POWER SYSTEM INCIDENT REPORT TRIP AND AUTORECLOSE OF THE MOUNT BEAUTY – DARTMOUTH 220 KV LINE AND LOSS OF WEST KIEWA PS UNITS 1 AND 4 ON 17 JUNE 2010

PREPARED BY: Electricity System Operations Planning and Performance

FINAL

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1 Introduction

At 13:07 hrs on 17 June 2010, the Mount Beauty to Dartmouth Power Station 220 kV transmission line tripped. Significant lightning activity was experienced in the vicinity of the line at the time. The No. 1 and 4 generating units at West Kiewa Power Station (totalling approximately 32 MW at the time) tripped in response to the disturbance.

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 SP AusNet and AGL. 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

Prior to the incident, the Mount Beauty to Dartmouth Power Station 220 kV transmission line was in service, although the Dartmouth Power Station was offline. The No. 1, 2 and 4 generating units at West Kiewa Power Station were online and operating at approximately 16 MW each.

Figure 1 shows the status of the relevant circuit breakers, generating units and the relevant network elements prior to the event. There was a thunderstorm with lightning activity in the area at the time of the incident.

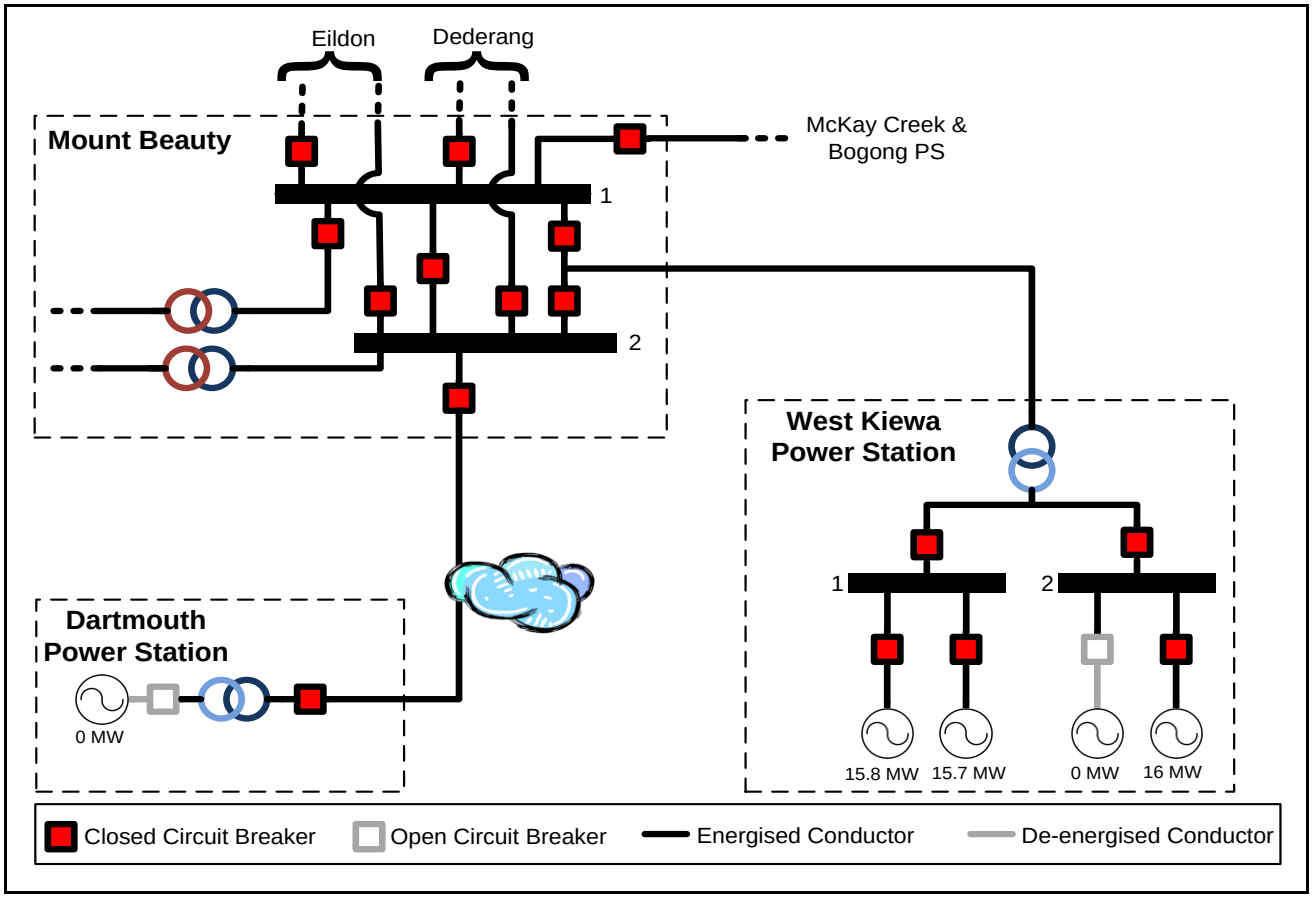

Figure 1 - Status of relevant circuit breakers, generating units and conductors prior to the event

3 Summary of Events

At 13:07 hrs on 17 June 2010, a lightning strike caused a two phase to ground fault on the Mount Beauty to Dartmouth Power Station 220 kV line approximately 16 km from the Mount Beauty transmission substation. The fault was cleared in 60ms when the following line circuit breakers opened to trip the line:

- Mount Beauty to Dartmouth PS 220 kV line circuit breaker at Mount Beauty
- Mount Beauty to Dartmouth PS 220 kV line circuit breaker at Dartmouth

Generating units 1 and 4 at West Kiewa tripped at the same time on the operation of generator differential protection while the generating unit 2 continued operating, unaffected by the disturbance.

The following circuit breakers opened to trip the two West Kiewa generating units due to the operation of generator protections:

- West Kiewa Power Station unit 1 11 kV generator circuit breaker
- West Kiewa Power Station unit 4 11 kV generator circuit breaker

The Mount Beauty to Dartmouth Power Station 220 kV line successfully auto-reclosed at both ends after 4 seconds.

Figure 2 shows the status of the relevant circuit breakers, generating units and conductors after the line and two generating units tripped. The Mount Beauty to Dartmouth line is shown as de-energised, although it auto-reclosed 4 seconds after tripping.

Generating units 1 and 4 at West Kiewa Power Station were returned to service on the same day, at 18:38 hrs and 16:28 hrs respectively.

