POWER SYSTEM OPERATING INCIDENT REPORT – SIMULTANEOUS TRIP OF ROWVILLE–YALLOURN NO.5 AND NO.6 220 KV LINES ON 27 NOVEMBER 2012

PREPARED BY: Systems Performance and Commercial

DATE: 10 January 2013

FINAL

Disclaimer

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Abbreviations and Symbols

Abbreviation	Term
CB	Circuit Breaker
kV	Kilovolt
MW	Megawatt
NEM	National Electricity Market

Contents

Incident summary

Date and time of incident	27/11/2012 04:41hrs
Region of incident	VIC
Affected regions	VIC
Event type	TT – Loss of multiple transmission elements
Primary cause	ENVI & LN – Environment and Lightning
Impact	Nil
Associated reports	Nil

1 Introduction

At 04:41 hours on 27 November 2012, the Rowville-Yallourn No.5 and No.6 220 kV lines in Victoria simultaneously tripped out of service. This also resulted in the off-loading of the Rowville-Richmond No.4 220 kV line. Heavy rain and lightning was reported in the vicinity of the lines at the time of the incident.

There was no loss of generation or load as a result of this incident.

This report has been prepared under clause 4.8.15 (c) of the National Electricity Rules (NER) 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 security.

This report is largely based upon information provided by SP AusNet[1]. 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 Pre-Contingent System Conditions

Prior to the incident, all equipment connected to the Rowville 220 kV busbars was in service. At Yallourn Power Station, generating unit 2 was offline while the other three units were in service generating a total output of approximately 900 MW.

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.

[1] Information provided by SP AusNet has been provided on a without prejudice basis and nothing in this report is intended to constitute, or may be taken by any person as constituting, an admission of fault, liability, wrongdoing, negligence, bad faith or the like on behalf of SP AusNet (or its respective associated companies, businesses, partners, directors, officers or employees).

