POWER SYSTEM INCIDENT REPORT TRIP OF MACKAY 'C' 132 KV BUSBAR ON 12 FEBRUARY 2010

PREPARED BY: Electricity System Operations Planning and Performance

FINAL

1 Introduction

At 08:53 hrs on 12 February 2010, T38 Mackay 'C' 132 kV busbar tripped due to the operation of protection systems during planned in service work on 415 volt equipment by Ergon Energy at T38 Mackay substation. There were no injuries to staff, loss of load or loss of generation during this incident.

This report has been prepared under clause 4.8.15 of the National Electricity Rules to assess the adequacy of the provision and response of facilities & 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 has also been used in analysing the event.

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

2 Pre-Contingent System Conditions

The T38 Mackay 132 kV substation consists of a ring busbar configuration. At the time of the event the 132 kV busbars were setup in a split ring configuration. The Mackay Gas Turbine was not in service during the event.

Figure 1 shows the statuses of relevant circuit breakers at T38 Mackay substation prior to the event.

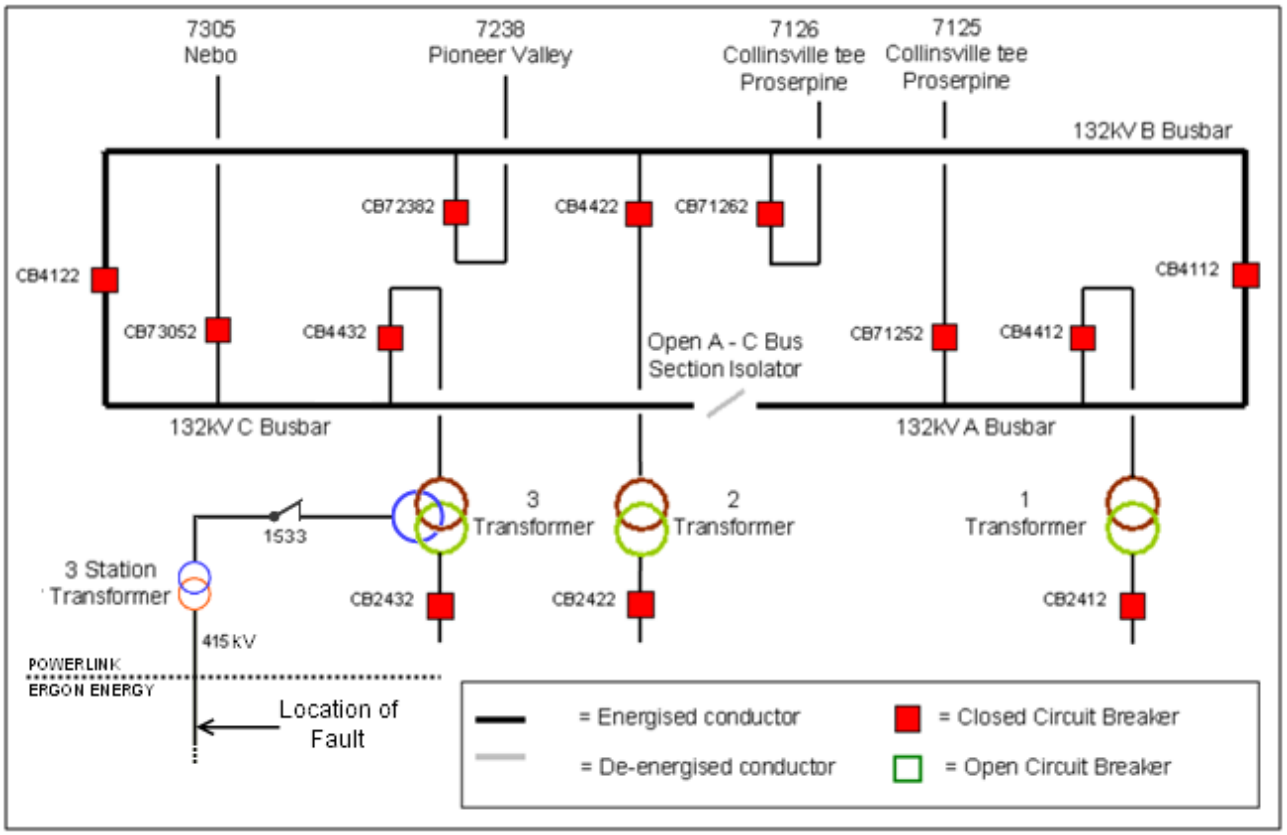

Figure 1: Status of relevant T38 Mackay substation circuit breakers prior to the event