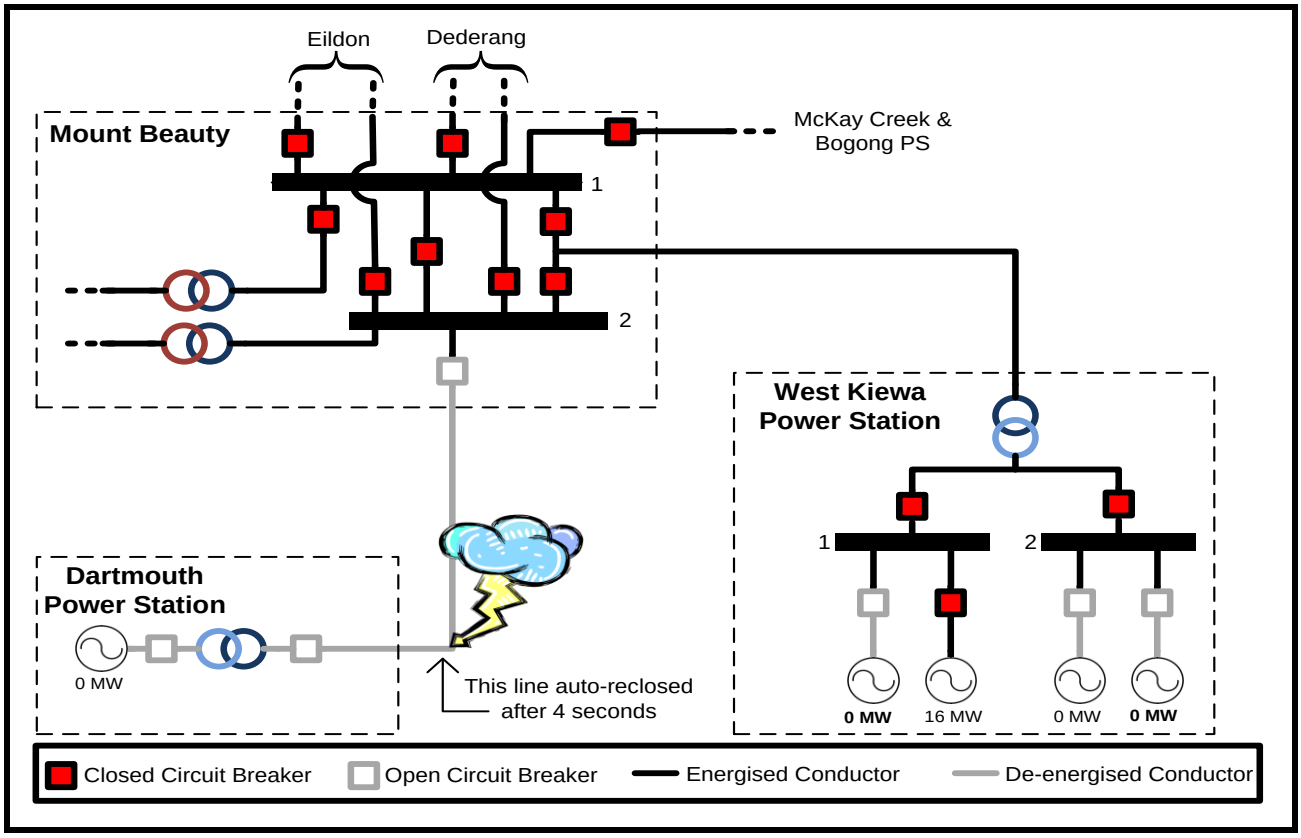

Figure 2 - Status of relevant circuit breakers, generating units and conductors immediately after the event

4 Power System Security Assessment

Local voltages dipped in the 60ms following the lightning strike, before the fault was cleared. Following this period, the power system frequency and voltages remained within the normal operating frequency and voltage limits throughout the remainder of the event. The power system remained in a secure operating state throughout the duration of the event.

Approximately 32 MW of generation was lost due to the incident, but no customer load was interrupted.

5 Immediate Actions

Following the event, AGL extracted and analysed data from the protection relays. It was determined that the generating unit trips were attributable to a lightning strike. Generating units 1 and 4 at West Kiewa Power Station were returned to service on the same day at 18:38 hrs and 16:28 hrs respectively.

6 Follow-up Action

The trip of generating units 1 and 4 at West Kiewa Power Station was not consistent with its agreed performance standards. As this was not the first time that AGL had experienced tripping of generating units similar to this, they revised the settings for the relays that tripped and simulated the fault in the laboratory. The relay rode through the fault, and the test was deemed successful. The relevant settings changes have since been made to the relays employed at West Kiewa power station and may be considered for AGL's other relays of the same type. The AER and Victorian TNSP have been advised of the non-compliance of West Kiewa Power Station to its agreed performance standard and that the non-compliance was resolved on 30 September 2010.

A line patrol of Mount Beauty to Dartmouth Power Station 220 kV transmission line was carried out on June 22. No defects were observed during this line patrol.

