POWER SYSTEM INCIDENT REPORT TRIP OF HAZELWOOD POWER STATION UNITS 1 AND 2 ON 9 JAN 2011

PREPARED BY: Electricity System Operations Planning and Performance

FINAL

Disclaimer

(a) ***Purpose -*** *This report has been prepared by the Australian Energy Market Operator Limited (**AEMO**) for the sole purpose of meeting obligations in accordance with clause 4.8.15 (c) of the National Electricity Rules.*

(b) ***No Reliance or warranty*** *– This report contains data provided by third parties and might contain conclusions or forecasts and the like that rely on that data. This data might not be free from errors or omissions. While AEMO has used due care and skill, AEMO does not warrant or represent that the data, conclusions, forecasts or other information in this report are accurate, reliable, complete or current or that they are suitable for particular purposes. You should verify and check the accuracy, completeness, reliability and suitability of this report for any use to which you intend to put it, and seek independent expert advice before using it, or any information contained in it.*

(c) ***Limitation of liability -*** *To the extent permitted by law, AEMO and its advisers, consultants and other contributors to this report (or their respective associated companies, businesses, partners, directors, officers or employees) shall not be liable for any errors, omissions, defects or misrepresentations in the information contained in this report, or for any loss or damage suffered by persons who use or rely on such information (including by reason of negligence, negligent misstatement or otherwise). If any law prohibits the exclusion of such liability, AEMO's liability is limited, at AEMO's option, to the re-supply of the information, provided that this limitation is permitted by law and is fair and reasonable.*

1 Introduction

At 0619 hrs on 9 January 2011, Hazelwood Power Station generating units 1 and 2 tripped simultaneously disconnecting approximately 350 MW of generation 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 & services and the appropriateness of actions taken to restore or maintain power system security.

This report is largely based upon information provided by International Power. 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 status of the relevant power system equipment before the incident is shown in Figure 1. Prior to the incident, Hazelwood Power Station generating unit 1 was generating approximately 130 MW and unit 2 approximately 220 MW.

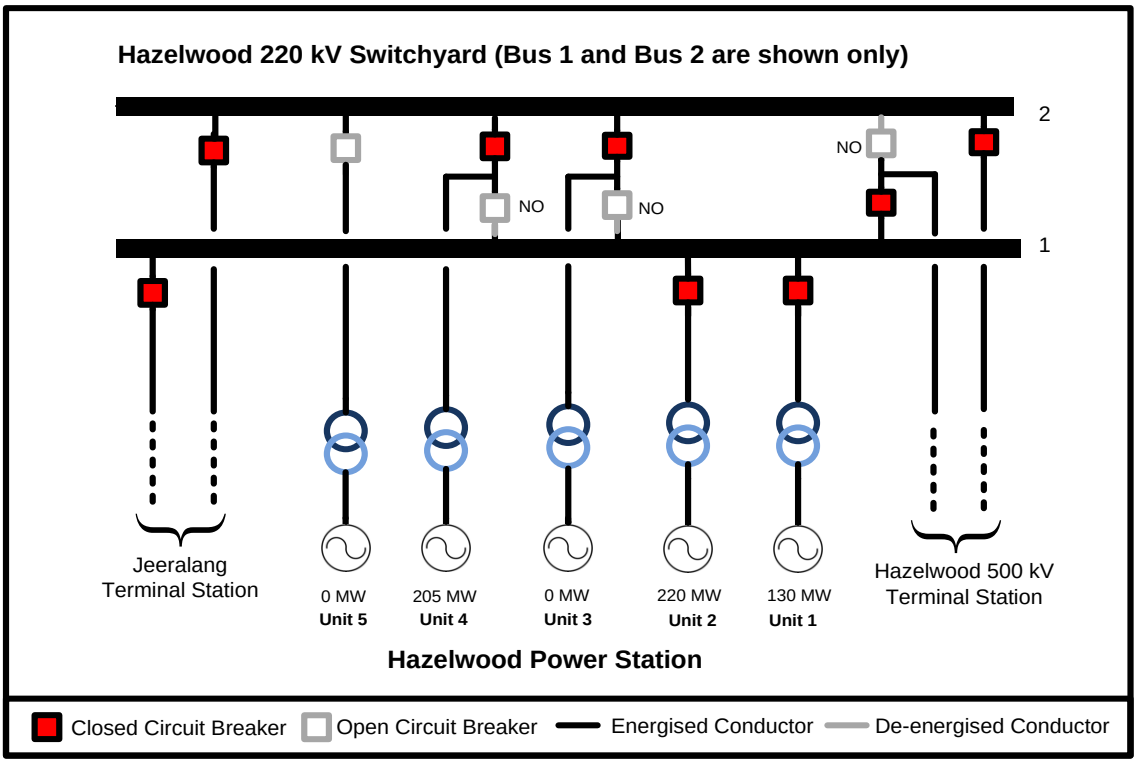

Figure 1 - Status of relevant circuit breakers, generating units and conductors prior to the event – "NO" donates a normally open circuit breaker

3 Summary of Events

At 0619 hrs on 9 January 2011 Hazelwood Power Station generating units 1 and 2 were tripped by their transformer protection systems and remote backup protection systems.

Following an investigation International Power determined that the trip was spurious. International Power also determined that the likely cause of the trip was a circuit fault in the 240 V DC power supply system. This power supply system supplies a number of control and protection system circuits including the generating units 1 and 2 transformer protection systems and remote backup protection systems.

The generating unit protection and remote backup protection system relay circuits have 240 V DC system wiring, including the protection system 240 V DC power supply system, in close proximity to 240 V AC control system wiring.