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

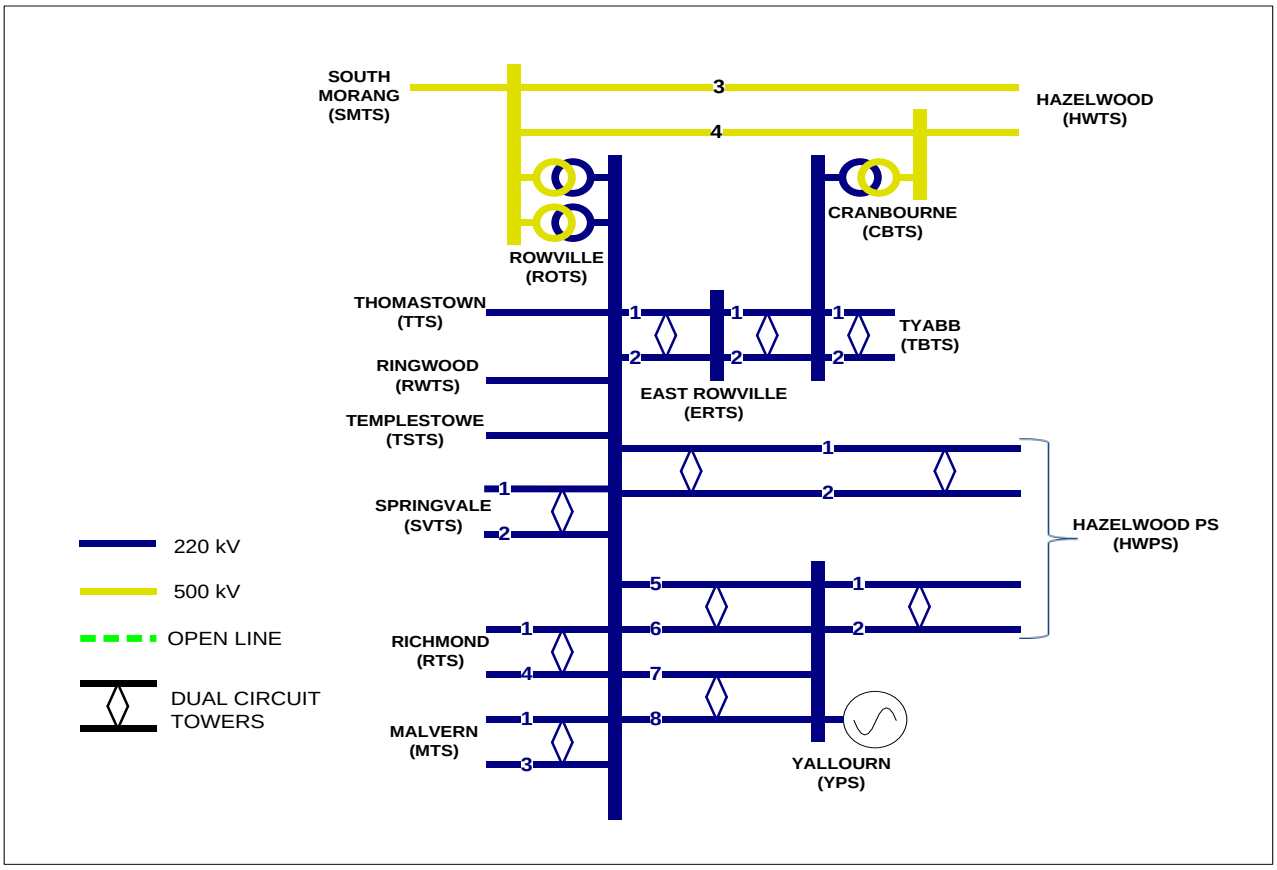
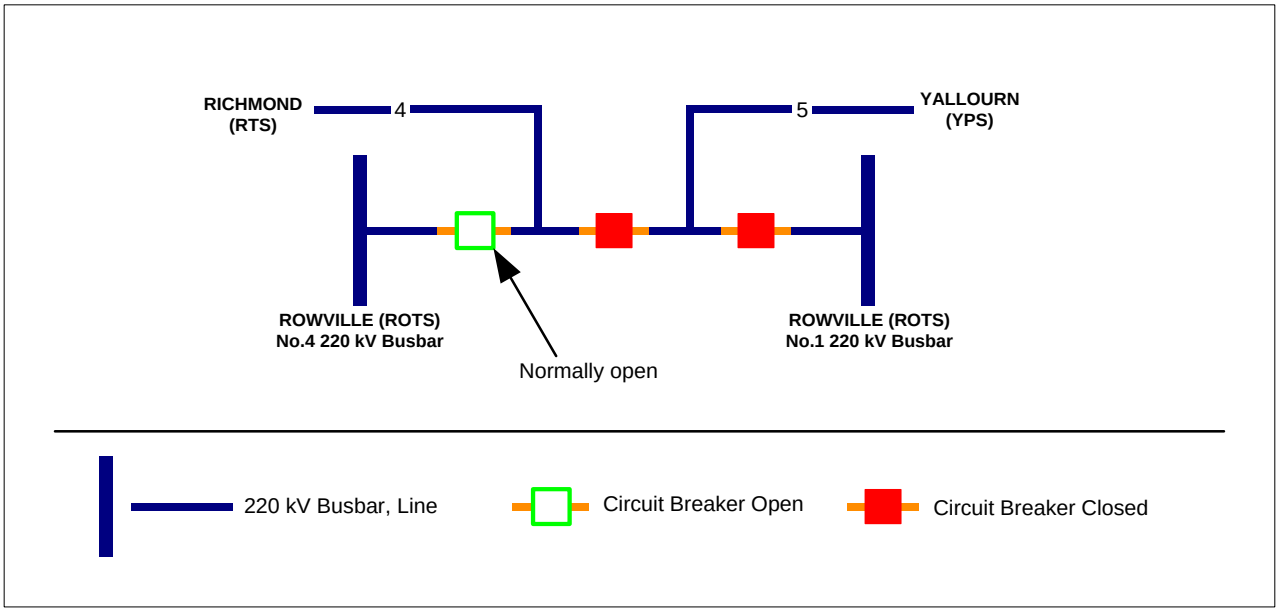


Figure 2 shows the switching configuration of Rowville-Richmond No.4 220 kV line and Rowville-Yallourn No.5 220 kV line at Rowville Terminal Station prior to the incident.

Figure 2 – Circuit breaker status at Rowville Terminal Station



3 Summary of Events

The key events that took place during the incident are summarised in Table 1 below.