Based on the information available immediately following the non-credible event on 17 June 2010, AEMO did not reclassify the loss of both the West Kiewa Power Station and Dartmouth Power Station as a credible contingency. This is because the initiating event that caused the non-credible contingency to occur was external to the West Kiewa Power Station and further investigation was required.

At 17:12 hrs, AEMO control room issued market notice 32198, advising the occurrence of this incident.

7 Conclusion

At 13:07 hrs on 17 June 2010, the Mount Beauty to Dartmouth Power Station 220 kV transmission line tripped after being struck by lightning. The line circuit breakers operated to clear the fault in 60ms and then successfully auto-reclosed 4 seconds later. Generating units 1 and 4 at West Kiewa Power Station (totalling approximately 32 MW at the time) tripped in response to the disturbance. The units were returned to service after analysis of the relay data concluded that the trips were in response to a lightning strike.

After successful testing of the revised relay settings, AGL deployed the protection relay settings to the West Kiewa generating units to avoid similar undesirable tripping in future.

8 Recommendations

AGL to investigate whether setting changes need to be made to similar relays installed at other AGL power stations and to advise AEMO of the outcome of this investigation by 31 March 2011.

AEMO will modify the Power System Security Guidelines to ensure that following a non-credible contingency event information is sourced from contributing and affected parties as soon as practically possible to determine if the condition that caused the non-credible contingency event has been identified and addressed. If AEMO is unable to obtain the appropriate level of information to determine this, then AEMO will reclassify the event as a credible contingency event. This task will be completed by the end of October 2010.