POWER SYSTEM OPERATING INCIDENT REPORT
TRIP OF MULTIPLE TRANSMISSION LINES ON 27 DECEMBER 2011

PREPARED BY: Electricity System Operations Planning and Performance

DATE: 18 April 2012

FINAL

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Abbreviations and Symbols

Abbreviation	Term
CB	Circuit Breaker
kV	Kilovolt

1 Introduction

At 1413 hrs on 27 December 2011, the Kareeya–Tully 7135 and 7253 132 kV lines simultaneously tripped out of service. No generation or customer load was interrupted as a result of the incident. An electrical storm existed in the geographical area of the lines at the time of the incident.

This report has been prepared under clause 4.8.15 (c) of the National Electricity Rules 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 Powerlink. Data from AEMO's Energy Management System and Electricity Market Management System has also been used in analysing the incident.

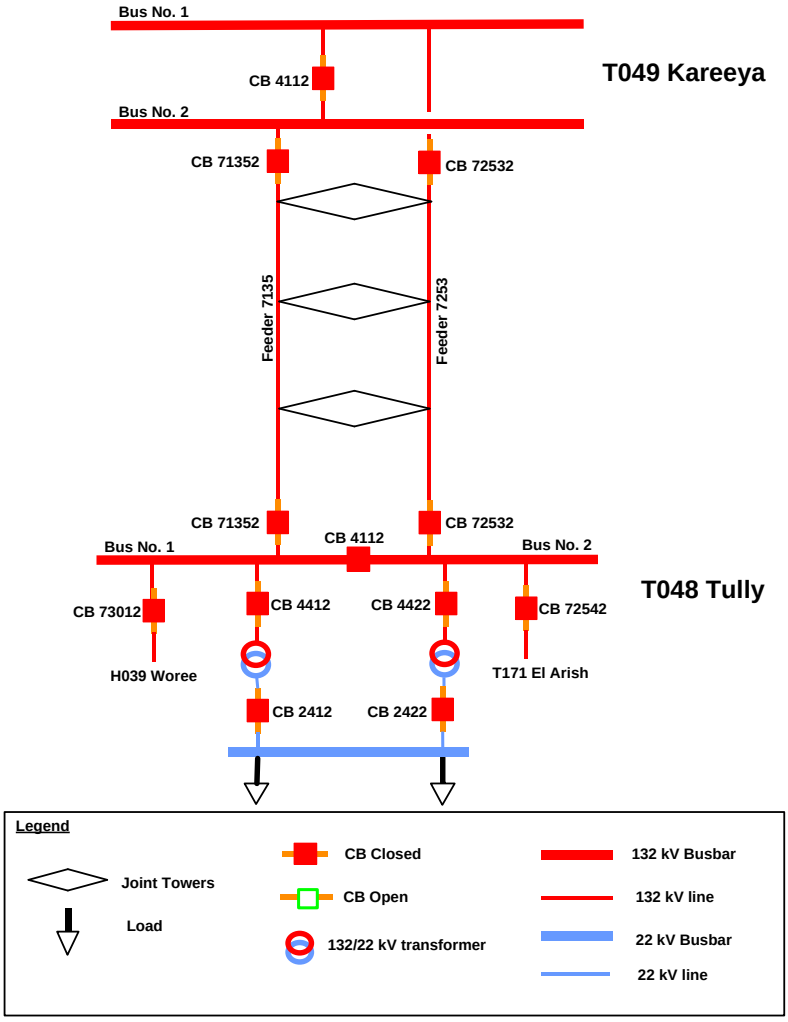
All references to time in this report are to National Electricity Market time (Australian Eastern Standard Time).

2 Pre-Contingent System Conditions

The 7135 and 7253 Kareeya–Tully 132 kV lines are double circuit lines that share common towers along their route length.

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.

Figure 1 – Network topology prior to the incident



3 Summary of Events

At a time of lightning activity on 27 December 2011, simultaneous high voltage faults occurred on the 7135 and 7253 Kareeya–Tully 132 kV parallel lines. The high voltage faults occurred at the time of an electrical storm in the area of the lines. The faults on both lines were successfully cleared by the operation of their respective distance protection systems. However, neither line auto-reclosed. The 7253 line did not auto-reclose because auto-reclose on the line was disabled due to maintenance work. For the 7135 line auto-reclose was initiated, but due to a fault in the auto-reclose relay at Kareeya, the line remained de-energised.

Line 7253 was returned to service at 1531 hrs.

Line 7135 was returned to service at 2144 hrs after personnel attended Kareeya to investigate controls of CB 71352.

Line 7135 was taken out of service at 2212 hrs to investigate why CB 71352 at Kareeya could not be manually closed earlier. The line was returned to service at 2220 hrs.

