POWER SYSTEM INCIDENT REPORT

TRIP OF MORWELL TERMINAL STATION 66 KV NO. 1 BUSBAR AND MORWELL POWER STATION ON 28 NOVEMBER 2010

PREPARED BY: ESOPP

FINAL

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1. Introduction

At 18:33 hrs on 28 November 2010, the 66 kV No. 1 busbar at Morwell Terminal Station (MWTS) in Victoria (VIC) region tripped when the MWTS to Foster (FTR) 66kV line experienced a fault. As a consequence of the power system incident and the voltage disturbance caused by the line fault, all generating units in service at Morwell Power Station (PS) disconnected from the power system.

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 and services and the appropriateness of actions taken to restore and maintain power system security.

Information for this report has been obtained largely from SP AusNet, Energy Brix, AEMO's Market Management System (MMS) and Energy Management System (EMS).

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

2. Summary of events

On Sunday 28 November 2010 at approximately 18:33 hrs, there was a white phase to earth fault on the MWTS to FTR 66 kV line. This single phase fault developed to a three phase fault before protection systems tripped the MWTS to FTR line at FTR. There was delayed clearance of the line fault at the MWTS end on the operation of relatively slow earth leakage protection, which has an in-built time delay of 3.8 seconds. The reasons for failure of the operation of primary protection at MWTS and the exact time of fault clearance are yet to be verified.

During the line fault, the 'X' protection of the MWTS 66 kV No. 1 busbar operated and tripped the busbar. As a result, several transmission elements opened at MWTS. Figure 1 and Figure 2 show the statuses of network elements at MWTS immediately before and after the incident. The following is a list of affected equipment during the event:

- 66 kV line between MWTS and Australian Paper Mill (APM)
- 66 kV line between MWTS and Moe (MOE)
- 66 kV line between MWTS and Loy Yang substation (LY)
- 66 kV line between MWTS and Sale (SLE)
- 220/66 kV No. 1 transformer between MWTS and Jeeralang Terminal Station (JLTS)
- Morwell PS

Morwell No. 1, 2, 3 and 5 generating units were in service at the time of the incident. Both No. 2 and No. 3 generating units tripped out of service immediately as a consequence of the sustained line fault and the No. 1 busbar trip. As the No. 1 generating unit derives its steam from the exhaust of No. 2 and No. 3 generating units, it tripped as a result of the loss of No.2 and No.3 generating units.

Some customer load interruptions would have been taken place during the sustained voltage depression during the line fault; however the exact amount, location and duration of load interruptions that took place are not available. SP AusNet investigations revealed that an incorrect ratio had been selected for the blue phase current transformer (CT) of the 11/66 kV No. 1 transformer causing the No. 1 66kV busbar to trip. The ratio of 2000/5 had been selected instead of the correct ratio of 1600/5. SP AusNet rectified the incorrect CT ratio immediately.

