POWER SYSTEM OPERATING INCIDENT REPORT
TRIP OF MULLUMBIMBY 132 KV BUSBAR AND MULTIPLE TRANSMISSION LINES ON 13 MARCH 2011

PREPARED BY: Electricity System Operations Planning and Performance

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FINAL

Version Release History

VERSION	DATE	BY	CHANGES
1.0	27/06/2011	Elijah Pack	Initial document.
2.0	09/08/2011	Elijah Pack	Clarification has been added to the details of how the re-classification criteria published under NER clause 4.2.3B was assessed and applied in the context of this non-credible contingency event required under clause 4.8.15(ca) of the NER. Refer to section 4 of this document.

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Abbreviations and Symbols

Abbreviation	Term
AEMO	Australian Energy Market Operator Ltd
CB	Circuit Breaker
DC	Direct Current
EST	Eastern Standard Time
kV	kilovolt
MW	megawatt
MWh	megawatt hour (also MW·h)
NEM	National Electricity Market
NER	National Electricity Rules

1 Introduction

At 1224 hrs on 13 March 2011, the 132 kV busbar at Mullumbimby substation in New South Wales tripped. Vegetation in the substation's filter yard caused a one phase to ground fault on the busbar during heavy rainfall. All three Directlink cables were off-loaded as a result of the protection operation that cleared the fault. No customer load was interrupted as a result of this incident.

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 Australian Pipeline Trust (APA Group) and Essential Energy. Data from AEMO's Energy Management System has 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

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, all circuit breakers and transmission elements at Mullumbimby were operating in their normal state. The TX2 transformer is normally switched out of service. The Directlink cables were transferring approximately 20 MW from Bungalora to Mullumbimby.