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

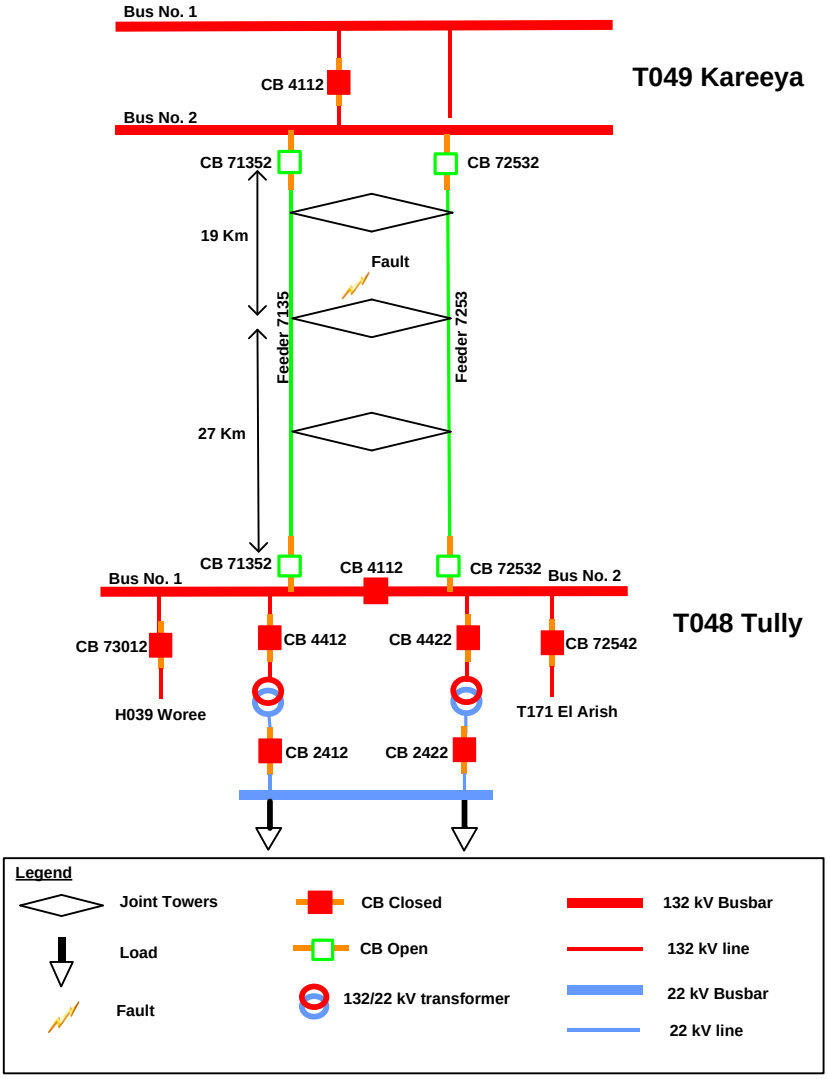
Table 1: Summary of events

Time	Operation	Comment
14:13.17.405	CB 71352 open at Tully	7135 line de-energised.
14:13:17.420	CB 71352 open at Kareeya	
14:13:17.423	CB 72532 open at Tully	7253 line de-energised.
14:13:17.433	CB 72532 open at Kareeya	
15:31:40	CB 72532 at Tully and Kareeya manually closed.	7253 line returned to service.
21:44:00	CB 71352 at Tully and Kareeya manually closed.	7135 line returned to service.

Powerlink's incident report confirmed the high voltage faults occurred immediately following a lightning strike as recorded by the Lightning Tracker System. The line protection systems indicated the faults occurred at similar locations on both lines. The fault location was determined to be 27 km from Tully substation and 19 km from Kareeya substation. The fault location calculated by the protection relays was consistent with the location of the lightning strike as recorded by the Lightning Tracker System.

The status of the power system immediately after the incident is shown in Figure 2.

Figure 2 – Network topology following the incident



4 Immediate Actions Taken

At 1527 hrs AEMO issued Market Notice No.37158 to advise of this incident as a non credible contingency event. In accordance with its operating procedure SO_OP 3715 Power System Security Guidelines[1], AEMO categorised the 7135 and 7253 132 kV parallel lines as vulnerable lines identifying the simultaneous trip of both lines to be a probable event.

5 Follow-up Actions

Subsequent line patrol conducted by Powerlink of the 7135 and 7253 lines identified evidence of flash over of insulators in the area of the lightning strike.

Powerlink confirmed that 7135 line did not auto-reclose due to a fault with the auto-reclose relay at Kareeya. Powerlink has replaced the auto-reclose relay to mitigate the risk of similar incidents occurring in future.

[1] Clause 4.2.3B of the NER requires that AEMO establish criteria to use when considering whether a non-credible contingency event is reasonably possible. This is published in AEMO operating procedure SO_OP3715 Power System Security Guidelines, which is available at: http://www.aemo.com.au/electricityops/3715.html

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 through-out the incident.

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

7 Conclusions

At 1413 hrs on 27 December 2011, the Kareeya–Tully 7135 and 7253 132 kV lines tripped on protection operation to clear high voltage faults due to lightning strikes. An electrical storm existed in the area of the lines at the time of the incident.

The facilities provided to manage the high voltage faults on the Kareeya–Tully 7135 and 7253 132 kV lines were adequate for the conditions experienced at the time.

However, AEMO concludes that the auto-reclose relay at Kareeya that prevented auto-reclose of the 7135 line is the principal cause for this simultaneous trip incident. AEMO is satisfied that Powerlink carried out the appropriate work to mitigate the risk of a similar incident occurring in the future.

AEMO correctly applied the criteria published in Section 12 of its Power System Security Guidelines in categorising the 7135 and 7253 132 kV parallel lines as vulnerable lines.

8 Recommendations

There are no recommendations arising from this incident.