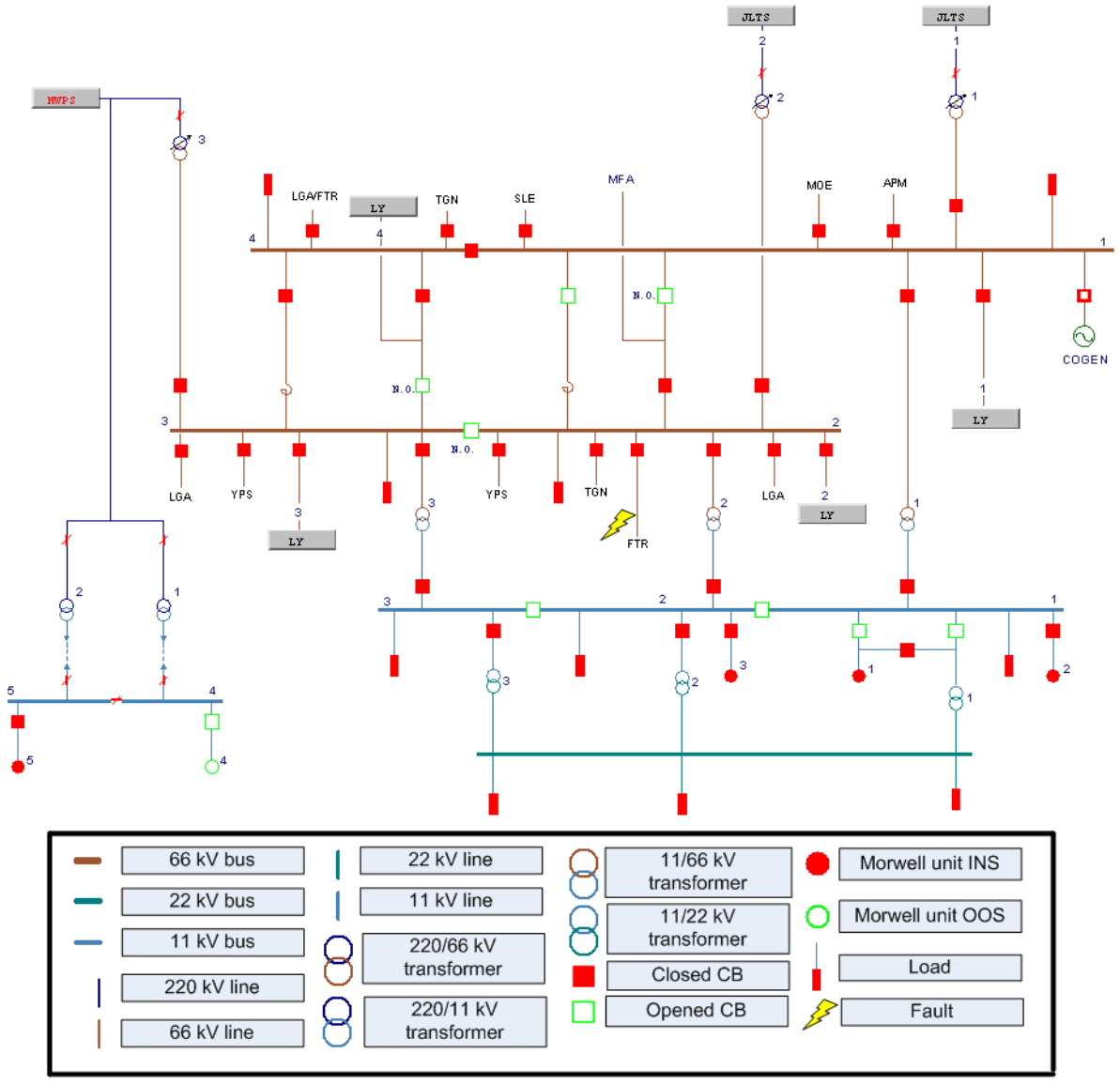

FIGURE 1. OVERVIEW OF MORWELL TERMINAL STATION AND MORWELL PS BEFORE THE INCIDENT.

Voltage depression in the 66 kV and lower voltage distribution network caused by the 66 kV line fault affected the auxiliary supplies of Morwell PS. This led to subsequent tripping of key auxiliary plant at the power station resulting in the tripping of the No. 5 generating unit due to boiler instability.

Approximately 153 MW of generation at Morwell PS was interrupted as a result of the incident. The following lists the approximate time these units returned to service.

- No. 1 unit returned to service at 20:55 hrs on 29 November 2010
- No. 2 unit returned to service at 01:20 hrs on 30 November 2010
- No. 3 unit returned to service at 06:34 hrs on 29 November 2010
- No. 5 unit returned to service at 07:20 hrs on 29 November 2010

