POWER SYSTEM OPERATING INCIDENT REPORT
TRIP OF NEWCASTLE 330 KV 'A' BUSBAR SECTION 1 ON 27 JULY 2011

PREPARED BY: Electricity System Operations Planning and Performance

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FINAL

Disclaimer

Purpose

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Abbreviations and Symbols

Abbreviation	Term
AEMO	Australian Energy Market Operator Ltd
CB	circuit rreaker
kV	kilovolt
MW	megawatt
MWh	megawatt hour
NEM	National Electricity Market
NER	National Electricity Rules

1 Introduction

At 1043 hrs on 27 July 2011 the No. 1 330/132 kV transformer, the 330kV 'A' busbar section 1, and the 92 Newcastle—Vales Point 330 kV transmission line (92 line) tripped at Newcastle substation in New South Wales due to a fault on secondary equipment. No customer load was interrupted as a result of this incident. There was no high voltage fault present on the network at the time of this event.

This report has been prepared under clause 4.8.15 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 have also been used in analysing the incident.

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

2 Pre-Contingent System Conditions

Prior to the incident, the No. 3 330/132 kV transformer was out of service for maintenance. The status of the power system prior to the incident is shown in **Error! Not a valid bookmark self-reference.**. For clarity only equipment relevant to this incident has been included in the diagram.

