POWER SYSTEM OPERATING INCIDENT REPORT – TRIP OF SYDNEY WEST 132 KV B BUSBAR ON 28 MARCH 2012

PREPARED BY: System Capability

DATE: 26 July 2012

FINAL

Disclaimer

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Abbreviations and Symbols

Abbreviation	Term
CB	Circuit Breaker
kV	Kilovolt
MW	Megawatt
SCADA	Supervisory Control and Data Acquisition
SVC	Static VAr Compensator

1 Introduction

At 1711 hrs on 28 March 2012, the 132 kV B busbar at Sydney West substation in New South Wales tripped following the explosive failure of the 132 kV B bus section circuit breaker (CB) 4112. At the time of the incident, section 2 of the 132 kV A busbar at Sydney West was out of service for planned maintenance. The bus section circuit breaker failure resulted in the interruption of approximately 80-90 MW of customer load supplied from the Mt Druitt and Mamre 132 kV substations.

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 TransGrid. Data from AEMO's Energy Management System and Electricity Market Management System 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).

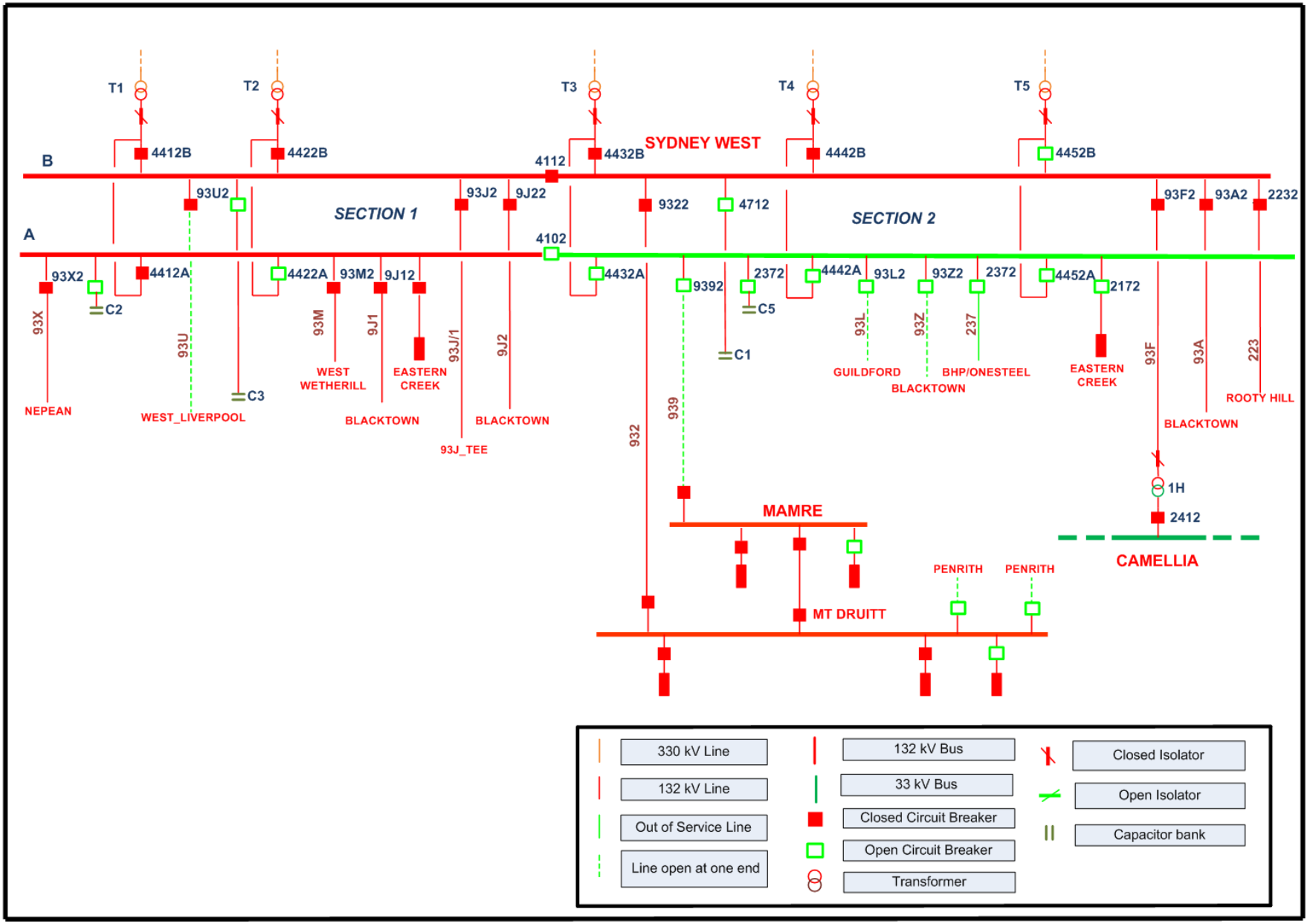
2 Pre-Contingent System Conditions

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.