3 Summary of Events

At 08:53:46 hrs, the T38 132/33kV 3 Transformer tripped due to the operation of a transformer protection system during in service work on 415 volt equipment at T38 Mackay substation. The transformer protection system tripped the following circuit breakers at Mackay substation:

- No. 3 transformer 132 kV circuit breaker 4432
- No. 3 transformer 33 kV circuit breaker 2432

Due to an electrical fault within a relay, circuit breaker 4432 did not open within the required time, which caused the operation of a circuit breaker fail protection scheme to trip the 132kV 'C' busbar by opening the following circuit breakers:

- 132 kV "B" – 'C' busbar section circuit breaker 4122
- Mackay to Nebo (7305) 132 kV line circuit breaker 73052

The operation of these circuit breakers resulted in the off-loading of the Mackay to Nebo (7305) 132 kV line. At 09:07 hrs, an attempt to close the CB 73052 at Mackay to place Mackay to Nebo (7305) line failed because the manual resetting of a relay at Mackay was required.

At 09:40 hrs, Mackay 'C' 132 kV busbar was re-energised and feeder 7305 was returned to service. By 09:42 hrs, the T38 132/33kV 3 Transformer was re-energised and placed on load.

Figure 2 shows the status of the relevant circuit breakers after the 'C' busbar trip.

