

POWER SYSTEM OPERATING INCIDENT REPORT – TRIP OF BALLARAT–BENDIGO 220 KV LINE AND WAUBRA WIND FARM ON 29 NOVEMBER 2011

PREPARED BY: Electricity System Operations Planning and Performance

DATE: 19 March 2012

FINAL

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Abbreviations and Symbols

Abbreviation	Term
kV	Kilovolt
MW	Megawatt
NER	National Electricity Rules
PWED	Pyrenees Wind Energy Development Pty Ltd
Waubra WF	Waubra Wind Farm

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1 Introduction

At 2140 hrs on 29 November 2011, the Ballarat–Bendigo 220 kV line and Waubra wind farm (Waubra WF) tripped out of service. Waubra WF was generating 76 MW at the time of the incident. Heavy rain and lightning activity were reported in the area at the time.

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.

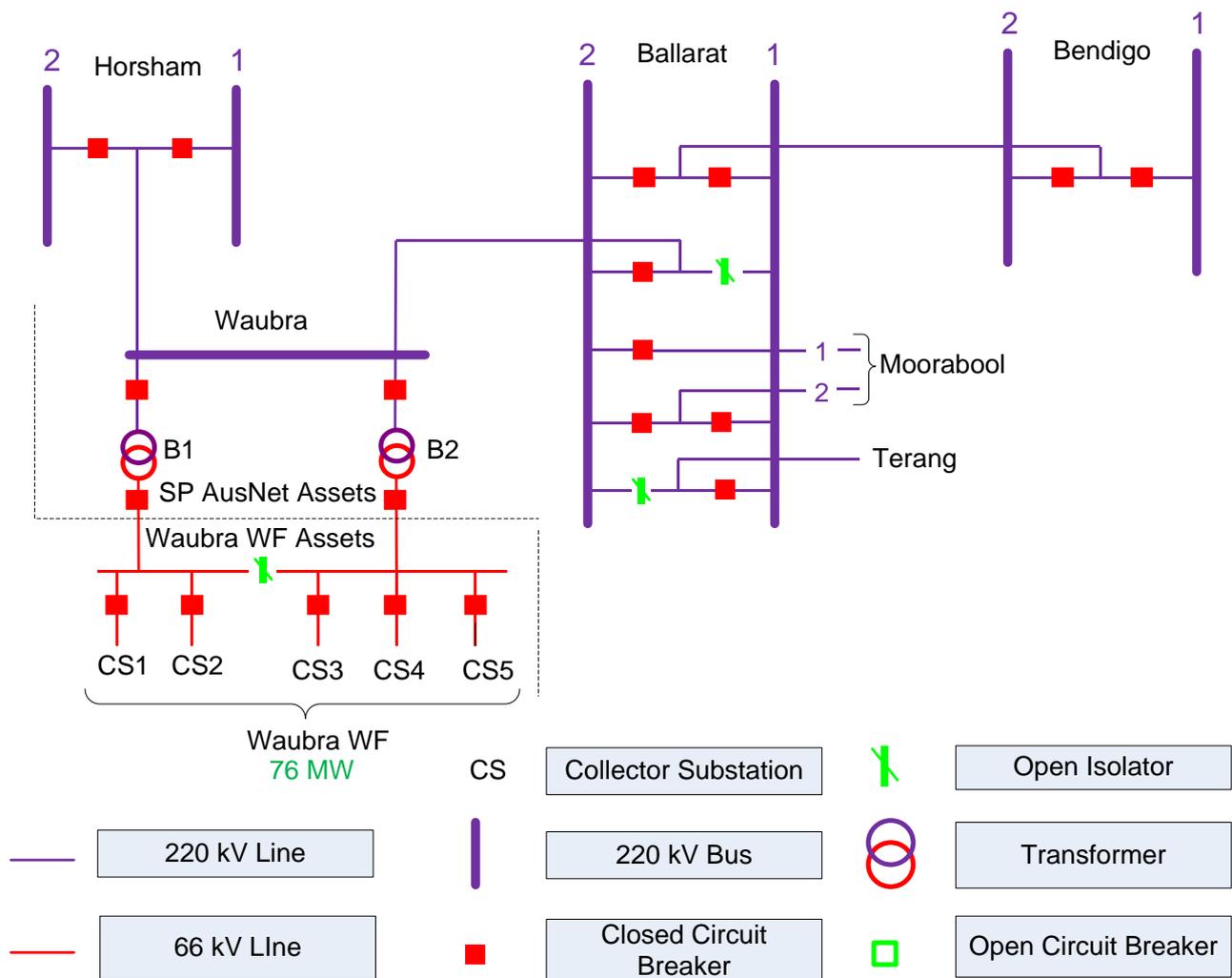
This report is largely based upon information provided by SP AusNet and Pyrenees Wind Energy Developments Pty Ltd (PWED). Data from AEMO’s Energy Management System has also been used in analysing the incident.