Prior to the incident, section 2 of the Sydney West 132 kV A busbar was out of service for planned maintenance, off-loading the 939 Mamre, 93L Guildford, 93Z Blacktown, 237 BHP/Onesteel and 217 Eastern Creek 132 kV feeders and leaving the Mt Druitt and Mamre 132 kV substations being radially supplied.

The T5 330/132 kV transformer at Sydney West was also off-loaded.

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



3 Summary of Events

At 1711 hrs on 28 March 2012, sections 1 and 2 of the 132kV B busbar at Sydney West tripped on operation of busbar protection following the explosive failure of the bus section CB 4112.

The busbar trip resulted in:

- disconnection of the Sydney West T1, T2, T3 and T4 330/132 kV transformers from the B busbar with only the T1 transformer remaining on load, supplying section 1 of the A busbar
- off-loading of the 93J/1 Wetherill Park tee Granville, 9J2 Blacktown, 93A Blacktown, 932 Mount Druitt, 93F Camellia and 223 Rooty Hill 132 kV feeders

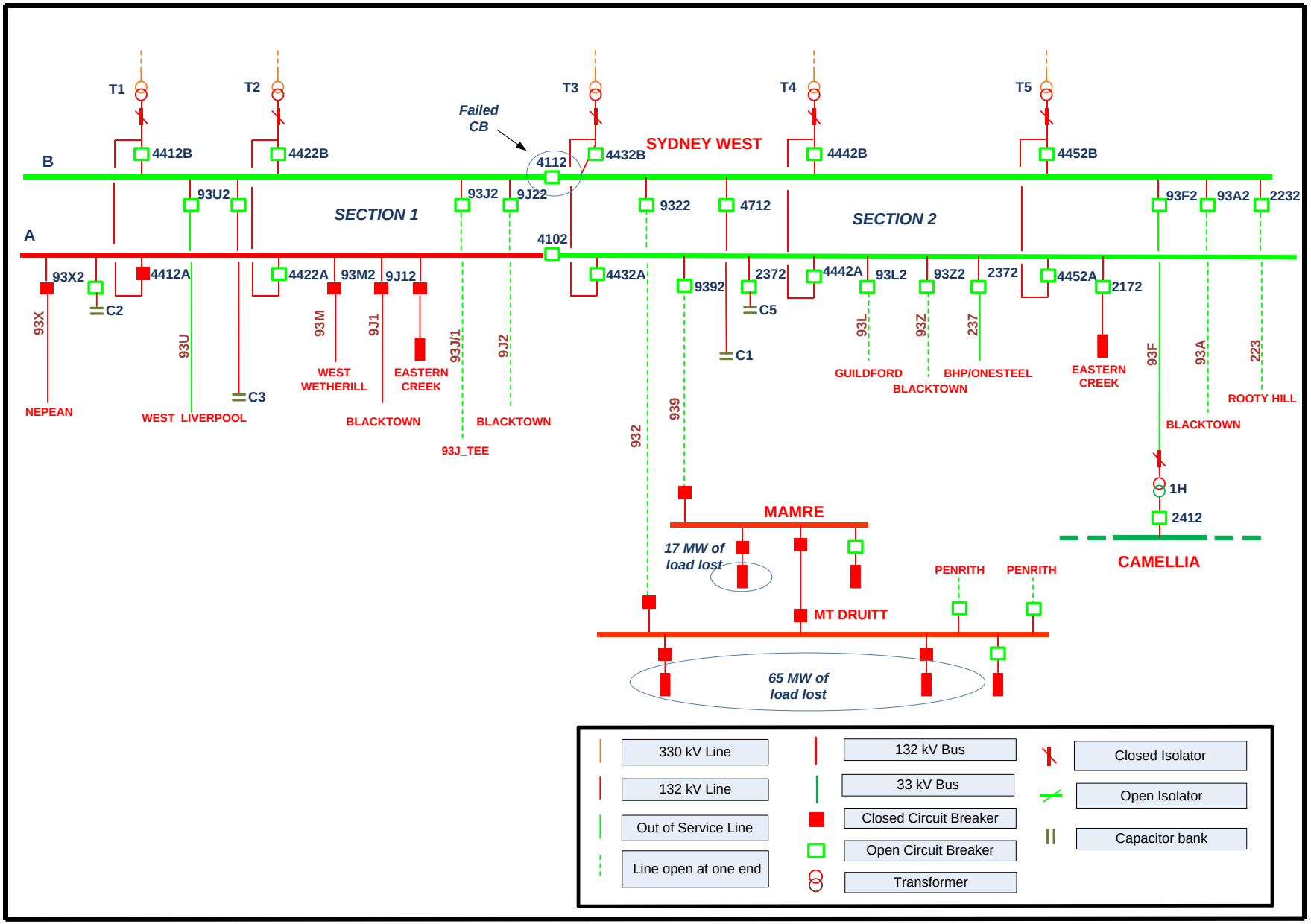
The T1 transformer exceeded its continuous rating, but remained within its short time rating.