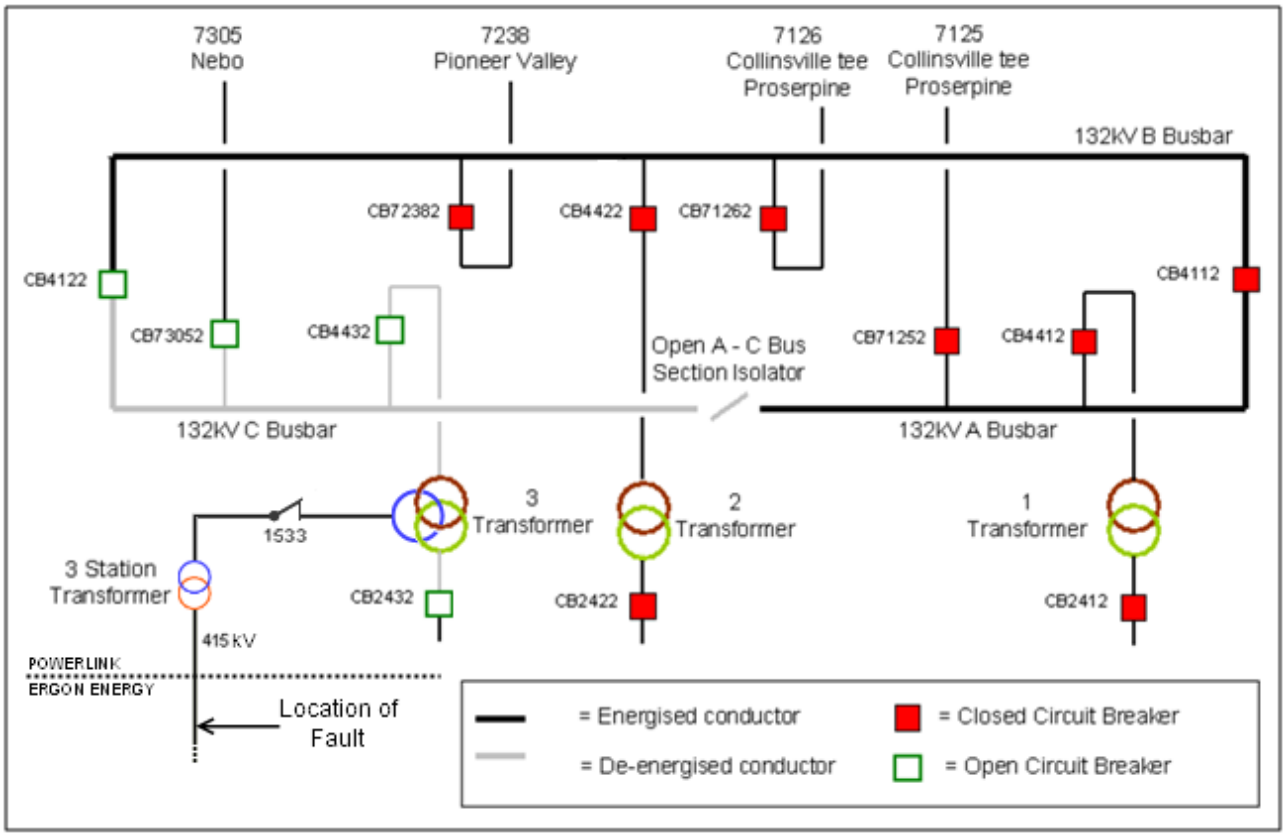

Figure 2: Status of relevant T38 Mackay substation circuit breaker after the busbar trip

4 Power System Security Assessment

T38 Mackay 132/33 kV 3 transformer is protected using a duplicate transformer protection system. The circuit breaker failure protection systems are also in place at T38 Mackay.

The trip of Mackay 132/33 kV 3 transformer occurred on the operation of the transformer protection system. This protection system was triggered due to a phase to ground fault on the 415 volt network supplied by the 11 kV tertiary winding of the transformer. The Mackay 'C' 132 kV busbar then tripped due to the subsequent operation of the circuit breaker fail system when circuit breaker 4432 did not open within the required time.

After the busbar trip, contingency analysis identified a system security issue with the loss of the Mackay to Pioneer Valley line or either of the two remaining 132/33 kV transformers at Mackay substation. At 09:07 hrs, an attempt to place transmission line 7305 line on load failed. This was because manual resetting of relay at Mackay was required.

In response to the system security issues identified, at 09:23 hrs Ergon Energy armed an under voltage scheme, which gradually sheds T38 Mackay 33 kV loads at voltages below 114 kV. As a backup to this scheme, Powerlink armed an under voltage load shedding scheme which operates below 112 kV and sheds all Mackay load. At 09:23, the system was considered secure with these schemes armed.

The under voltage load shedding schemes were disarmed when all equipment was returned to service at 09:42 hrs.

There was no loss of load or generation as a result of this incident. The power system frequency and voltage remained within the normal operating frequency and voltage band during the event.

5 Immediate Actions

Immediately after the event, Powerlink undertook an investigation of the event and found that there were no high voltage power system faults at the time of this incident. Powerlink established that the instigating cause of the protection operation was a phase to ground fault took place on the 415 volt conductors supplied by Mackay 132/33 kV 3 transformer at the time.

6 Follow-up Action

A fault in the tripping relay associated with the No.3 transformer protection system caused the delayed opening of 132 kV circuit breaker 4432. This triggered the circuit breaker fail protection to trip the 'C' busbar. The faulty tripping relay has since been replaced.

AEMO was satisfied that the event did not require reclassification of the loss of T38 Mackay 'C' 132 kV busbar as a credible contingency event.

At 11:11 hrs, AEMO control room issued a market notice 30331, advising the occurrence of this incident.

7 Conclusion

The trip of Mackay 'C' 132 kV busbar can be attributed to an operation of the circuit breaker fail protection, which occurred when a 132 kV circuit breaker did not open within the required time upon operation of the transformer protection system. The transformer protection system was triggered by a phase to ground fault on the 415 volt equipment at T38 Mackay substation. The tripping relay which led to the slow operation of the circuit breaker has been replaced.

8 Recommendations

Nil