as a credible contingency due to lightning. AEMO did not reclassify the trip of the Farrell-John Butters 220 kV line and the Farrell-Rosebery-Queenstown 110 kV line as the lines were not classified as vulnerable lines.

Prior to this incident AEMO had not classified the Farrell-John Butters 220 kV transmission line and Farrell-Rosebery-Queenstown 110 kV transmission line as a vulnerable double circuit. This is because over the past five years these circuits had not tripped simultaneously due to lightning.

The status of the power system prior to the incident is shown in Figure 1. For clarity only equipment relevant to this incident has been included in the diagram. The diagram shows that 220 kV CB A752B and 110 kV CB A552 at Farrell Substation and were open.

¹ NER v57 Clause 4.8.15(a)(1)(i) and AEMC Reliability Panel Guidelines for Identifying Reviewable Operating Incidents.

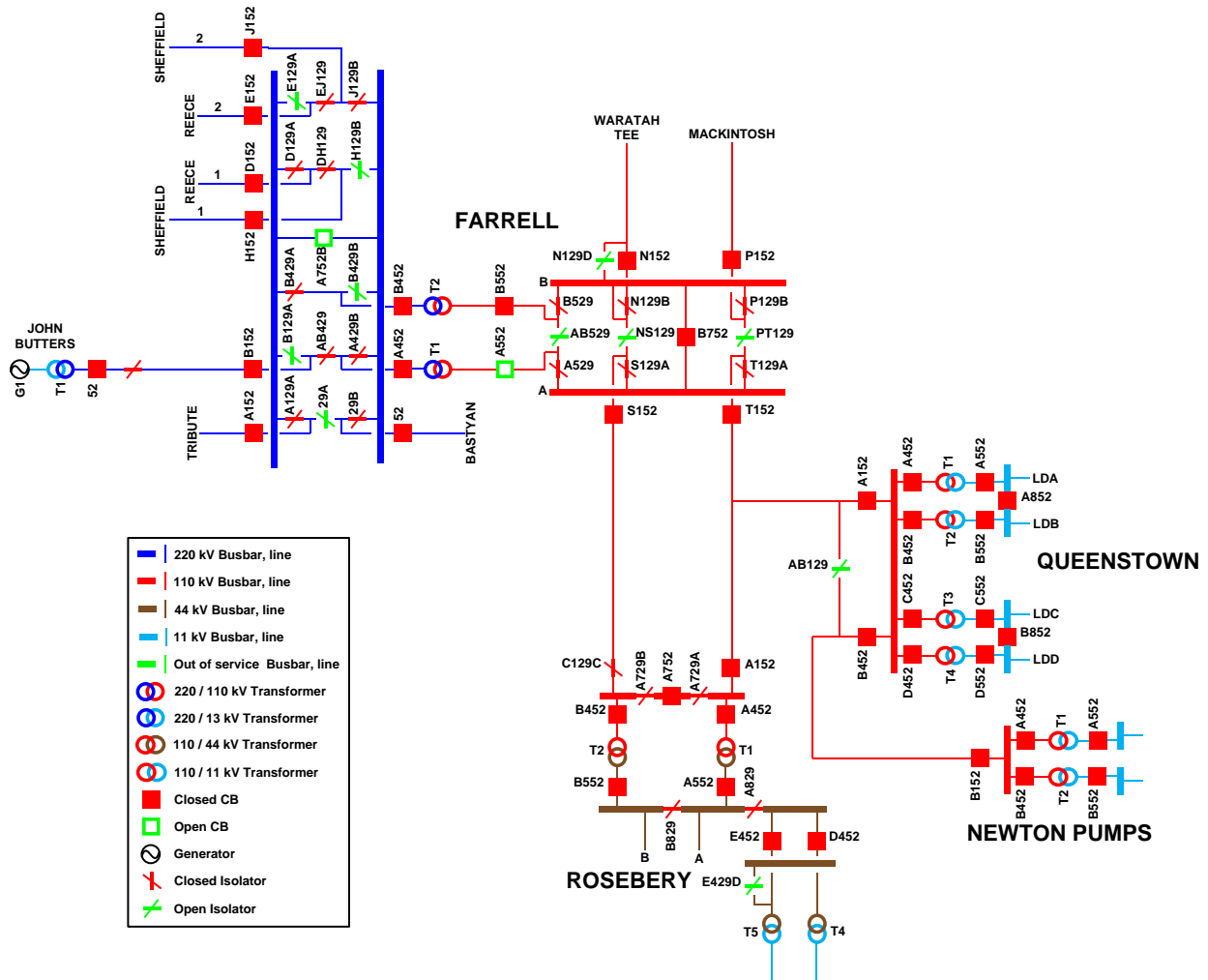
² NER v57 Clause 4.8.15 (b)

³ Transend is the Transmission Network Service Provider (TNSP) in Tasmania

⁴ Ref: AEMO Power System Security Guidelines – Section 11.4 (www.aemo.com.au)

These circuit breakers were intentionally open as part of a Transend contingency plan to manage the loss of both Farrell-Sheffield 220 kV transmission lines which were reclassified as a credible contingency due to lightning activity in that area.

