POWER SYSTEM OPERATING INCIDENT REPORT - TRIP OF SOUTH MORANG No.2 500 kV BUSBAR 1 JUNE 2013

PREPARED BY: AEMO - Systems Performance and Commercial

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FINAL

Disclaimer

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Incident Classifications

Date and time of incident	1 June 2013 at 0106 hrs
Region of incident	Victoria
Affected regions	Victoria
Event type (classification code)	Busbar Trip (BB)
Primary cause (classification code)	Protection and Control (PTN & CTR)
Impact	Nil
Associated reports	Nil

Abbreviations and Symbols

Abbreviation	Term
AEMO	Australian Energy Market Operator
EMMS	Electricity Market Management System
EMS	Energy Management System
kV	Kilovolt
NEM	National Electricity Market
NER	National Electricity Rules
SF6	Sulpher Hexafluoride
TNSP	Transmission Network Service Provider
V-SMTS_BYPASS_HW_SY	A NEM constraint set that is invoked for the outage of a South Morang Terminal Station 500 kV Busbar. The constraint set abbreviations are: V - Victoria, SMTS - South Morang Terminal Station, HW - Hazelwood, SY – Sydenham.

Contents

1 Introduction

This report reviews a power system operating incident that occurred in the Victorian Region on Saturday 1 June 2013 at SP AusNet's South Morang Terminal Station. AEMO is required to review this incident as it is classified as a non-credible contingency that satisfies the requirements of a reviewable incident under the NER[1].

The purpose of this power system operating incident review is to assess power system security over the course of the incident. In reviewing an 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 security[2].

This report is based upon information provided by SP AusNet[3] and data from AEMO's Energy Management System (EMS) and Electricity Market Management System (EMMS).

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

2 The Incident

At 0106 hrs on Saturday 1 June 2013, at South Morang Terminal Station, the No.2 500 kV Busbar SF6 Gas Density Protection Scheme operated and tripped No. 2 500 kV Busbar. At South Morang Terminal Station both 500 kV busbars and associated circuit breakers are SF6 Gas Insulated.

A damaged secondary cable was found to have caused the trip of the busbar. The incident occurred during heavy rainfall in the area of South Morang Terminal Station.

No load, generation or other transmission elements were off-loaded as a result of this incident. The No.2 500 kV Busbar was returned to service at 0550 hrs on Saturday 1 June 2013.

3 TNSP Investigation

SP AusNet investigated the incident and found that a false trip condition had initiated the No. 2 500 kV Busbar SF6 Gas Density Protection Scheme. This protection system correctly tripped all four circuit breakers connected to the No. 2 500 kV Busbar at South Morang Terminal Station.

A damaged secondary cable was found to have caused the trip. The cable connected the Blue Phase Gas Density Monitor on the Bay E Zone of No. 2 500 kV Busbar to the SF6 Auto De-Energisation Panel.

At the time of the trip there had been heavy rainfall in the area. Earlier that night there had been battery earth alarms on the 48 V DC and 250 V DC systems at South Morang Terminal Station.

SP AusNet response staff isolated the secondary circuit associated with the damaged cable. This enabled the busbar to be returned to service at 0550 hrs, approximately four hours and 45 minutes after the initial event.

Following remedial work, the No. 2 500 kV Busbar SF6 Gas Density Protection trip function for the Blue Phase of Bay E Zone was returned to service 17 days after the incident on 18 June 2013. During this period, the Bay E Blue Phase Gas Density Protection alarm function remained in service.