All references to time in this report refer to 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.

Figure 1 - Status of Waubra, Ballarat and Bendigo prior to the incident

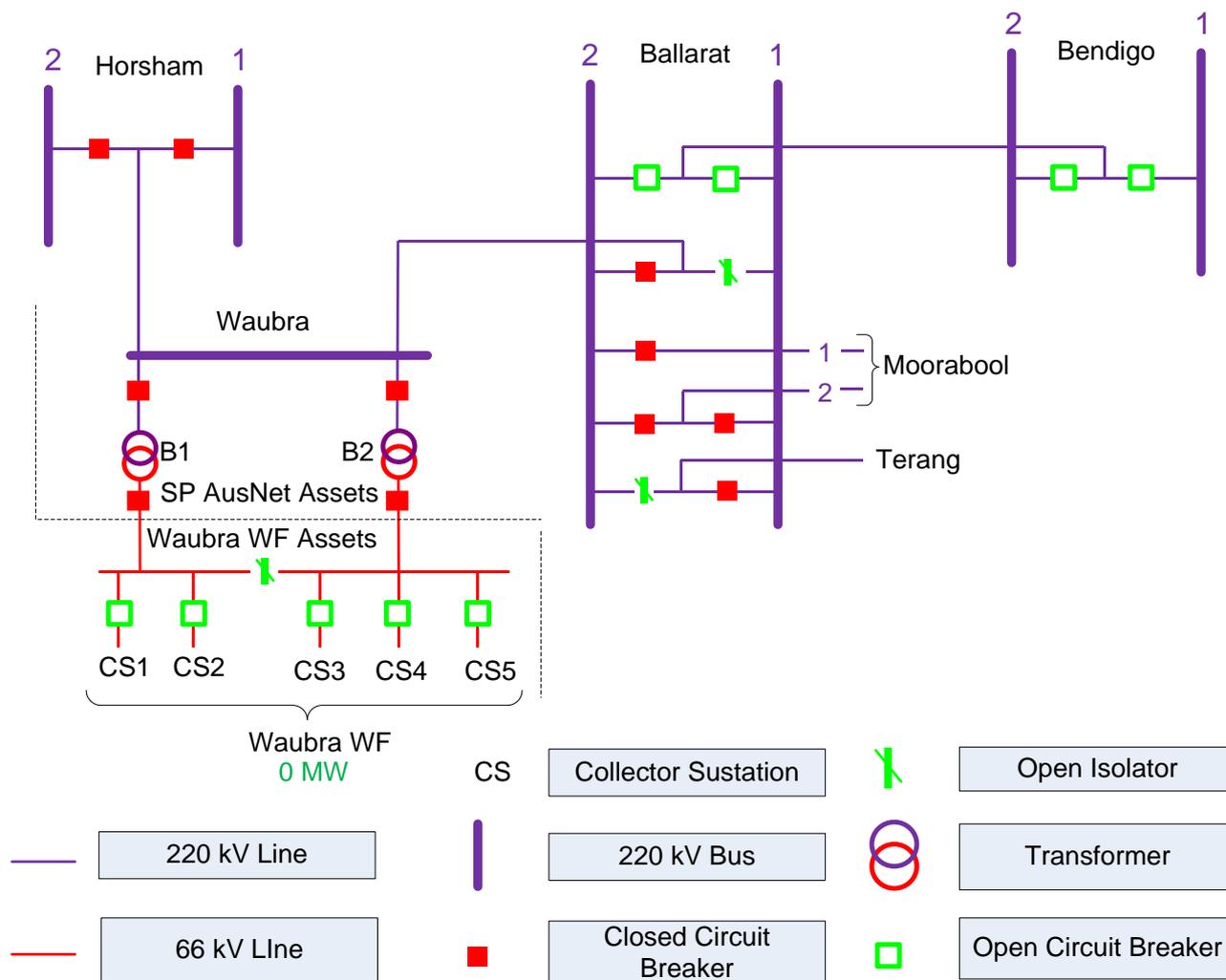


3 Summary of Events

At 2140 hrs on 29 November 2011, the Ballarat–Bendigo 220 kV transmission line and Waubra WF tripped. Auto-reclose of the line was expected by the design but auto-reclose did not work. Heavy rain and lightning were reported in the Ballarat area at the time of this incident.