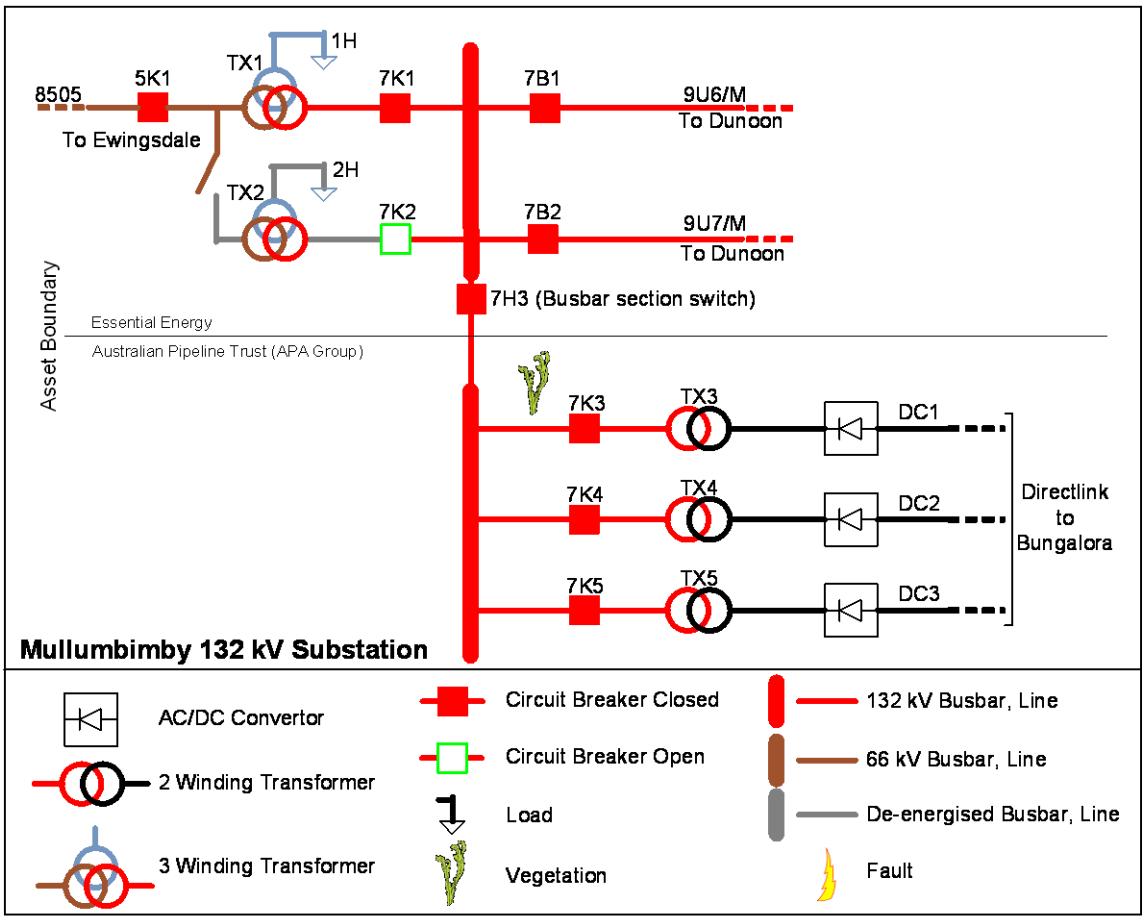

Figure 1 – Status of the power system prior to the incident

3 Summary of Events

At 1224 hrs on 13 March 2011, the vegetation in the filter yard of Mullumbimby substation caused a one phase to ground fault on the busbar during a period of heavy rain. The fault occurred near the 7K3 circuit breaker as shown in Figure 2 below. A protection operation cleared the fault by opening circuit breakers 7K1, 7K2, 7K4, 7K5, 7B1 and 7B2, de-energising the Mullumbimby 132 kV busbar. One phase of circuit breaker 7K3 failed to open, but the fault was isolated from the system because the DC1 converter valves blocked when the fault occurred, so energy could not be transferred over the DC link at this time.

The busbar section switch 7H3 currently has no protection or control functions, so it remained closed.

