POWER SYSTEM INCIDENT REPORT

TRIP OF NO.1 AND NO.3 BUSBARS AT 500 KV LOY YANG POWER STATION SWITCHYARD ON 06 APRIL 2010

PREPARED BY: Electricity System Operations Planning and Performance

VERSION NO: 1.0

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 10:42 hrs on 6 April 2010, the No.1 and the No.3 500 kV busbars at Loy Yang Power Station switchyard (LYPS) tripped. SP AusNet were conducting protection maintenance at LYPS at the time. Generating Unit 1 at Loy Yang A Power Station (LYPS A) tripped from 520 MW and the No 2 LYPS to Hazelwood Terminal Station (HWTS) 500kV line which is single switched at LYPS, was off-loaded at LYPS, as a consequence of the busbar trip.

This report has been prepared under clause 4.8.15 of the Rules 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.

Information for this report has been supplied to AEMO by SP AusNet. 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. Summary of Events

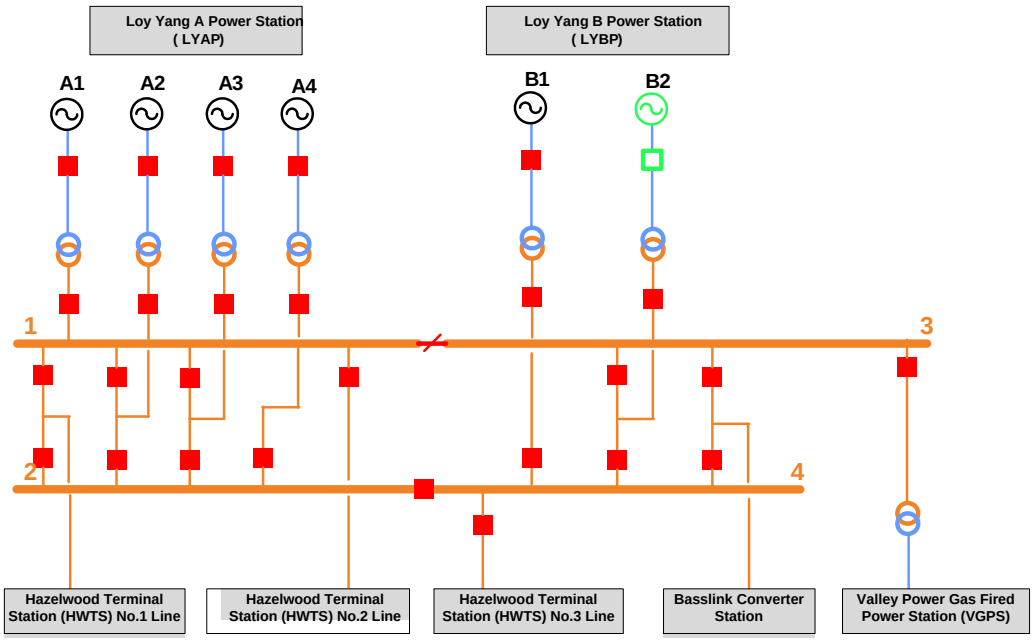
On 6 April 2010 SP AusNet was replacing a faulty protection relay at LYPS switchyard. SP AusNet advised that during the operational testing of the new protection relay, a complication arose that required the testers to move to another protection panel to diagnose and resolve the problem. On returning to the panel where maintenance work was performed, the tester inadvertently went to the adjacent panel which has the same layout and applied a test signal to an incorrect relay. This triggered operation of protection (operation of 1-3 500kV X Bus Protection Backup Trip relay) which worked as designed. The protection systems tripped both the No.1 and No.3 500 kV busbars which utilise common busbar protection systems. LYPS No.1 and No.3 500 kV busbars tripped at 10:42 hrs.

Transmission network arrangements at LYPS switchyard before and after the event are shown in Figure 1.

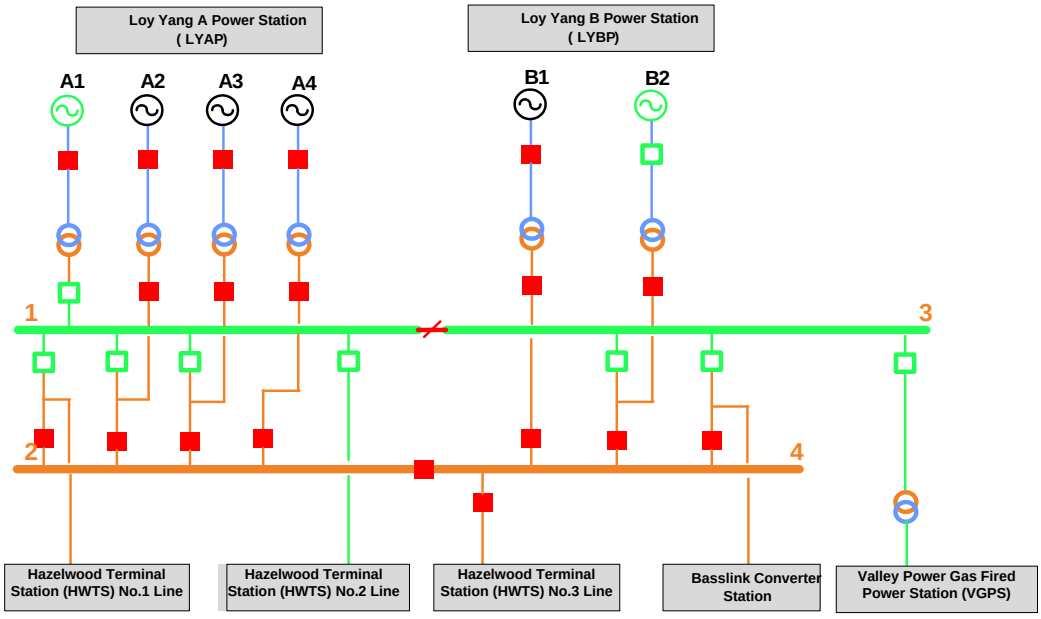
LYPS A Generating Unit 1 has only a single transmission connection to the LYPS switchyard via the LYPS No.1 500 kV busbar. Similarly Valley Power gas fired power station (VPGS) also has a single transmission connection to the LYPS via LYPS No.3 500 kV busbar. Hence the loss of No.1 and No.3 500 kV busbars resulted in the loss of LYPS A Generating Unit 1 and VPGS. VPGS was not generating at the time.