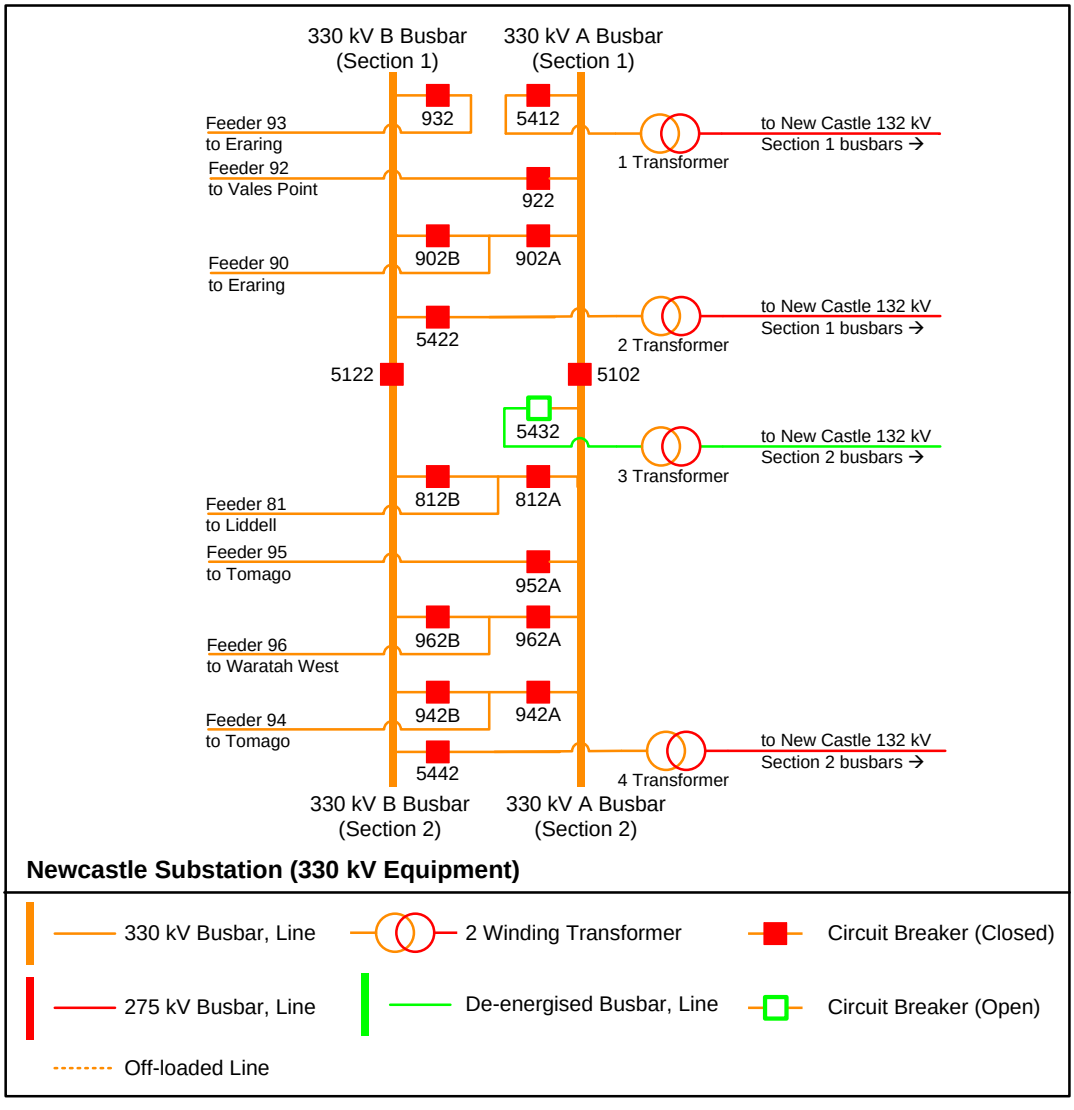

Figure 1 – Status of the power system prior to the incident

3 Summary of Events

At 1043 hrs on 27 July 2011 the No. 1 330/132 kV transformer at Newcastle substation tripped on the operation of the transformer's differential protection[1]. The operation of the differential protection was triggered by a fault on a current transformer secondary cable causing a current injection to the differential protection relay. This protection operation opened the circuit breakers directly connected to the No. 1 330/132 kV transformer. Because the fault on the current transformer cabling continued to inject current to the differential protection system after a signal had been given to open the circuit breaker, the circuit breaker fail protection[2] correctly operated to trip the 330 kV 'A' busbar section 1. This operation also off-loaded the 92 line because it is single switched to the busbar. The 92 line remained energised from Vales Point.

The status of the Newcastle 330 kV equipment immediately after the incident is shown in Figure 2.