Figure 1 - Status of the power system prior to the incident



5 Incident Event Log

The sequence of events comprising the incident are itemised in Table 1. The incident spanned approximately 17 minutes from the simultaneous tripping of the Farrell-John Butters 220 kV transmission line and the Farrell-Rosebery-Queenstown 110 kV transmission line to the power system being returned to the pre-incident state.

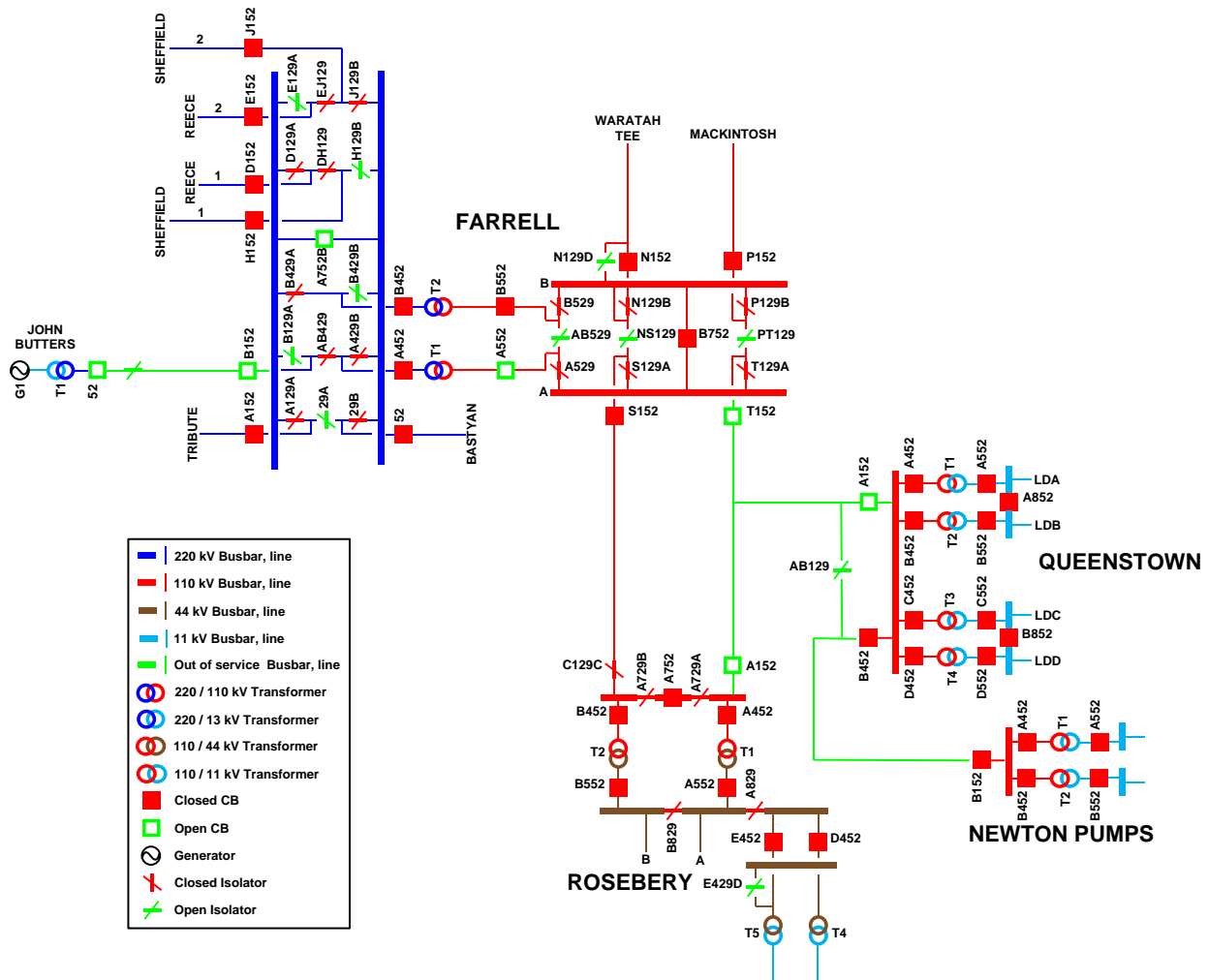
Table 1 – Event Log

Time and Date	Event
0025 hrs - 1 Oct 2013	Farrell-Rosebery-Queenstown 110 kV transmission line and Farrell-John Butters 220 kV transmission line tripped simultaneously.
0036 hrs - 1 Oct 2013	Farrell-Rosebery-Queenstown 110 kV transmission line returned to service.
0039 hrs - 1 Oct 2013	Farrell-John Butters 220 kV transmission line returned to service.
0042 hrs - 1 Oct 2013	John Butters generating unit returned to service.
0042 hrs - 1 Oct 2013	AEMO issued Market Notice 43477 - notification of non-credible contingency event and reclassification of the event as a credible contingency
1943 hrs - 4 Oct 2013	AEMO issued Market Notice 43543 – cancellation of reclassification

6 Post-Incident State

The status of the power system immediately after the incident is shown in Figure 2. The diagram shows that the Farrell-John Butters 220 kV transmission line and the Farrell-Rosebery-Queenstown 110 kV transmission line were de-energised via open circuit breakers.

Figure 2 - Status of the power system immediately after the incident



7 Immediate Actions

Transend re-energised the Farrell-Rosebery-Queenstown 110 kV transmission line at 0036 hrs, and the Farrell-John Butters 220 kV transmission line at 0039 hrs. John Butters generating unit was returned to service at 0042 hrs.

AEMO issued Market Notice 43477 at 0136 hrs to notify the market:

- of a non-credible contingency event
- that the cause of the non-credible contingency event was not known at that time
- that AEMO reclassified this event as a credible contingency from 0045 hrs on 1 October 2013 until further notice
- that no constraint sets were required for the reclassification

AEMO issued Market Notice 43477 approximately 71 minutes after the lines tripped. This is within the two hour period in which AEMO is required to notify the market of a non-credible contingency⁵.

AEMO also is required to assess whether or not to reclassify a non credible contingency event as a credible contingency⁶ and to report how re-classification criteria were applied⁷. AEMO has to determine if the condition that caused the non-credible contingency event has been resolved. AEMO correctly reclassified this event as a credible contingency as the cause of the event was unknown at the time.