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

Figure 2 - Status of Waubra, Ballarat and Bendigo immediately after the incident



4 Immediate Actions Taken

AEMO issued market notices to advise of the unplanned outage of the Ballarat–Bendigo line and the non-credible contingency event. Refer market notices 36805 and 36808.

Constraint set V_BABE for the prior outage of Ballarat–Bendigo line was invoked from 2145 hrs on 29 November 2011 to 0305 hrs on 30 November 2011. Waubra WF was returned to service at 2315 hrs.

SP AusNet patrolled the line but found no defects and the line was returned to service at 02:59 hrs on 30 November 2011.

Because the Ballarat-Bendigo line was out of service, SP AusNet disabled the Murraylink runback schemes at 22:09 hrs on 29 November 2011. SP AusNet enabled the runback schemes again at 03:03 hrs on 30 November 2011, after the line was returned to service.

5 Follow-up Actions

A further patrol was carried out on the morning of 30 November 2011, which found a flashed blue phase insulator on tower 181. SP AusNet will be replacing the faulty insulator in due course.

SP AusNet investigations revealed that there was a one phase to ground fault approximately 6.4 km from the Ballarat end of the Ballarat–Bendigo line at the time of the incident. The fault was cleared in 60 ms at the Ballarat end and in 70 ms at the Bendigo end.

On 14 December 2011, SP AusNet downloaded the event records to investigate the cause of Ballarat–Bendigo line auto-reclose failure, but found that the records had been overwritten by other power system events. SP AusNet will be modifying the event recorder settings to eliminate recording of non-essential events.

Waubra WF tripped when five 66kV circuit breakers opened within the Waubra WF. The two 66kV circuit breakers within the Waubra Terminal Station did not open. PWED undertook an investigation in coordination with SP AusNet on the trip of Waubra WF 66 kV circuit breakers at the time of Ballarat–Bendigo line trip. There was significant lightning activity in the area at the time. PWED concluded that the Waubra WF trip can be attributed to a lightning strike in the vicinity of the WF. PWED also concluded that the trip of the Waubra WF busbar is not directly related to the trip of Ballarat-Bendigo line, although the lightning activity in the area caused both events.

PWED has informed AEMO of non-compliance to the agreed performance standard of Waubra WF and are currently working to address this.

As a corrective action PWED will install and test a fibre optic solution to improve the protection scheme so that induced voltages on protection cables will not cause inadvertent tripping of Waubra WF when lightning is present in the vicinity of the wind farm. PWED has scheduled to complete this protection modification by 30 April 2012.

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 throughout the incident.

The one phase to ground fault on Ballarat-Bendigo line was cleared by the protection systems in accordance with the requirements specified in the NER¹.

7 Conclusions

Ballarat–Bendigo line tripped due to a one phase to ground fault. The Waubra WF tripped at the same time due to incorrect operation of one of its protection systems. There is no direct link between the two events. Both events are attributed to the lightning activity present in the area at the time of the incident.

SP AusNet was unable to investigate failure of the auto-reclose function of the Ballarat-Bendigo line because the event records had been overwritten. SP AusNet will revise the settings of its event recorders so that, in future, more important information on power system events will be kept in the records for a longer time.

PWED is undertaking corrective actions to improve the protection system that caused the incorrect trip of Waubra WF.

¹ Refer Schedule S5.1a.8 in the NER.

8 Recommendations

1. SP AusNet will amend settings of its event recorders so that more important information on power system events can be kept in the records for a longer time. SP AusNet will complete this action by the end of May 2012.
2. PWED will modify the relevant protection scheme to prevent inadvertent tripping of the wind farm due to induced voltages on the protection signalling wire between Waubra terminal station and Waubra Switching Station. PWED will complete this modification by the end of April 2012.