Table 1: Summary of Events

Date/Time	Event
27/11/2012 04:41 hrs.	• Rowville-Yallourn No.5 220 kV line tripped and auto-reclosed at Rowville end. • Rowville-Yallourn No.6 220 kV line tripped. • Rowville-Richmond No.4 220 kV offloaded at Rowville end.
27/11/2012 04:46 hrs.	Rowville-Richmond No.4 220 kV line returned to service.
27/11/2012 04:48 hrs.	Rowville-Yallourn No.5 220 kV line returned to service.
27/11/2012 04:55 hrs.	Network constraint (V-ROYP6_R) invoked for the Rowville-Yallourn No.6 220 kV line outage
27/11/2012 11:46 hrs.	Rowville-Yallourn No.6 220 kV line returned to service.
27/11/2012 11:55 hrs.	Network constraint (V-ROYP6_R) revoked

SP AusNet advised that the trip of the Rowville-Yallourn No.5 and No.6 220 kV lines was due to lightning.

The protection system on the Rowville-Yallourn No.5 220 kV line detected a blue phase to earth fault; while the protection system on the Rowville-Yallourn No.6 220 kV line detected a white phase to earth fault. The protection system at the both ends of the lines operated correctly and tripped the associated circuit breakers.

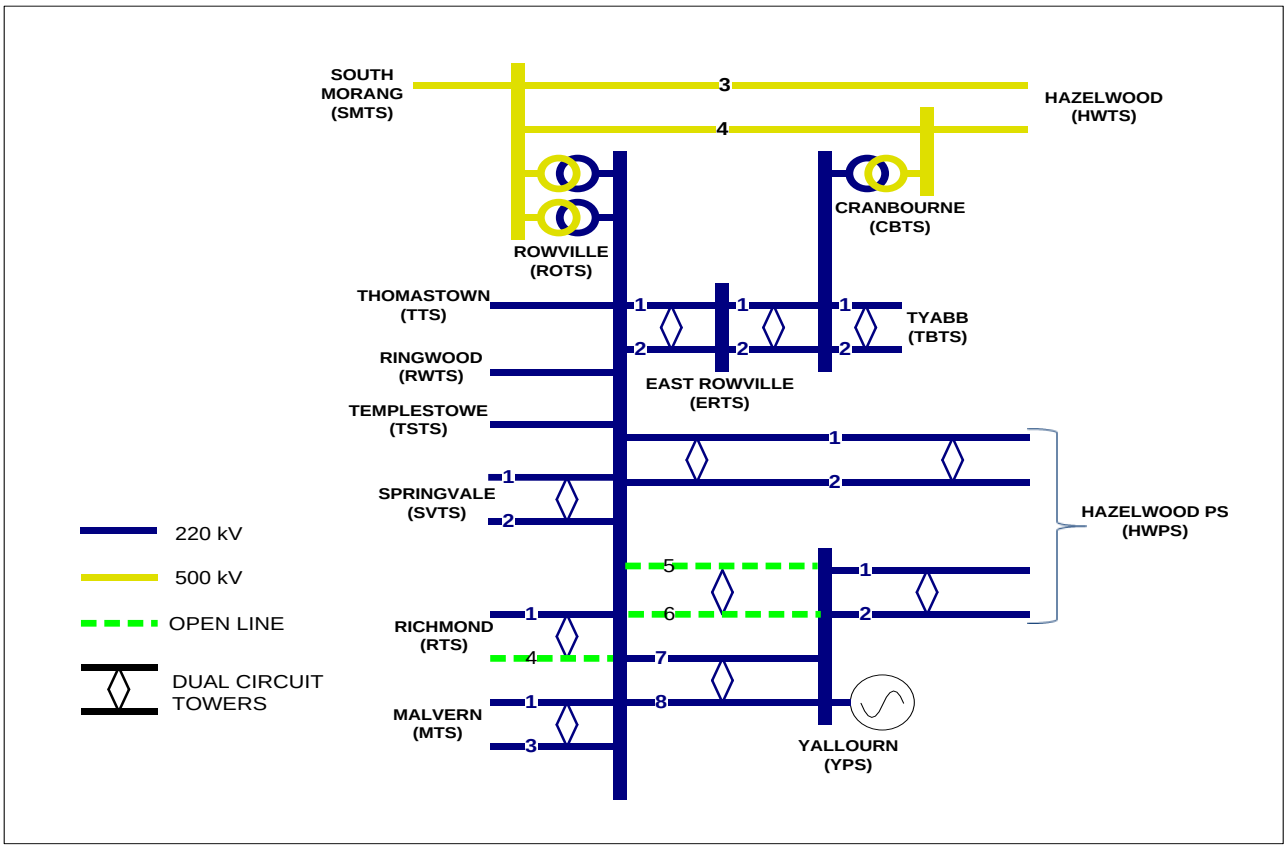
For Rowville-Yallourn No.5 220 kV line, the protection system at Rowville end initiated the Single End Auto Reclose (SEAR) function as designed. Thus the line circuit breaker was reclosed successfully at Rowville end.