The No.2 LYPS to HWTS 500 kV transmission line is connected to LYPS No.1 500 kV busbar. As a consequence of the incident, this transmission line was off-loaded at LYPS.

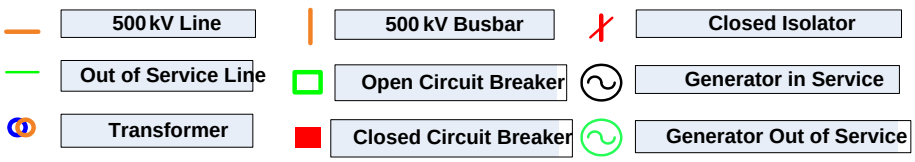
AEMO invoked relevant constraint equations to cover the outage of No.1 and No.3 500 kV busbars at LYPS to maintain the power system security.



Before the Trip



After the Trip



Legend

FIGURE 1: TRANSMISSION NETWORK ARRANGEMENTS AT LYPS SWITCHTARD BEFORE AND AFTER THE TRIP OF NO.1 AND NO.3 500 kV BUSBARS

LYPS No.1 and No.3 500 kV busbars were restored at 11:14 hrs. LYPS-HWTS No.2 500 kV transmission line was restored at 11:17 hrs and the LYPS-VPGS line was restored by 11:33 hrs.

3. Power System Security Assessment

Following the trip of LYPS No.1 and No.3 500 kV busbars approximately 520 MW of generation was disconnected from the power system. The power system frequency declined to 49.79 Hz in the mainland and Tasmania region. The mainland and Tasmania frequencies remained outside the normal operating frequency band for 248 seconds and 223 seconds respectively. Frequency remained well within the power system frequency operating standard for a multiple contingency event due to delivery of Frequency Control Ancillary Service (FCAS).

The following constraint equations were invoked by AEMO from 11:05 through 11:25 hrs to help maintain the power system security:

- V-LY_BUS1 invoked from 1105 hrs through 11:25 hrs
- V-LY_BUS3 invoked 1105 hrs to 1125 hrs
- V-HWLY_2 from 11:05 hrs through 11:25 hrs

Market Notices 31189 and 31194 were issued advising the market of the incident and measures taken to maintain the power system security. SP AusNet advised that the event was caused by human error and re-occurrence of the same error is unlikely. Therefore the loss of LYPS No.1 and No.3 kV 500 kV busbars was not reclassified as credible contingency.

The power system remained in a secure operating state during the event. The impact of this event would have been more significant had VPGS been generating at full capacity at the time.

4. Follow up actions

SP AusNet investigated this incident and came up with the following recommendations:

1. When working at the rear of a control panel, consideration should be given to applying temporary plastic barriers or tape etc., to adjacent panels so that the intended work area is clearly visible independent of the normal labels attached to panels and relays. SP AusNet will update its procedure to reflect this by the end of August 2010.
2. SP AusNet has commenced training personnel in methods to identify those instances where a break in concentration has occurred, and therefore determine at what stage they should recommence the original job. SP AusNet will continue this training on an on-going basis.

3. SP AusNet will assess the feasibility of implementing measures to minimise the risk of similar occurrences at critical sites. Such measures will include the installation of permanent barriers behind panels with open access. SP AusNet will complete an assessment of the feasibility of such measures by the end of December 2010.

5. Conclusion

The trip of LYPS No.1 and No.3 busbars took place during protection work being conducted by SP AusNet. The cause of this event can be attributed to the human error.

The power system remained in a secure operating state during the event and sufficient FCAS was delivered to maintain the power system frequency within the frequency operating standards.

SP AusNet has investigated the incident and identified suitable corrective actions to avoid similar occurrences in future.

6. Recommendation

SP AusNet will inform AEMO the progress of follow up actions 1 and 3 (refer section 4 above) by the end of August 2010 and by the end of December 2010 respectively.