Remote protection at Camellia 132 kV substation also operated to open CB 2412 at Camellia, disconnecting the 93F line.

Refer to Figure 2 for the status of the power system immediately after the incident.

Because the Mt Druitt and Mamre 132 kV substations were radially supplied prior to the incident, the busbar trip resulted in the interruption of approximately 80-90 MW of customer load supplied from those substations. A further reduction of approximately 70-80 MW of load was also observed, believed to have been caused by the operation of internal protection systems of customers.

Figure 2 - Status of the power system immediately after the failure of the bus section CB 4112



4 Immediate Actions Taken

TransGrid reconfigured the network to restore the interrupted load, as follows:

- At 1720 hrs TransGrid closed the T3 transformer CB 4432A, returning section 2 of the A busbar to service ahead of schedule
- At 1721 hrs TransGrid closed CB 4442A, placing the T4 transformer on load
- At 1724 hrs the 132 kV A bus section CB 4102 was closed, allowing the T3 and T4 transformers to supply loads connected to A busbar section 1[1]
- At 1728 hrs CB 9392 was closed, returning the 939 Mamre 132 kV feeder to service and restoring supply to the Mt Druitt and Mamre substations

By 1737 hrs, 26 minutes after the incident, all interrupted customer load was restored.

After restoration of the load, TransGrid did further switching to manage loadings:

- At 1733 hrs the T5 transformer was returned to service
- At 1735 hrs the 93Z Blacktown 132 kV feeder was energised from Sydney West, reducing the loading on the 9J1 Blacktown 132 kV feeder
- At 1743 hrs CB 93L2 was closed, re-energising the 93L Guildford 132 kV feeder[2]
- At 1758 hrs CB 2372 was closed, re-energising the 237 Onesteel/BHP 132 kV feeder[3]
- At 1846 hrs the Eastern Creek load was restored ahead of schedule

At 1732 hrs, AEMO issued Electricity Market Notice No. 38509 advising of the outage of a 132 kV busbar at Sydney West substation with approximately 160 MW of load lost.

At 2049 hrs AEMO issued Electricity Market Notice No.38510 advising of the occurrence of this non-credible contingency event. AEMO advised that this non-credible contingency event would not be re-classified as credible as it was unlikely to reoccur. The market notice also advised the loss of approximately 230 MW of load. TransGrid later clarified that the 230 MW value advised to AEMO was the total reduction in load on the Sydney West transformers immediately following the incident, not the lesser value of the actual customer load interrupted of approximately 80-90 MW.

At 0114 hrs on 29 March 2012, section 1 of the Sydney West B 132 kV busbar tripped whilst TransGrid were attempting to re-energise the bus section and return it to service. The trip of section 1 of the Sydney West B 132 kV busbar also tripped the T1 transformer which provides auxiliary supply to the No. 1 330 kV SVC (not shown in Figure 1 or 2). Consequently the No. 1 330 kV SVC tripped (CB 5V12 opened) due to the loss of its auxiliary supply. A latched input on the 132 kV B busbar section 1 protection (which had operated on the previous busbar trip) was identified as the cause of this spurious trip.

At 0334 hrs, after TransGrid staff manually reset the latched input, section 1 of the 132 kV B busbar and the T1 and T2 transformers were successfully returned to service. Shortly after, section 2 of the 132 kV B busbar was successfully returned to service.

At 0422 hrs the No. 1 330 kV SVC was returned to service.

[1] Prior to this, there was no load on section 2 of the A busbar as it was already out of service
[2] Prior to this, with section 2 of the A busbar out of service, Guildford was being supplied via the 132 kV network
[3] Prior to this, with section 2 of the A busbar out of service, Onesteel/BHP was being supplied via Blacktown

5 Follow-up Actions

The failed CB 4112 remained out of service until 1733 hrs on 22 April 2012 when it was returned to service.

A TransGrid investigation into the cause of the CB failure is still in progress. Based on the first phase of this investigation TransGrid believes the cause of the CB failure to be the result of insufficient mechanical damping of the CB operating mechanism. TransGrid has identified the population of CB's of the same type and has assessed them through site inspection, review of maintenance records and number of operations. TransGrid is currently developing a longer term strategy for managing this issue for the affected CB population.

6 Power System Security Assessment

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.

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

AEMO correctly applied the criteria published in section 12 of its Power System Security Guidelines in assessing that the circumstances of this incident did not warrant reclassifying similar incidents as a credible contingency event because the failed CB remained out of service until it was replaced.

7 Conclusions

At 1711 hrs on 28 March 2012, the 132 kV B busbar at Sydney West tripped due to the failure of the 132 kV B bus section CB 4112, resulting in the interruption of approximately 80-90 MW of customer load supplied from the Mt Druitt and Mamre substations.

AEMO is satisfied that TransGrid's response to the incident was adequate and the appropriate work has been undertaken to mitigate the risk of a similar incident occurring in the future.

8 Recommendations

TransGrid will inform AEMO of the progress in developing a longer term strategy for managing the issue for the affected CB population, by the end of August 2012.