However for Rowville-Yallourn No.6 220 kV line, the SEAR function of the protection system at Rowville end was inadvertently left out of service after a planned outage which was carried out on 23 November 2012. Thus the auto-reclose did not occur at the Rowville end of the line as a result of this incident.

The switching configuration of Rowville Terminal Station shown in Figure 2 shows that prior to the incident the Rowville-Richmond No.4 220 kV line No.4 Bus circuit breaker was open. This is the normal configuration. Therefore under this switching configuration Rowville-Richmond No.4 220 kV line offloaded at Rowville end when the Rowville-Yallourn No.5 220 kV line tripped.

The status of the power system immediately after the incident is shown in Figure 3.

Figure 3 - Status of the power system immediately after the incident



4 Immediate Actions Taken

At 04:46 hours on 27 November 2012, the Rowville-Richmond No.4 220 kV line was returned to service.

At 04:48 hours on 27 November 2012, the Rowville-Yallourn No.5 220 kV line was returned to service.

At 04:55 hours on 27 November 2012, AEMO invoked a network constraint (V-ROYP6_R) to manage the loss of the Rowville-Yallourn No.6 220 kV line.

At 05:11 hours on 27 November 2012, AEMO issued Electricity Market Notice No.39378 advising the occurrence of this non-credible contingency event.

5 Follow-up Actions

Following the incident SP AusNet patrolled the entire length of the Rowville-Yallourn No.5 and No.6 220 kV lines (which are on common towers), but no evidence of the fault was found. Therefore at 11:46 hours on 27 November 2012, the Rowville-Yallourn No.6 220 kV line was returned to service.

AEMO revoked the network constraint (V-ROYP6_R) at 11:55 hours on 27 November 2012 after SP AusNet returned the Rowville-Yallourn No.6 220 kV line to service.

SP AusNet checked the protection relays at Rowville Terminal Station and Yallourn Power Station, and confirmed that the protection on the Rowville-Yallourn No.5 and No.6 220 kV lines operated as designed. The protection relays detected a blue phase to earth fault on the Rowville-Yallourn No.5 220 kV line and a white phase to earth fault on the Rowville-Yallourn No.6 220 kV line.

SP AusNet also confirmed that the Rowville-Yallourn No.5 220 kV line was reclosed successfully at Rowville end, as expected. But the auto-reclose did not occur for the Rowville-Yallourn No.6 220 kV line during the incident because the SEAR function of the line was inadvertently left out of service. SP AusNet advised that their control room inadvertently left the SEAR function out of service during the restoration of the Rowville-Yallourn No.6 220 kV line after a planned outage on 23 November 2012, although a step to restore the SEAR function was included in the switching instructions.

At 11:48 hours on 27 November 2012, SP AusNet enabled the SEAR function of the Rowville – Yallourn No.6 220 kV line after the line was returned to service.

AEMO updated its operating procedure SO_OP 3715 Power System Security Guidelines to include the Rowville-Yallourn No.5 and No.6 220 kV lines as vulnerable lines with respect to reclassification due to lightning strikes.

6 Power System Security Assessment

There was no loss of load or generation as a result of this incident.

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

7 Conclusions

At 04:41 hours on 27 November 2012, the Rowville-Yallourn No.5 and No.6 220 kV lines in Victoria simultaneously tripped on protection operation to clear earth faults due to lightning strikes. Rowville-Richmond No.4 220 kV line offloaded at Rowville end as a result of the tripping.

No loss of generation or customer load occurred during this incident. Also there was no loss of power system security as a result of this incident.

AEMO correctly applied the criteria published in section 12 of its Power System Security Guidelines in categorising the Rowville-Yallourn No.5 and No.6 220 kV lines as vulnerable lines with respect to reclassification due to lightning strikes.

8 Recommendations

There are no recommendations arising from this incident.