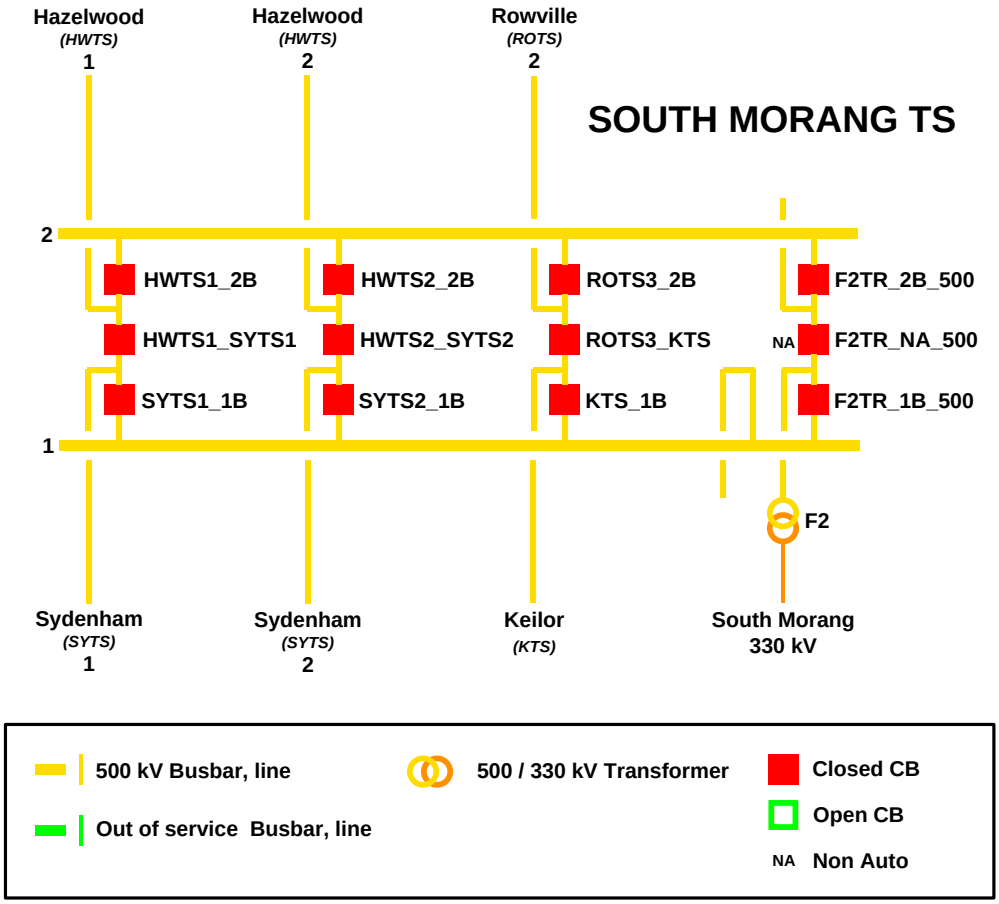
[1] *NER* v55 Clause 4.8.15(a)(1)(i), and AEMC, *Reliability Panel Guidelines for Identifying Reviewable Operating Incidents*
[2] *NER* v55 Clause 4.8.15 (b)
[3] Information provided by SP AusNet has been provided on a without prejudice basis and nothing in this report is intended to constitute, or may 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).

4 Pre-Incident Power System

Prior to the incident, the No. 2 500 kV Busbar and all transmission elements connected to the busbar were in-service under system normal operating conditions.

The status of the power system prior to the incident is shown in Figure 1. The diagram shows all circuit breakers connected to the No. 2 500 kV bus bar closed.

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



5 Incident Event Log

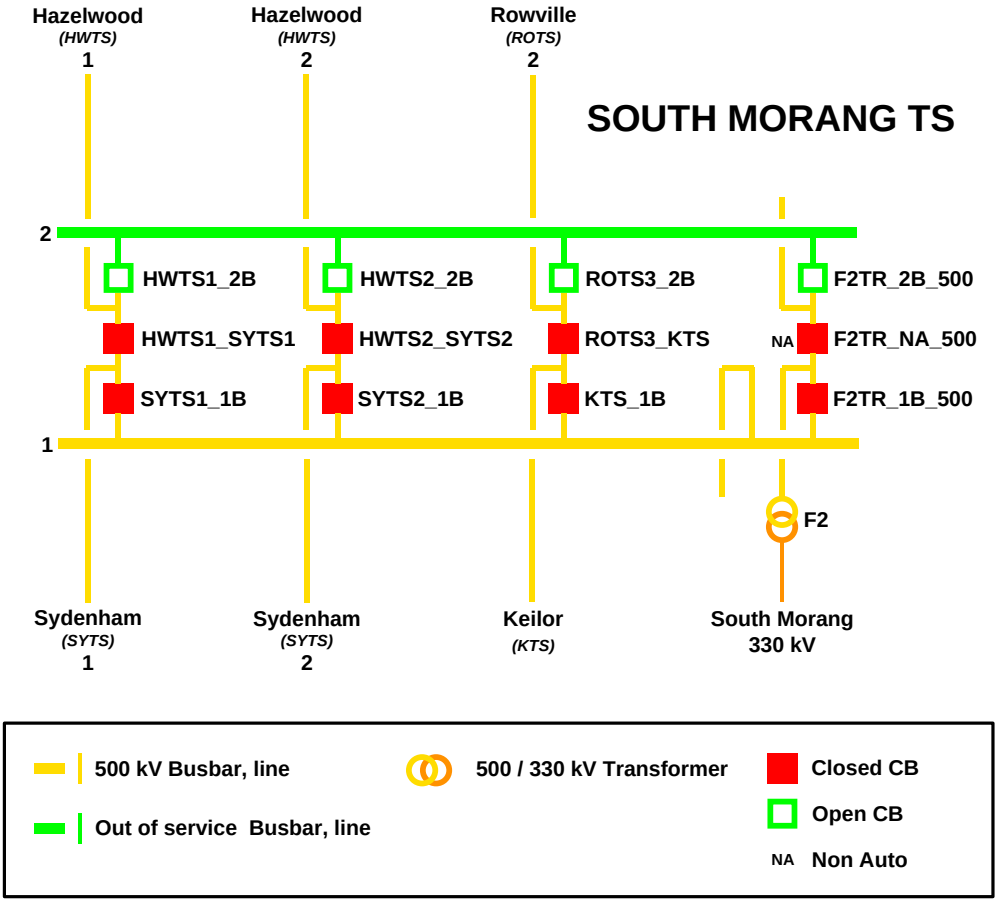
The sequence of events comprising the incident are itemised in Table 1. The incident spanned approximately four hours and 45 minutes from the SF6 Gas Density Protection System operating to the power system being returned to the pre-incident state.