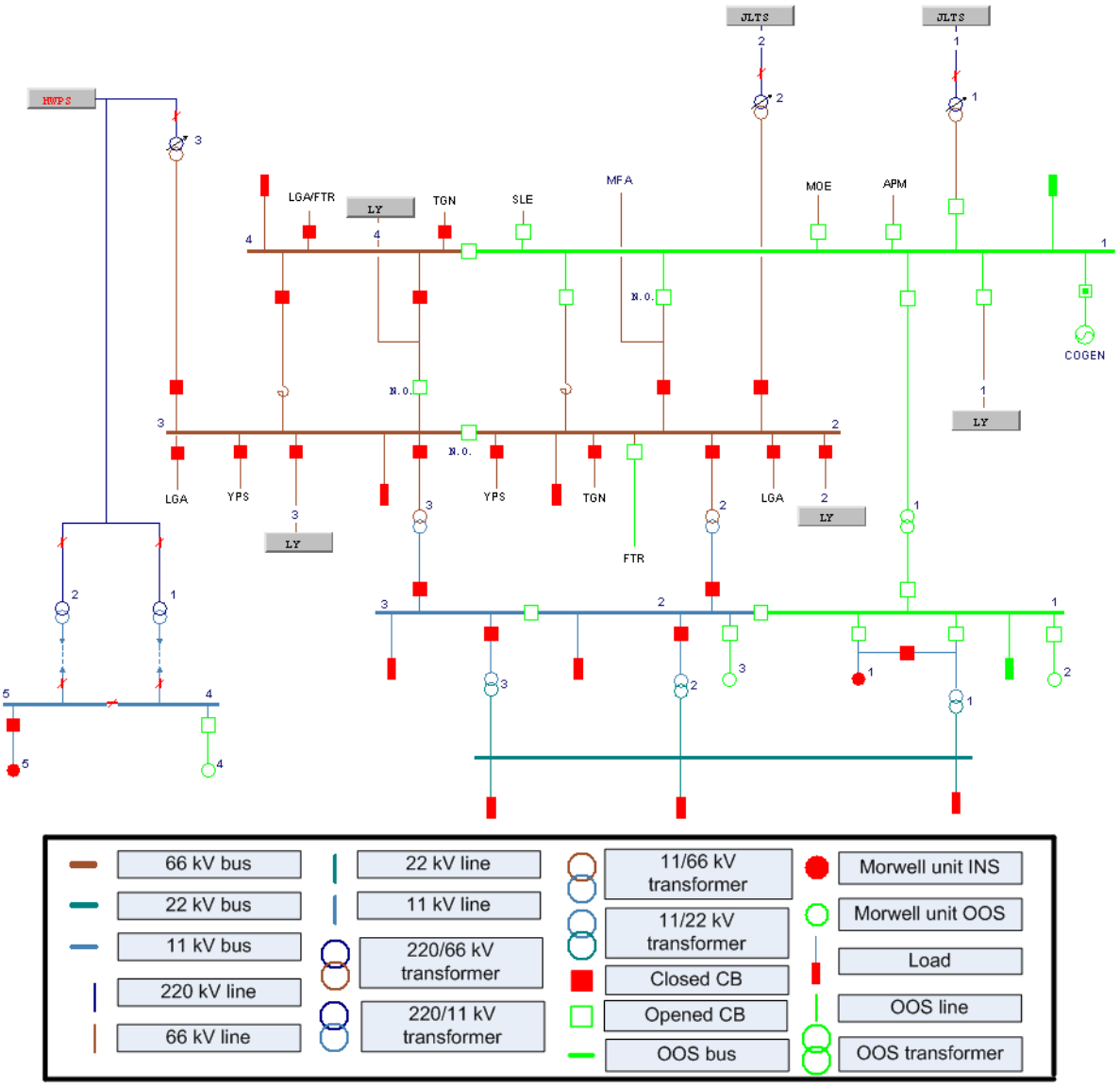

FIGURE 2. OVERVIEW OF MORWELL TERMINAL STATION AND MORWELL PS IMMEDIATELY AFTER THE LINE FAULT AND BUSBAR TRIP.

3. Follow up action

Nil.

4. Power System Security Assessment

There were no power system security issues flagged in AEMO's real-time power system security monitoring applications. The power system frequency remained well within the frequency operating standards. All affected equipment was returned to service promptly after the incident.

5. Conclusions

On 28 November 2010 at 18:33 hrs, a fault on a 66kV distribution line combined with the selection of incorrect CT ratio used for secondary systems associated with the 11/66 kV No. 1 transformer at MWTS caused the trip of 66 kV No. 1 busbar when a fault on the MWTS to FTR 66 kV line was experienced. Two Morwell generating units tripped immediately with the third unit tripping on loss of steam supply. The remaining generating unit tripped when the key auxiliary plant tripped as a result of the voltage depression experienced during the sustained fault. The reasons for failure of the operation of primary protection at MWTS and the exact time of fault clearance are yet to be verified.

6. Recommendations

SP AusNet will inform the reason for slow clearance of the fault on MWTS to FTR 66 kV line and the corrective action taken to AEMO by the end of April 2011.