8 Follow-up Actions

Transend further investigated the tripped lines and found that the incident was caused by a lightning strike within the vicinity of shared transmission towers of the tripped lines. Both transmission lines have overhead earth wires and no evidence of damage to the lines was found at that time.

Based on this information provided by Transend, AEMO was satisfied that a similar non-credible contingency event was unlikely to re-occur. AEMO cancelled the reclassification of the event as a credible contingency via Market Notice 43543 at 1943 hrs on 4 October 2013.

On 25 October 2013, AEMO updated its operating procedure SO_OP 3715 Power System Security Guidelines to include the Farrell-Rosebery-Queenstown 110 kV transmission line and the Farrell-John Butters 220 kV transmission line as vulnerable lines.

9 Power System Security

AEMO is responsible for power system security in the NEM and is required to operate the power system in a secure operating state⁸. AEMO must thereby ensure that the power system is maintained in, or returned to, a secure operating state following a contingency event.

For this incident no immediate actions were required of AEMO. Transend promptly and correctly restored the affected transmission lines to service following the incident.

The post-contingent system voltages and frequencies remained within the normal operating bands and the power system remained in a secure operating state throughout the incident.

Transend's protection and control systems operated as required and in accordance with the fault clearance times specified in the NER.

The provision and response of facilities was adequate to maintain power system security.

⁵ AEMO, *Power System Security Guidelines*, v54 Section 10.3

⁶ NER v55 Clause 4.2.3A (c)

⁷ NER v55 Clause 4.8.15 (ca)

⁸ NER v55 Clause 4.2.4 (a)

10 Conclusions

The simultaneous tripping of the Farrell-John Butters 220 kV transmission line and the Farrell-Rosebery-Queenstown 110 kV transmission line on 1 October 2013 was caused by a lightning strike within the vicinity of shared transmission towers of the tripped lines.

Over the course of the incident, the response of AEMO and Transend was appropriate and power system security was maintained.

11 Recommendations

There are no recommendations arising from this incident.