The status of the power system immediately after the incident is shown in Figure 2. The diagram shows the out of service No. 2 500 kV Busbar and associated circuit breakers.

Table 1 – Event Log	
Time	**Event**
1 June 2013 0106 hrs	South Morang Terminal Station No. 2 500 kV Busbar SF6 Gas Density Protection operates

	• Circuit Breakers HWTS1_2B, HWTS2_2B, ROTS3_2B and F2TR_2B_500 open • South Morang No. 2 500 kV Busbar de-energised
1 June 2013 0120 hrs	Constraint set V-SMTS_BYPASS_HW_SY invoked
1 June 2013 0124 hrs	Market Notice 42518 issued. Notifies market of • Non credible contingency event • South Morang No. 2 500 kV Busbar tripped • Constraint set V-SMTS_BYPASS_HW_SY invoked
1 June 2013 0550 hrs	South Morang No. 2 500 kV Busbar returned to service
1 June 2013 0605 hrs	Market Notice 42520 issued. Notifies the market of • South Morang No. 2 500 kV Busbar returned to service • The casue of the non-credible contingency identified • AEMO satisfied that a reoccurance of the event unlikely • The event not to be reclassified as a credible contingency event • Constraint set V-SMTS_BYPASS_HY_SY revoked at 0605 hrs
1 June 2013 0605 hrs	Constraint set V-SMTS_BYPASS_HW_SY revoked
18 June 2013	No. 2 500 kV Busbar SF6 Gas Density Protection trip function for the Blue Phase of Bay E Zone returned to service

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



6 Immediate Actions

AEMO invoked constraint set V-SMTS_BYPASS_HW_SY approximately 15 minutes after No. 2 500 kV Busbar tripped. This action ensured that the power system was in a secure operating state. AEMO is required to return the power system to a secure state within thirty minutes following a contingency event.[4]

AEMO then issued Market Notice 42518 to notify the market of:

- A non-credible contingency event
- South Morang No. 2 500 kV Busbar tripped
- Constraint set V-SMTS_BYPASS_HW_SY invoked

AEMO issued Market Notice 42518 approximately 24 minutes after No. 2 500 kV Busbar tripped. AEMO is required to notify the market of a non-credible contingency event within two hours of the event[5].

SP AusNet dispatched First Response and Protection and Control Officers to South Terminal Station site to investigate the incident. No further unexpected power system events occurred at South Morang Terminal Station whilst No. 2 500 kV Busbar was out of serive.

7 Follow-up Actions

AEMO issued Market Notice 42520 at 0605 hrs following the return to service of No. 2 500 kV Busbar. This notice advised the market that:

- South Morang No. 2 500 kV Busbar had been returned to service
- The cause of the non-credible contingency had been identified
- The trip of No.2 500 kV Busbar at South Morang Terminal Station was not re-classified as a credible contingency

AEMO is required to assess whether or not to reclassify a non credible contingency event as a credible contingency[6] and to report how re-classification criteria were applied[7]. AEMO has to determine if the condition that caused the non-credible contingency event has been resolved.

AEMO did not reclassify the trip of the busbar to a credible contingency because the cause of the trip had been identified and that the cause of the trip was unlikely to reoccur. AEMO was satisfied that SP AusNet had identified the cause of the false trip condition and had taken remedial measures to minimise the risk of a reoccurrence.

8 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 state[8]. AEMO must thereby ensure that the power system is maintained in, or returned to, a secure operating state following a contingency event.

AEMO invoked constraint set V-SMTS_BYPASS_HW_SY to ensure the power system was in a secure operating state. This constraint set manages system stability in the event of a further credible contingency involving a 500 kV transmission line connected to South Morang Terminal Station.

Constraint set V-SMTS_BYPASS_HW_SY is required when a 500 kV busbar is out of service at South Morang Terminal Station. The constraint set remained invoked for the period while No. 2 500 kV Busbar at South Morang Terminal Station was out of service.

[4] *NER* v 55 Clause 4.2.6 (b)
[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)

9 Conclusions

AEMO and SP AusNet correctly discharged their power system security obligations following the non-credible contingency event. Power system security was maintained throughout the course of the incident.

10 Recommendations

There are no recommendations arising from this incident.