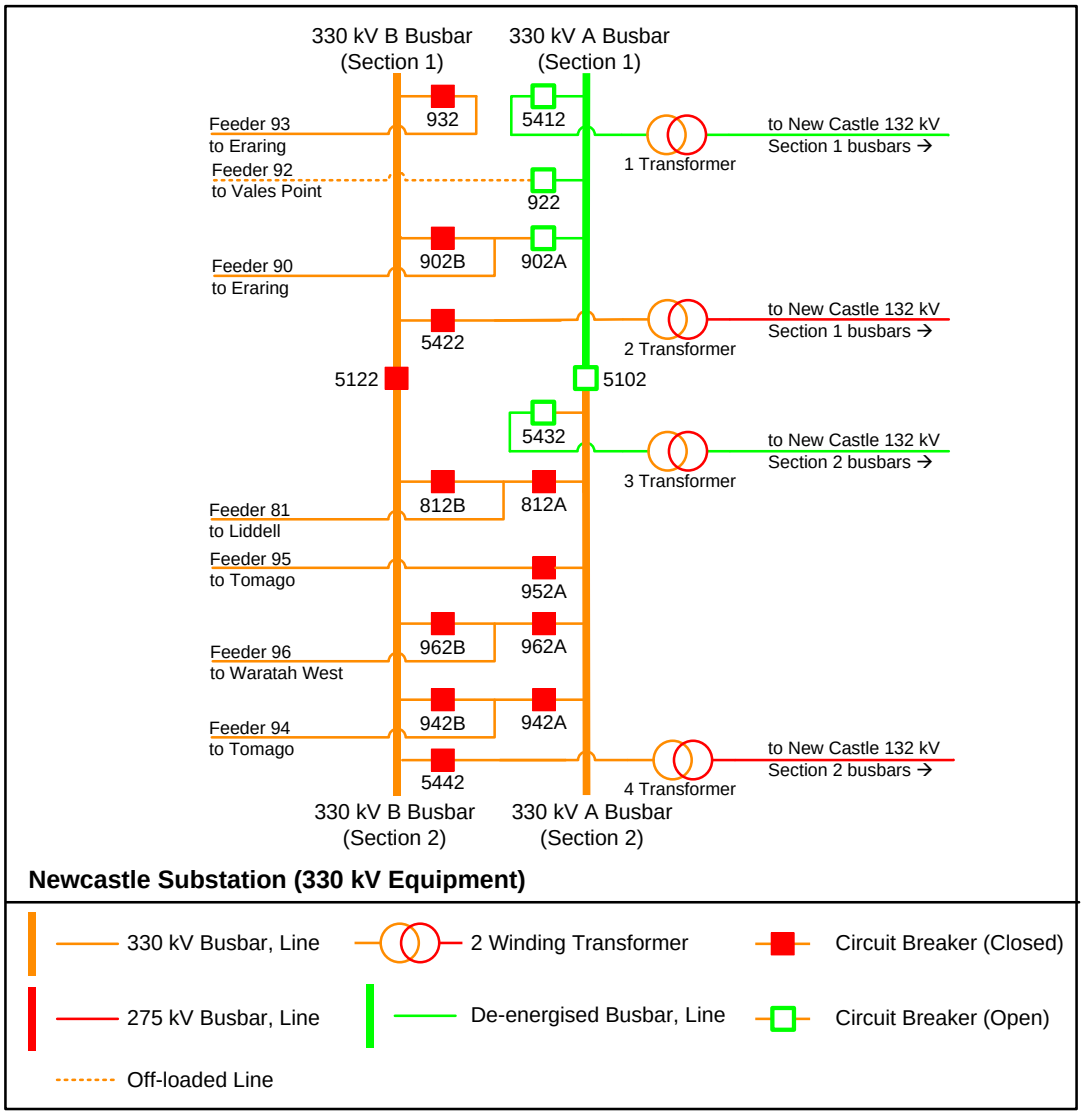

Figure 2 - Status of the power system immediately after the incident

[1] Transformer differential protection systems are designed to detect a fault in a transformer by comparing the current flows on each side of the transformer and taking the turns ratio into account.

[2] Circuit breaker fail protection is designed to provide local back up when the primary circuit breaker fails to clear a fault.

4 Immediate Actions Taken

Following the incident, AEMO determined that the power system remained in a secure operating state. No constraint sets were required for the equipment that was out of service.

At 1157 hrs the busbar was returned to service and the 92 line was placed on load.

At 1317 hrs AEMO issued market notice 35707 advising the occurance of this non-credible contingency event involving the busbar, transformer and the 92 line. The non-credible contingency event was not reclassified as being credible. This was because the No. 1 330/132 kV transformer remained switched out pending further investigation and TransGrid advised that the protection issue had been resolved.

5 Follow-up Actions

Investigations by TransGrid determined that the cause of the incident was a fault on a current transformer secondary cable associated with the differential protection of the transformer. This fault triggered the operation of the differential protection which tripped the transformer. Because the fault current injection continued to the differential protection, the circuit breaker fail protection operated to trip the busbar and off-load the 92 line. The faulted element was replaced, the protection was tested and the transformer was returned to service at 1808 hrs on 28 July 2011.

6 Conclusions

In relation to the reviewable operating incident at 1043 hrs on 27 July 2011 at Newcastle, AEMO concludes:

- The non-credible contingency was caused by operation of CB failure protection on the transformer due to a low-voltage fault on secondary equipment associated with the transformer.
- Although there was no high-voltage fault, the CB fail protection is adequate and responded correctly.
- There was no power system security violation as a result of the incident.
- TransGrid carried out the appropriate work in a timely manner to mitigate the risk of a similar incident occurring in the future.
- For this incident, AEMO did not reclassify the event as being credible based on advice from TransGrid that the protection issue had been resolved by leaving the No. 1 330/132 kV transformer switched out.

7 Recommendations

There are no recommendations arising from this incident.