The circuit fault resulted in imposition of a 240 V AC signal on the 240 V DC system. The signal was picked up by the generating unit transformer protection relay and remote backup protection relay as an 'initiation of trip' instruction. This was confirmed by International Power using the data downloaded from the generating unit transformer and remote backup protection relays' event recorders on both Hazelwood Power Station generating units 1 and 2. The data showed inputs to both sets of protection relay inputs corresponded to the AC signal[1].

Figure 2 shows the status of the relevant circuit breakers, generating units and conductors following the operation of generating units 1 and 2 protection systems.

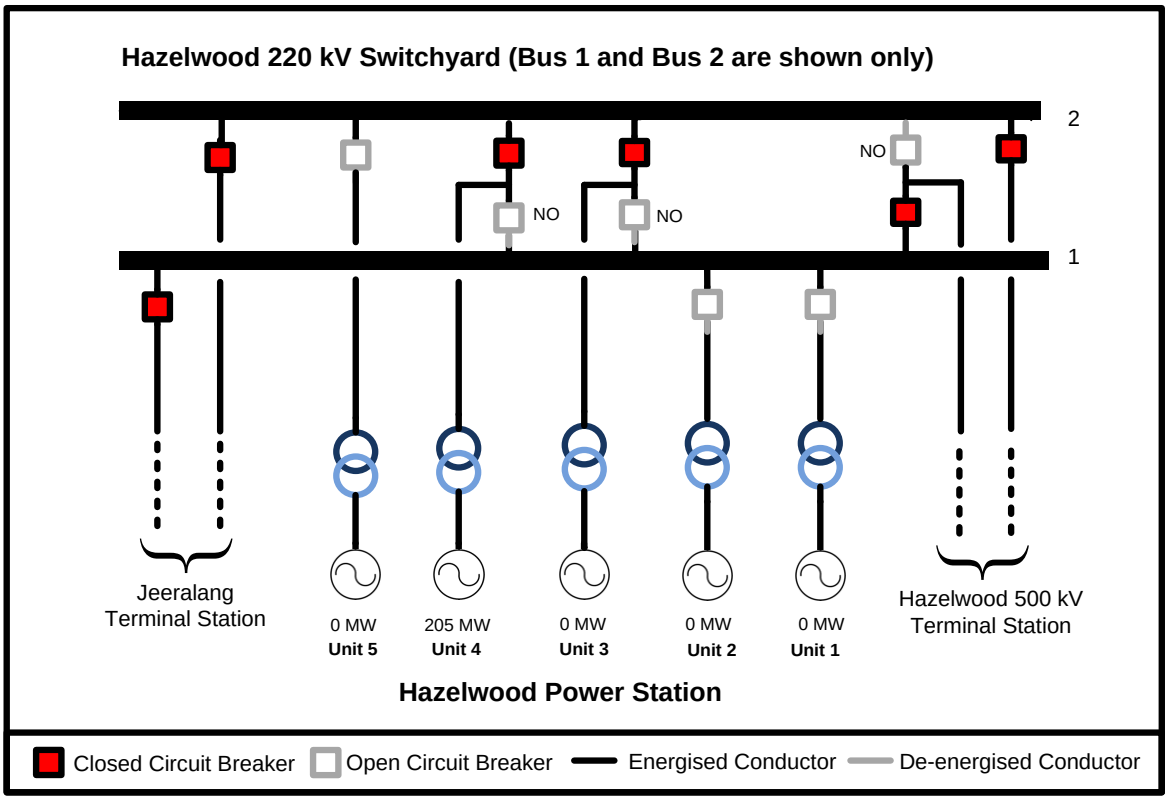

Figure 2 - Status of relevant circuit breakers, generating units and conductors after the event - "NO" donates a normally open circuit breaker

[1] The inputs were asserted every 10 ms which corresponds to half an AC cycle.

4 Power System Security Assessment

The power system frequency decreased to 49.87 Hz following the loss of approximately 350 MW of generation. No load was disrupted.

Due to delivery of frequency control ancillary services the power system frequency was restored within the required timeframe defined in frequency operating standards.

Based on the information available immediately following this event AEMO was satisfied that the event did not require reclassification as a credible contingency event. AEMO issued market notice 33983 advising the market participants of the incident.

The power system remained in a secure operating state throughout the incident.

5 Follow-up Action

Following the investigation of the incident, International Power discovered that during the commissioning of the generating unit 1 protection system AC interference to the input signals on some relays was observed.

On advice from the generating unit protection system relay manufacturer, resistors were loaded on the protection system relay inputs on generating units 1 and 2 to reduce their sensitivity to the observed external AC interference. Resistors were only added to the relay inputs where interference had previously been observed. During the incident on 9 January 2011 the relays that were modified during commissioning did not initiate spurious trips.

Following the 9 January 2011 incident International Power have now made a similar modifications to all protection system relays associated with generating units 1 and 2. Generating units 3 to 8 use a different type of protection system relay which is insensitive to spurious voltages on status inputs.

International Power also reprogrammed generating unit 1 and 2 protection system relays to require a signal to be continuously asserted for greater than 10 milliseconds for an input to be recognised. The additional operating time is negligible in the context of the overall operating timeframe associated with the generating unit protection systems and remote backup protection systems.

6 Conclusion

The loss of International Power Station generating units 1 and 2 was caused by spurious operation of the generating unit protection systems.

To reduce the risk of a similar incident International Power have made the following changes to generating units 1 and 2 protection systems:

- The inputs signals to generating units 1 and 2 protection system relays were loaded with resistors to make the inputs less sensitive to external voltage signals.
- The generating unit 1 and 2 protection system relays were reprogrammed to require a signal to be continuously asserted for greater than 10 milliseconds for an input to be recognised.