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

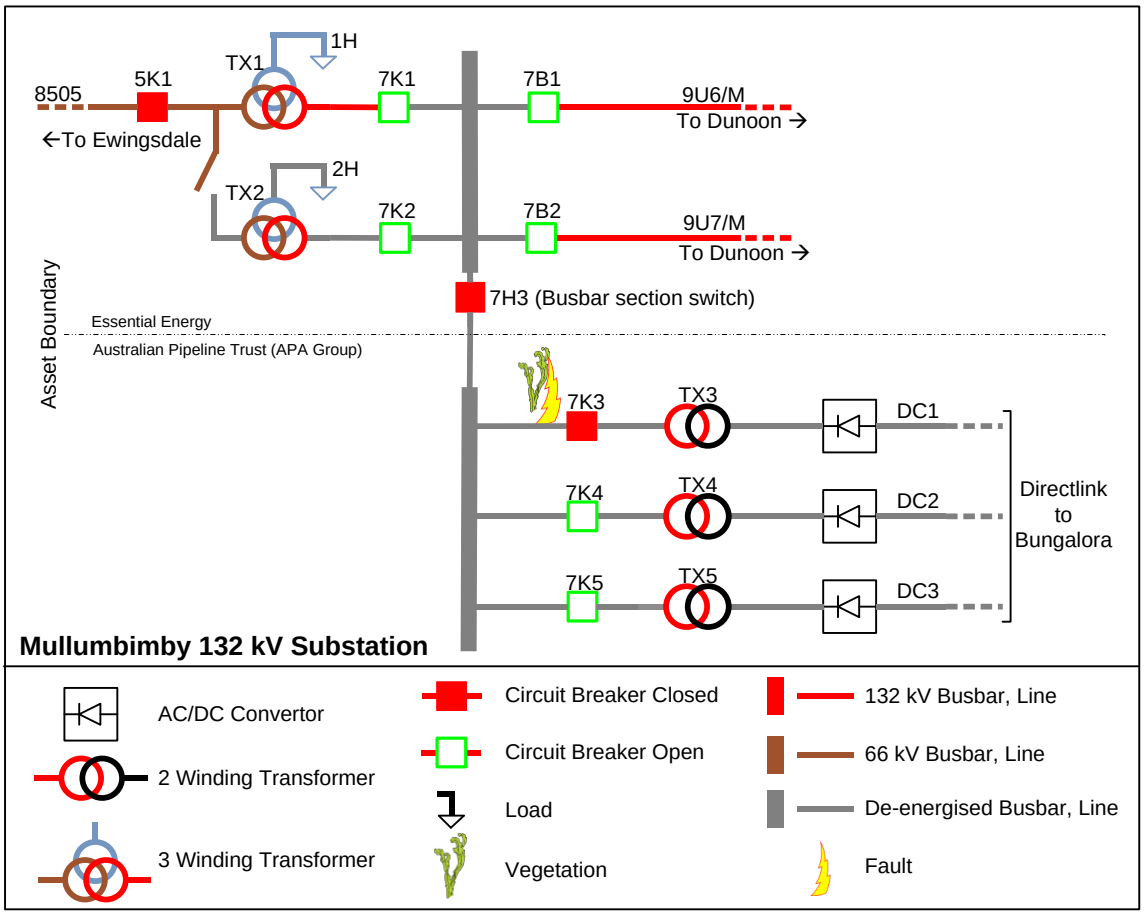

Figure 2 - Status of the power system immediately after the incident

At 1616 hrs, busbar section switch 7H3 was opened so that the 9U6/M and 9U7/M Mullumbimby–Dunoon 132 kV lines and the TX1 transformer could be returned to service.

After an assessment of the cause and condition of all equipment was complete, DC cables DC2 and DC3 of Directlink were returned to service at 19:31:55 and 19:34:16 respectively on 13 March 2011. Cable DC1 was not returned to service at this time because circuit breaker 7K3 was removed from service after a fault in the operating mechanism was identified.

4 Immediate Actions Taken

At 1238 hrs, AEMO control room issued market notice 34803, advising that there was an unplanned outage of Directlink.

At 1245 hrs, AEMO advised Essential Energy that the 8504 Ballina–Lennox Head 66 kV line appeared to be overloaded. Essential Energy gave consideration to the operating conditions on the day and informed AEMO of a revised rating for the line. The loading on the line was below the revised rating for this line.

At 1324 hrs, AEMO control room issued market notice 34804, advising which equipment at Mullumbimby tripped out of service (see section 3).

At 1625 hrs, after the busbar section switch 7H3 was opened and the TX1 transformer and the Mullumbimby–Dunoon lines were returned to service, the constraint set to manage the outage of these lines was revoked.

At 1704 hrs, AEMO issued market notice 34808, advising that the Mullumbimby busbar had been returned to service at 1616 hrs, that the faulted element remained out of service and that the event would not be reclassified as a credible contingency. This was because the faulted section affected by the vegetation clearance issue was isolated prior to the remainder of the substation being returned to service and that this immediate issue was then addressed before the faulted section was later returned to service.

5 Follow-up Actions

The circuit breaker 7K3 at Mullumbimby failed to open on one phase when the protection system operated to clear the fault. Australian Pipeline Trust (APA Group) has advised that the circuit breaker failed to operate because of a fault in the operating mechanism, which was not related to the fault on this date. The operating mechanism was repaired and the DC1 cable was returned to service on 28 March 2011.

Work is planned to be completed by January 2012 that will incorporate busbar section switch 7H3 into the protection schemes so that a similar fault will split the Mullumbimby busbar, leaving other Essential Energy assets at Mullumbimby in service.

6 Power System Security Assessment

The constraint set for the outage of all three DC cables of Directlink was invoked from 1230 hrs. At 1235 hrs, the relevant constraint set to manage the outage of the Mullumbimby–Dunoon lines was also invoked.

At 1940 hrs, after two Directlink DC cables were returned to service, the constraint set to manage the outage of all three cables was revoked and replaced with a constraint set to manage the outage of a single DC cable, which was to remain out of service for maintenance.

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.

7 Conclusions

At 1224 hrs on 13 March 2011, the Mullumbimby 132 kV busbar tripped when some vegetation in the filter yard of Mullumbimby substation caused a one phase to ground fault on the busbar at a time of heavy rain. The busbar was returned to service at 1616 hrs.

8 Recommendations

In light of this incident, APA Group will review their schedule for vegetation management adjacent to high voltage equipment. APA Group will inform the progress of this review to AEMO by the end of July 2011.